The World Economy’s Convergence of Per Capita Income
LDCs Are Catching Up

Nake Kamrany
in Collaboration with Georgi Vassilev

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• Copyright Page
• Table of Contents
• Excerpt of Chapter 1

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THE WORLD ECONOMY’S
CONVERGENCE OF
PER CAPITA INCOME

LDCs Are Catching Up

Nake Kamrany
and
Georgi Vassilev

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Contents

Alphabetical List of Country Studies v
Preface vii

PART ONE: Convergence, Economic Development and Growth 1

PART TWO: The End of the Population Explosion 35

PART THREE: Growth Projections—Country Studies 45
World Growth 47
High Income Countries 51
European Monetary Union 59
Low & Middle Income Countries 65
East Asia & Pacific 67
Europe & Central Asia 89
Latin America & Caribbean 115
Middle East & North Africa 137
South Asia 151
Sub-Saharan Africa 157
Ending the 30-Year War in Afghanistan:
   Transition from Chaos to Stability? 175
Contrasting the Convergence Performance of
   China and India 183

PART FOUR: Appendixes 193
A. Analytical Approach 193
B. Some Theoretical Discussion 193
C. Methodology and Findings 194
D. Step by Step Project Description 197
E. Technical Notes 205
F. Table 1: Openness of Different Countries 209
G. Country Classifications 217
H. Wealth of Nations 220
I. Suggested Readings 221
<table>
<thead>
<tr>
<th>Country</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>175</td>
</tr>
<tr>
<td>Argentina</td>
<td>125</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>111</td>
</tr>
<tr>
<td>Brazil</td>
<td>117</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>103</td>
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<tr>
<td>Chad</td>
<td>171</td>
</tr>
<tr>
<td>Chile</td>
<td>129</td>
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<tr>
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<td>Egypt</td>
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<td>121</td>
</tr>
<tr>
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<td>159</td>
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<tr>
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<td>81</td>
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The phenomenon of global economic convergence is both revolutionary and very exciting. It is revolutionary to think that some day relatively soon nearly all nations will join the ranks of the developed countries and the dichotomy between Less Developed Countries (LDCs) and Developed Countries (DCs) will disappear. In other words, it is being conjectured that in the future there will be the end of world poverty and the LDCs. Under this scenario, there will be no more need for foreign aid, no more abject poverty and no more dependence. Those countries will get up there on their own just like Japan and many of the newly industrialized countries of the Far East such as Korea, Hong Kong and Singapore did. The modern economic convergence phenomenon is exciting because it is taking a relatively short time horizon for poor countries to catch up. Although the spread of cities took more than 6000 years and the process of modern economic growth took more than 500 years, the late comers such as China and India are covering the pace of development in decades instead of centuries. Furthermore, economic convergence via globalization diminishes the concept of traditional political sovereignty of nation states due to countries’ interdependence. Instead, it places a preference upon international consumer sovereignty. It means that the international consumer is the sovereign who makes the ultimate decision what to be produced, how things are to be produced and for whom to be produced on a world-wide basis. It further implies that, under the theory of convergence, many economic, social and political indicators throughout the world will tend toward uniformity. Under globalization, borders of nation states are disappearing as they did among the European Union members and are becoming dimmer among other nation states.

The notion of the less developed countries catching up with the advanced countries or global convergence of per capita income originated with me during the summer of 1996 when I was visiting Edinburgh, Scotland doing research on globalization. The idea became more concrete when I assigned my students the convergence hypothesis in the spring semester of 2003 at the University of Southern California. The outcome of that assignment led to the first edition which appeared in 2004 entitled, “A Developing World Economy: Unlimited Growth with Limited Population”. It was followed by the publication of the second edition in 2005 –“World Economic Growth in the 21st century” and a third edition followed exploring “Global Economic Convergence: Developing Countries Catching Up”. In this edition, the statistical information is updated to 2008 based on World Bank’s publications.

Also, 25 countries are identified, some of these countries have already converged, others are converging, rapidly or moderately, and there are countries that will not make it unless international intervention and support are made available.

Although it is doubtful that at this time some professional development economists, who are embedded in the dichotomy of developed countries (DCs) and underdeveloped countries
(LDCs) division, will embrace the phenomenon of convergence I have been encouraged by favorable responses at international development conferences, colleagues, instructors in other institutions students and recent empirical analyses.

In this endeavor I was ably assisted by D.J. Webster of the Program in Economics, Political Science and Public Policy (PEPP), especially in the preparation of the first volume. She made insightful and substantive contributions. Georgi Vassilev, a Ph.D. candidate in the Department of Economics has revised the graphs, tables, and the country studies in all of the successive second, third editions and the current volume with a view to explicate the convergence phenomenon. He has made invaluable and substantive contributions to the current volume and in the theoretical and statistical assertions of the convergence theory. He has presented papers on the subject to several international conferences.

Finally I wish to acknowledge the contributions, untiring use of computers and hard work of many students whose assistance speeded up the publication of these volumes.

Nake M. Kamrany
Pacific Palisades, California
January, 2010
PART ONE

Convergence, Economic Development and Growth
1. THE RAPID ECONOMIC CONVERGENCE PHENOMENON

INTRODUCTION

The modern global per capita income convergence concept refers to the process of low income and middle income countries catching up with the high income countries. It means growth and development of poor and middle income countries will bring wealth to citizens and economic power to countries. Wealth is the key to well-being and prosperity of mankind. Wealth makes it possible to solve the challenges of making a comfortable living and solve many problems of daily life. It is axiomatic that citizens of rich countries enjoy many comforts of life including preventive medicine, adequate health care, comfortable living quarters, quality education, nutritional requirements and other basic needs. In addition, a rich country can afford to supports intellectual discourse, arts, music, theatre, sports, e-mail, the internet, computer technologies, data bases, and many elements towards the actualization of a meaningful living. Even a “sufi” who suppresses materialism and wants is better off in a rich country than in a poor country. The surge of ideas and innovation usually take place in rich countries where opportunities for freedom of action and entrepreneurship, research and development are substantially enlarged. The process of convergence of per capita income of the poor and middle income countries to those of rich countries edifies the possibilities of the poor countries to achieve wealth and thus provide similar amenities to their citizens as the rich countries do. Then it would not matter in what location in the world a person is born, as opportunities would spread globally.

ECONOMIC GROWTH IS NOT A ZERO-SUM GAME—“THE CHINESE ARE NOT COMING” ALTHOUGH THEY MAY CATCH UP IN A QUARTER OF A CENTURY

An important misconception about economic growth is the notion of a zero-sum game assuming that the “pie” is fixed and if others get a larger share it erodes the share of those who already have captured their share. Economic growth presents the opposite of the “zero-sum” notion; it presents the notion of “growing sum” for all participants since the world’s wealth is not fixed and it is growing. The absolute shares of each nation would grow while the relative share may change.

Economic growth presents a situation in which each country has its own “pie” and if each pie gets bigger it contributes to the enlargement of others’ instead of subtracting from others.

Take the case of a rich country A with a big “pie” and a poor country B with a small “pie.” In this case country A transfers some resources to assist country B in the form of foreign aid.
But if county B’s pie grows large foreign aid will cease and country B will contribute to further growth of country A via mutual trade and investment. For instance, many poor counties did graduate from being poor and receiving foreign aid as soon as they became rich. The best example is South Korea which used to receive foreign aid from the United States in the 50s but emerged as a rich country. Now, South Korea is a viable partner with the United States and is contributing to the enrichment of the United States through trade and investment. By the same token, the emergence of China has provided a major source of financing and funding for the United States. Thus, “the Chinese are not coming”, they are joining in.

Rapid convergence, as explicated in this book, refers to the process of bringing the less-developed countries (LDCs) in line with the leading or developed countries (DCs). The convergence theory states that in the long run the per capita income of the poor LDCs will catch up with rich developed countries if there is a productivity growth differential in favor of the LDCs. Empirical evidence suggests that a majority of poor countries will catch up with rich countries within the 21st century or shortly thereafter despite the fact that currently a large gap exists in productivity levels and the material well-being of the rich and poor countries.

TRANSITION FROM STAGNATION TO GROWTH

The factors that have given impetus to rapid economic growth in modern times are in sharp contrast to factors that contributed to the slow transition from stagnation to growth during mankind’s history. The enhanced development of technology and its rapid transfer and diffusion are primarily responsible for the major jump in global growth. Moreover, the re-alignment of international political forces—the demise of the former Soviet Union, and the promotion of free trade and free movement of finance and international investment by the Western world have contributed enormously to economic growth. Differences in per capita income among countries were first explained by Walt W. Rostow’s seminal publication “Stages of Economic Growth”. Modernly, Oded Galor and others have identified the sources of economic transition to growth in historical perspective. Differences in various epochs of economic growth are rooted in pre-historical bio-geographical conditions (biodiversity, migratory distance, genetic diversity). Then there was transition from stagnation to growth—the emergence of multiple growth regimes and more importantly the ability of larger countries to adopt Western institutions over time. China and the newly industrial countries of the Far East placed specific emphasis upon international trade for growth. Ying Fang and Zhao Yang argue that China’s reforms are part of a long and circuitous historical transition from antiquity to modernity over the last 150 years wherein the influence of the West figured in prominently. Furthermore, the effect of institutions on economic growth in China was significant. It is worthy to mention that several countries have skipped the traditional step in the transformation from stagnation to growth.

Each country on earth has its own historical growth experiences, and the per capita GDP of nations currently varies between $1,000–$40,000+. However, in a wide cross section of countries, convergence appears to have been occurring during the last few decades at a faster rate than the historical norm.
For convergence to occur, three essential elements must be met. First, a difference in the level of productivity—output per hour of work—must exist. That is, there must be technological laggards, LDCs, and technological leaders—developed countries. Second, a difference in the annual growth rate or rate of increase of productivity between the laggards and the leaders must exist. The difference must be in favor of the laggards or LDCs. Third, a long-run time horizon is required.

There are three underlying “turning points” in human experiences that have occurred. They explain the rapid convergence phenomenon, as follows:

(i) Turning Point 1: Universal Secular Decline in Fertility Rates;

(ii) Turning Point 2: Rapid Transfer of Technologies from DCs to LDCs at low cost; and,

(iii) Turning Point 3: The demise of the Soviet Union in 1991 as a super political system, opening up and freeing nearly one third of the world economies to international exchange and globalization.

A. Turning Point 1: Decline in fertility rates (number of children per woman) globally and in the LDCs.

Recent fertility rates (number of children per women) have dropped globally including in the laggard countries or LDCs. This phenomenon is indeed a major turning point in human experience. If the average global fertility rate declines to 1.5 children, which is most likely, world population will continue to increase from its current level of 6.8 billion, peak to 9 billion by the year 2050 and then drop to 3.5 billion by 2150. This is in sharp contrast to the human experience prior to the 1970s.

In 1830s, when Thomas Malthus (1835) espoused his theory of population, the world’s population was 1 billion. He argued that population will double every generation. By 1920 it reached 2 billion, by the year 2000, it reached 6 billion. Although world population was increasing at an increasing rate over time, the acceleration was most pronounced in the decades through the 1960s, leading scientists to dire forecast of the coming population time bomb.

However, the perennial debate between Thomas R. Malthus and his father which started two centuries ago over the future condition of mankind is still continuing. Malthus, a cleric, philosopher and empirical economist, argued on two grounds: that the mankind species like other species will multiply so much so that there will be no standing room on earth. And, the law of diminishing return will depress labor wages to subsistence, a rather dismal forecast. His father, also a cleric, argued that the nature of human race was such that it would always be improving based on his precepts of the philosophical theological perfectionist tendencies that he foresaw in human kind. Malthus won the debate in the short run by virtue of the influence of his ideas but his father won the debate in the long run by virtue of being correct as mankind made the appropriate adjustment to avert a population explosion.
Malthus’ forecast was incorrect although mankind in some regions of the world has suffered the Malthusian curse for a time although this has been changing rapidly and continually improving. The forecast of his father was correct but not for the reasons that he espoused. In short, both the father and the son were incorrect although their prognosis was diametrically opposed. A reversal of the population growth rate has been observed since the 1970s, approximately 170 years after Malthus’ essay was published. The recent decline in fertility rates is largely attributed to a rising per capita income. An inverse relationship is found between per capita income and fertility rates pointing to a declining birthrate as per capita income rises globally and in the LDCs. In fact the recent declining population growth trends have caused concern for France and Japan whose absolute numbers are declining and for China whose government is seriously rethinking its policy of one child per couple.

B. Turning point 2: Transfer and appropriation of technologies by the laggard countries at low marginal cost.

The convergence movements on the part of the countries that are catching up is substantially enhanced by the low cost and ease of adopting new technologies that have been made available by developed countries. Modern technologies are much cheaper now to imitate and emulate by the LDCs than in the past. The advanced countries have already borne the expenses of the risky and time-consuming development of these technologies through the long process of research, laboratory testing and production. The recent dissemination of computers and communication technologies with low overhead, low sunk cost, low capital cost and low training cost has contributed significantly to productivity enhancement. These technologies include the internet, faxing, cable television, DVD, satellite communications and many digital technologies. Output of these technologies has reached mass production, is easy to adopt and transfer, and can be accessed by millions of users throughout the world. Factor inputs such as capital, skills, jobs and technologies are substantially mobile across national boundaries, seeking a value maximization and a higher rate of return on investment (ROI).

With an abundant supply of these technologies in developed countries, their ROI are low. Therefore their incremental contribution to productivity and domestic growth is low. The potential for growth is much larger in poor countries where the factor inputs are in scarce supply. It follows that in the long run per capita growth of the poor countries is going to be favorably affected by the growth rate of productivity. In due course, these faster rates of growth will allow poor countries to maintain a high rate of productivity growth to catch up with developed countries in terms of per capita income as illustrated by Japan and Singapore.

A note published by Diego A. Comin and Bart Hoblin, the Cross –Country Historical Adoption of Technology (CHAT) dataset, details information on the adoption of 100 technologies in more than 150 countries since 1800. These technologies improve the level of productivity in poor countries, i.e., productivity is a function of technology. The positive differential between productivity growth rates of the LDCs and DCs is the essence of the convergence theory because productivity growth compounds over time, like the interest rate on a savings account or on a debt. A small differential increment in productivity growth between
the poor and rich countries can have a huge effect on the level of productivity over time. This explains how poor countries in due course will be able to converge with rich countries in per capita income terms.

Many factors enhance the productivity differential between the poor and rich countries. The following are illustrative:

1. **Urbanization.** People migrating from rural to urban areas contribute to higher productivity since the average urban productivity is higher than rural productivity. This process is still continuing in the LDCs.

2. **Universal Education.** The average education level in LDCs has been rising over time—from 8th grade to 12th grade contributing to higher average productivity.

3. **Diffusion of Information.** Although information by itself is silent, the uses to which it is put provide the basis for economic growth. Private firms safeguard their trade secrets and draw upon copyrights and patent laws to recoup their R/D investment before others copy their findings. Nevertheless, the dissemination of information/knowledge has become rapid by digitized electronic exchange globally. Electronic communication is a turning point in the transmission of information/knowledge on which the cyber infrastructure is based. This process of digitizing information will further speed up with such projects as Google's creation of the next great library, which will scan books from leading world libraries onto the Internet. Such activities will speed up the convergence of poor countries by giving them access to a wealth of previously unavailable information at almost no cost.

4. **Globalization and Regional Synergy.** Regional linkages and trade unions such as World Trade Organization (WTO), European Union (EU), North America Free Trade Association (NAFTA), Central America Free Trade Association (CAFTA) and other have been useful to integrate the economies of their respective member states. However, these regional unions will give way to globalization which implies that in the long run there will be no economic borders suggesting free trade in goods and services, mobility of factor inputs including labor, investment capital, resources and technologies.

**C. Turning point 3: The Demise of the Soviet Union in 1991 as a major political system.**

After World War II, the “Cold War” ensued in which the world’s power and political system was dominated by a bipolar structure. Global economic activities were bifurcated into East and West blocs. For nearly half a century (1945 to 1991), the Soviet Union had dominated the Eastern European countries and competed with the United States in the third world for penetration and domination of the world as exemplified by the invasion and occupation of Afghanistan (1979-89). The explicit and implicit cost of the “Cold War” included emigration of 7 million people from Afghanistan to neighboring countries, arms race, reduced global economic activities in trade, investment, and technology transfer, and misallocation of resources. Moreover, the Soviet Union engaged in military brinkmanship vis-à-vis the United States causing a shift of resources from the civilian to the military sector. Citizens under the Soviet domination suffered from lack of personal freedom. Political suppression and government control in all walks of life.
In 1991, the Soviet Union folded as a super power. Its political system and its empire were succeeded by 13 independent states that are characterized by market and democratic orientation. Although these newly independent states suffered set-backs during the initial transition to market economies, soon enough they were poised to catch-up and experience convergence as shown in the country studies in Part III of this book. Moreover, the demise of the Soviet Union has freed enormous economic resources that were sunk into the military and has contributed to substantial increases in international trade, investment, globalization and technology transfer.

II. PER CAPITA INCOME IS A ROUGH MEASURE OF WELL-BEING AND STANDARD OF LIVING

Economists explore the economic well-being of nations in terms of national wealth, gross national product, gross national income and per capita income and output. National wealth is the sum accumulation of all the wealth that citizens of a nation have accumulated plus all the wealth of a nation’s natural resources, structures, capital goods, organizations, institutions and the remaining private and public equity. Wealth is a stock concept.

Wealth measures the value of all equities (private and public) at a specific time, it is a static concept. According to the World Bank (2007), average per capita wealth ranges from approximately $20,000 (Ethiopia) to $650,000 (Switzerland). Prosperity is defined as a function of the relative contributions of various kinds of capital to economic growth. These include the following.

1. Natural resources, 1%-3%
   It is the sum of nonrenewable resources including oil, natural gas, minerals, coal, cropland, pasture land, forested areas and protected areas.

2. Produced or Built Capital, 17%
   It is the sum of machinery equipment, and structures including infrastructure and urban land.

3. Intangible Capital, 80%
   It is the judicial system, the social system, trust among people in a society, property rights, and effective governance and institutions.

The ratio of per capita wealth to per capita income is approximately 12 (See Appendix H).

The value of economic power and production of a country is the gross domestic product (GDP) which measures the market value of all final goods and services produced in a country in a year regardless of the nationality of the producers. It is a flow concept (it is dynamic). When the value of foreign net earnings are included, i.e., the value of goods and services by a country’s residents wherever located, it generates gross national product or GNP. For most countries the values of GDP and GNP are very close.
GDP does not include non-market production, underground economy, barter, leisure, pollution or distribution of income. Generally, countries with large population will generate large GDP such as China and India with more than a billion populations each which rank second and fourth in the world. However, the relative productivity of the population determines the contribution to economic power such as the United States which is ranked number one in the world. Generally there is a relationship between wealth, GDP and per capita income. People generally accumulate wealth over time.

The share of the citizenry in the economy is measured by dividing the GDP by the population generating **per capita income**. Per capita real GDP or per capita income is a standard measure of economic well-being and progress of people and countries.

There are alternative ways of measuring the well-being of a citizen of a country by quantifying the quality of life indicators including the positive and negative societal attributes. These may include positives such as health, life expectancy, school enrollment, adult literacy, independence of women, communal support, harmony, security, welfare, societal interaction and negatives such as pollution, crime, congestion, corruption, inequities, mal-distribution of wealth and income, and the like.

The main drawback of per capita income as a measure of well-being of an average citizenry is that it could be grossly misleading if there exist a major disparity in the distribution of income or mal-distribution of income since it represents average income. If “A” has an income of $1,000 and “B” has an income of $10, their average income is $505, a totally misleading figure so far as the well-being of the average person. Nevertheless, per capita income is a rough measure of well-being and standard of living. Also, per capita income cannot project the total economic power of a country. For instance China is the world’s second largest GDP after the United States but it is ranked below middle income in per capita income ranking because of the large size of its population. Singapore’s per capita income ranks among the high income countries in the world and yet its total GDP is relatively small because of the small size of its population. Table 1.1 provides the per capita GDP ranking of countries.
Table 1.1: Countries’ ranking by GDP in 2008

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<td>2</td>
<td>China</td>
<td>7,305</td>
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<td>Japan</td>
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<td>India</td>
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<td>Germany</td>
<td>2,765</td>
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<td>6</td>
<td>Russian Federation</td>
<td>2,115</td>
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<td>7</td>
<td>United Kingdom</td>
<td>2,071</td>
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<td>8</td>
<td>France</td>
<td>1,959</td>
<td>31,577</td>
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<td>Brazil</td>
<td>1,827</td>
<td>9,517</td>
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<td>10</td>
<td>Italy</td>
<td>1,686</td>
<td>28,167</td>
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<td>11</td>
<td>Mexico</td>
<td>1,426</td>
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<tr>
<td>12</td>
<td>Spain</td>
<td>1,296</td>
<td>28,442</td>
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<tr>
<td>13</td>
<td>Low income</td>
<td>1,255</td>
<td>1,290</td>
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<td>14</td>
<td>Korea, Rep.</td>
<td>1,239</td>
<td>25,498</td>
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<tr>
<td>15</td>
<td>Canada</td>
<td>1,200</td>
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There are several ways that gross domestic product is measured.

a. The sum of the market value of goods and services via final demand or national spending plus or minus net export.

\[ GDP = C + I + G + NX \]

- \( C \) = private spending on final goods and services
- \( I \) = private spending on equipment, tools, structures for production
- \( G \) = spending by government of final goods and services excluding of transfer payments
- \( NX \) = value of exports minus the value of imports

b. The sum of income or cost or remuneration received by the factors of production including labor, capital, land (resources) and enterprise.

\[ GDP = WAGES + RENT + INTEREST + PROFIT \]

c. The sum of firms’ sales minus the cost of input – purchases of materials and services from other firms or the VALUE ADDES at each production stage.

\[ GDP = \sum \text{SALES} - \sum \text{COST OF INPUTS} \] at each production stage.
REAL V. NOMINAL GDP—A nominal or current GDP is not adjusted for changes in prices or inflation. A real GDP is adjusted for changes in prices by using a base period and adjusting prices so that values in different periods are directly comparable. This will remove the price-increase or inflation component. Thus, real GDP is the change in total output after price changes or inflation is removed. Real GDP is equal to nominal GDP divided by the GDP deflator or the price index:

\[
\text{Real GDP} = \frac{\text{Nominal GDP}}{\text{GDP price index}} = \frac{PQ}{P'}
\]

Examples: Nominal GDP increase at 20% between year t and year t’. If the price index is 1 in year t and 1.5 in year t’ then real GDP has increased by \(1/1.5 \times 20\% = 13.3\%\) instead of 20%.

There are three kinds of price indexes—consumer price index (CPI), the Producer Price Index (PPI) and GDP price index or GDP deflator. A price index measures inflation. The rate of inflation is measured as follows: Rate of Inflation = \(100 \times \frac{P_t - P_{t-1}}{P_{t-1}}\)

Growth of GDP in Year t = \(100 \times \frac{(GDP_t - GDP_{t-1})}{GDP_{t-1}}\)

Multiyear growth rate: Growth from (t – n) to t = \(100 \times \left(\frac{x_t}{x_{t-n}}\right)^{1/n} - 1\)

CPI with multiple goods: % in CPI = \(100 \times \left(\sum \text{weight}_i \times \% \text{change } P_i\right)\)

PURCHASING POWER PARITY—PPP

GDP and per capita income calculations of the less developed countries are underestimated due to market determined exchange rates and political events. In other words, market exchange rates of currencies could distort the real value of GDP and per capita income of a country. The prevalent approach is to convert each currency to dollars but the market exchange rates are very volatile and thus disruptive. An alternative method of calculation is to use an exchange rate that equalizes the cost of buying traded goods at home with the cost of traded goods abroad. For example, if the price of a steak dinner is $20 in Los Angeles and 400 pesos across the border in Mexico the implied exchange rate is 20 pesos for one dollar. To see that, notice that at an exchange rate of 200 peso to a dollar, the dinner will cost only $2 for an American to go to Mexico and have the same dinner. If this relative price could be applied across the board (market basket) then American consumer would go to Mexico to buy goods and services, which will cause the peso to appreciate relative to the dollar. The process will lead the peso’s exchange rate to fall to 20 pesos to the dollar. At this exchange rate the price of the market basket will be equal in both countries and the currencies will have equal purchasing power in both countries. Likewise, currencies of countries will depreciate relative to other countries if they have higher inflation rate. Factors that will impede the process of PPP include tariffs, taxes, transportation cost and financial flow restrictions. Nevertheless, many international institutions use PPP to estimate the value of GDP and per capita income which yield higher values for low and middle
income countries than relying on the market exchange rates. Using the PPP approach has shown to increase the value of the GDP of some countries by a factor of 2+

**THE POPULATION EFFECT UPON PER CAPITA INCOME**

China is ranked second by GDP but falls among the middle of ranked countries in terms of per capita income due to its large absolute number of population. Some countries that have high GDP growth rates and high population growth their per capita incomes are low because the population growth rates eat up the GDP growth rate—the population growth rates would have to be subtracted from the GDP growth rate.

**THE CORRUPTION EFFECT UPON PER CAPITA INCOME**

Until recently Nigeria’s per capita income was actually lower than its 1960 level, that is, instead of increasing its living standards they were decreasing due to what is called the Dutch disease, i.e., corruption of the ruling government for confiscating its wealth and transferring to foreign banks leaving the population destitute. Another illustration of the effects of corruption is Afghanistan. According to the Los Angles Times, during December of 2009, $10 million per day were leaving the airport of Kabul, Afghanistan for foreign banks—an unprecedented capital flight that have left the population destitute. Governmental corruption is the number one impediment to economic growth in the poor countries.

**HOUSEHOLD PRODUCTION IS NOT COUNTED IN THE GDP**

This factor underestimates the value of GDP of the poor countries since many activities are not counted in the GDP such as household services, self employment, communal economic activities, relatives helping each other out in the process of production or provision of services, barter exchanges and other non-monetized or non-market activities.

**THE EVOLUTION OF GDP AND PER CAPITA INCOME OVER HISTORY—THE PROCESS OF ECONOMIC GROWTH**

As we travel through the history of mankind going back to the origin of human history several millions years ago up to the emergence of the great prophets over a thousand years ago, there was little to be said about economic growth, GDP and per capita income. The innovation of growth began in Great Britain in the nineteenth century followed by the United States in the twentieth century along with other European countries and Japan. When Adam Smith wrote his book, “The Wealth of Nations” (1776), economic growth was largely a function of resources (land) and the production function could be shown as follows:

$$Q = f(R)$$
where $Q = \text{output}$, $f$ is the production function and $R = \text{land and resources input}$. Then labor was added to resources and the production function evolved.

$$Q = f(R, L)$$

where $L = \text{labor} = \text{human capital including skills, know-how, experience, and information acquired through education, experience, training, and learning by doing}$. In that construct, doubling of $R$ and $L$ would double $Q$.

Then Robert Malthus and David Ricardo in the 1800s identified the law of diminishing returns showing that by increasing labor output production would increase but at a diminishing rate. Smith, Malthus and Ricardo were the pillars of what is known today as the classical school of economic thought.

The role of capital and technology was added to the production function with the contribution of the neoclassical economists such as Alfred Marshall, John Stuart Mill and others in the nineteenth century. Other modern economists such as Robert Solow (1956) further embellished the growth theory.

$$Q = f(R, L, K, T)$$

$K$ stands for physical capital including tools, structures, machines and equipment and $T$ for technology. This relationship is also being expressed as follows:

$$Q = Af(K, L, R)$$

where $A = \text{level of technology}$. Some economist argue that technology only accounts for more than 90% of production in the modern growth construct which imply that the production function could be expressed as follows:

$$Q = f(T)$$

where $T = \text{Technology} = \text{how the world works}$. The creation of technology is a function of research and development, education, and entrepreneurship.

One of the outstanding characteristic of technological change is that it is readily subject to transfer and diffusion. This explains the rapid growth of the laggard nations such as China and India who has been able to draw upon transfer and diffusion of technologies in the process of their economic growth. In a sense, technology is a public good so that anyone can have access to it without having to pay for it (the free rider issue). This raises an issue of the recoupment of the cost for the development of technologies. However, the main explanations for the rapid transfer and diffusion of technology are profit motive and the enormous growth in international trade and international finance. In most cases technology is transferred via international trade and investment. Those who sell technology via international trade, investment or otherwise
make profit and maximize their profit by selling technologies at the marginal cost of technology which means it is cheap although expensive to create it. Moreover, modernly it is difficult to safeguard copying of technology in spite of granting intellectual property rights for the inventors and developers of technology.

Development economists now include several additional factors that are required for economic growth in addition to what appears in the production function. These include incentives and institutions including property rights, a dependable legal system, personal security by governments, honest government, and open markets. However, a number of countries have experienced rapid growth even though some of these factors are missing. For instance, China has a one-party system that by its inherent nature is subject to instability, corruption has been high there, and property rights are not guaranteed by the government. However, by and large, evidence strongly points to the fact that incentives and institutions are significant influences upon economic growth.

**CONSTRAINT ON ECONOMIC GROWTH—THE PROBLEM OF DIMINISHING RETURN**

In the neoclassical model of growth capital plays a significant role. The marginal product of capital, i.e., the increase in output caused by an additional unit of capital, increases output at a diminishing rate. The iron logic of diminishing returns is because the subsequent units of capital are applied to less productive tasks. Moreover, capital growth equals investment minus depreciation. In the LDCs where the stock of capital is low, the marginal product of capital is high and vice versa for developed countries. Economic growth stops when investment is just equal to depreciation. It follows that the higher the investment the wealthier a country becomes.

A steady state is when the rate of investment is equal to depreciation. Then, the farther away a country’s capital stock is from its steady state value the faster will be the rate of economic growth. This partially explains the convergence phenomenon of many countries. However, long-term growth cannot be explained entirely by capital accumulation. Therefore other elements such as entrepreneurship, inventions, innovations, new ideas, and many social movements contribute to long-run economic growth. Modernly, inventions and innovations are copied easily (as music/songs) because they are non-rivalrous and non-exclusive. However, most innovations reap their profit in the short time that they have retained their exclusivity.

The constraint on economic growth due to the existence of diminishing returns to capital and labor is countered effectively since other factors are not kept constant and by the rapid globalization movements wherein inventions and innovations are rewarded due to very large and dynamic global market and the absorptive capacity of the global market for practically any good ideas that are being shared largely through the market forces and a robust global market.
III. ECONOMIC GROWTH IS A HIGH PRIORITY AND CRITICAL OBJECTIVE OF ALL NATIONS—FAILURE TO GROW IS NO LONGER ACCEPTED

For most of history there was little or no economic growth. Modernly, however, economic growth has transformed many nations and there is now a clear vision that all countries can grow and provide a better living standard to their citizens than in the past. Also, there is an understanding that nations can grow and cover the path of growth in 50 years rather than 250, as forecasted in the past. Governments and policy makers in modern states pledge and implement economic growth projects to improve the living conditions of the citizenry in contrast to old kingdoms whose governments exclusively served the king. Leaders now serve the interest of non-leaders in order to get elected in the next term.

Any country whose per capita income grows at more than 2.5% per year will eventually catch up with the per capital level of the United States. As stated earlier, real gross domestic product (GDP) measures the value of all final goods and services produced by a country in a given year, with adjustments for increases in price due to inflation. Economic growth is an upward trend in the real GDP and is often used interchangeably with the term economic development. However, in economic terms, growth denotes only a higher GDP with the same quality and dimensions as before. In contrast, development requires an improved and differentiable change in the quality and structure of the size of the economy. For the purpose of this book, the meaning of economic growth incorporates the definition of economic development. Economic growth/development is the expansion of a country’s potential for higher and higher levels of GDP and represents one of the critical objectives of any nation (along with justice, equity, freedom, security, & stability). Growth/development contributes to an improved quality of life via greater average per capita income. As gross domestic product and in turn per capita income grows, private citizens will experience an improved standard of living, more net equity (wealth) and more money to meet their demands for a good life. The positive relationship between GDP and per capita income has been observed for most countries, in spite of the fact that GDP has several limitations as a measure of national output as compared to net economic welfare.

Economic growth also provides resources that help governments meet their citizens’ basic needs, such as nutrition, housing, health care, universal educations, social security, and the preservation of the environment, along with developmental requirements including infrastructure and direct productive activities. In part III of this book, the growth prospects of 25 countries are compared and projected with that of the United States over a 100-year period from 2009 to 2108. The U.S. has been used as a benchmark because it has one of the best long-term growth performances and is indeed a role model for many countries. This comparative performance study could be instructive for governments around the globe, providing advice on how to shift their policies and performance to beef up their economic development. For specifics of data collection and assumptions used in the analysis, please refer to the Project Description and Project Notes in the appendixes of this book.

The recent economic miracles of China, the impressive growth rate of India and the graduation of Korea from a middle to a high income country are illustrative of the fact that economic growth is a high priority of nation states.
IV. ECONOMIC GROWTH IS YOUNG AND OF RECENT ORIGIN

The beginning of economic development can be traced back about four centuries while human origins go back more than 7 million years. This implies that for approximately 6.7 million years human beings did not experience appreciable growth and just 200 years ago many people and nations states were poor. In fact, recent discoveries of human skulls in Ethiopia have been estimated to be about 160,000 years old. Nevertheless, for thousands of years the human condition did not change appreciably. Development, a change in the economic conditions faced by human beings, began around 1600 but moved at a snail’s pace until the beginning of the 20th century. Led by Great Britain, some countries began to pull ahead of the pack in the 1800s, gaining momentum by implementing the technological improvements of the Industrial Revolution. In these advancing countries, real GDP has grown by a factor of 20 since 1900, pointing to a remarkable change in performance as compared to the previous periods.

Economic growth in what have come to be called less-developed countries (LDCs) is a post-World War II phenomenon linked to the end of colonialism and the beginning of technology transfer. Prosperity itself proved harder to achieve for the latecomers and development itself was by no means an intuitive process, so scholars turned their attention to find ways to bridge the gap. Many economic development textbooks appeared in the 50s and these studies were followed in the late 50s and the 60s by the establishment of quite a few economic development institutes, centers, and programs in various universities around the world.

Figure 1.1: Economic Growth In Major World Regions Across Time (Time axis not to scale)

In spite of the plethora of economic theories of development produced by academics in the 20th century, from World War II to 1991, the primacy of political objectives engulfed the process of economic development in the LDCs. During the cold war, the Soviet Union attempted to persuade the LDCs to adapt its economic system of command or planned economy in order to enlarge its sphere of influence vis-à-vis the United States. As a keen competitor, the U.S.
matched its rival move for move, ostensibly encouraging the spread of democracy and free markets. The struggle between the superpowers derailed economic development in the LDCs as only a few despots and a handful of favored states benefited from their relations with either side.

Since the demise of the Soviet Union in 1991, states have been left largely to their own devices in the quest for economic development through international trade, international finance and investment via the free market. Institutions such as the International Monetary Fund and the World Bank have more power than ever to push countries toward their free market ideals, but less funding is being provided by the developed world to assist in that endeavor. In this process, financial capital has moved to those countries that have been able to combine a high rate of return on investments with a certain amount of political and economic security. Other states have floundered without the crunch of public and international assistance aid. Much work will have to be done in order to achieve true global prosperity but things are moving ahead.

Though the benefits of economic development may not be evenly spread around the world right now, it is important to remember that, relative to the age of the earth and the existence of the human species, that the conscious process of economic development is very young, spanning only the last few hundred years. It follows that the process of economic development will continue, perhaps as far into the future as one can perceive, although the historical trends are not inevitable. There is no theoretical basis for the expectations that rapid technological progress will continue indefinitely, that the world will not suffer major waves of recessions as in the years 2007–2009 or depression as in the 1930s, or that environmental concerns will not overwhelm economic development. Both improved understanding and persistent effort may be necessary in order to continue the recent trends toward increased production capacity and higher standards of living.
The convergence theory states that in the long run poor countries will catch up with rich countries in terms of per capita GDP if there is a productivity growth rate differential that favors poor countries. Empirical evidence suggests that a majority of poor countries will catch up with rich countries within the 21st century or shortly thereafter despite the fact that a large gap exists in the productivity level and the material well-being of the rich and poor countries.

Each country on Earth has its own historical growth trend that has been formed by social, political, economic and international factors. These different paths have resulted in a large variance in the development of countries that can be measured by their per capita GDP, which currently ranges by a factor of 40 from approximately $1,000 to over 40,000+. Figure 1.2 below illustrates the wide range of national per capita GDP in 2008 (2005 constant dollar) for the countries analyzed in this book.

These differences are largely due to variation in the natural resource endowment, human capital, entrepreneurship, technologies, political systems and social institutions. Rather than attempting to create a model that could endogenize all of the possible variables that determine the growth potential of other countries, we will use the United States’ growth performance as a benchmark for comparison.

The U.S. is the largest economy in the world today, producing almost 1/5 of global GDP (in PPP terms) and has maintained a relatively high growth trend of over 3% since 1961. Over the last 30+ years, some countries have been converging with the US, others have been diverging and still others have been growing on a parallel trend line. Since we know that the U.S. has been

doing well, we can say that those states that are either growing faster or at a similar rate are also progressing, while those that are diverging are not doing so well.

In order for countries to converge with, or catch up to the US, their real GDPs per capita must be growing at a faster pace, better than 3.0% per year. The best example of convergent movement is the way that Japan caught up with the United States after World War II. An overwhelming majority of nations are now in the convergent mode, and barring great recessions of the 2007-2009 type or the great depression of the 1930s, political impediments (war such as WWI and WWII), or natural disasters, should be able to experience rapid economic growth. In other words, in the very long run, per capita income of all nations should converge to that of the US with some dispersion—about the same variance that exists among the 50 states in the United States of America. The convergent movement on the part of the countries that are catching up is enhanced by the fact that the cost of adopting new technologies is much cheaper for LDCs than it was for the advanced countries that paid for the full development of the new technologies.

Research and development is often the most costly step in producing a new technology, so if developing countries can benefit from the dissemination of technologies already perfected by others, they can avoid some of the costs associated with increasing productivity. The U.S. itself was able to appropriate labor saving technologies developed in resource-poor, labor-rich Great Britain as the former colony made the transition from producer of primary products to industrial giant. LDCs are trying to use the same strategy in modern times, as exemplified by the transfer and diffusion of communication technologies worldwide. However, enforcement of patent laws at the international level is much stricter now than it was in the 1800s. Additionally, many countries will have to build up their human capital to take advantage of whatever new technologies they are able to appropriate. For more details, see the country studies in Part III.

Across a wide cross section of countries, convergence is the norm, although it has been rather slow for many countries from the 1950s to the 1990s. However, since the 1990s there appears to be a greater rate of convergence as illustrated by China. This higher productivity growth rate for poor countries as compared to rich countries was made possible by the recent introduction and rapid dissemination of computer and communication technologies including the internet, fax, cable television, DVD, satellite communications and the like. Now that they have reached the stage of mass production, these technologies require small overhead investment and sunk costs, are easy to adopt and transfer, and can be accessed by millions of people and enterprises throughout the world. Moreover, factor inputs such as capital, skills and technologies are in abundance in rich countries and therefore there are small increments and little room for additional growth. On the other hand, the potential for growth is much larger in poor countries where the same factor inputs are in scarce supply. It follows that in the long-run, per capita growth of the poor countries is favorably affected by the growth rate of productivity. In due course, these higher rates of growth will allow poor countries to catch up with the United States in terms of per capita income such as Singapore. There is no doubt that a typical labor in a poor country has less technology, education, capital stock and resources to work with than his counterpart in a rich country, but these inputs in poor countries increase faster than in the rich countries. This positive differential between productivity growth rates is the essence of the
convergence theory because productivity growth compounds over time, like the interest rate on a saving account or on a debt. A small increase in productivity growth can have a huge effect on the level of productivity over time.

Let us just repeat the basic elements of convergence. There are three essential elements for convergence theory to operate:

1. A difference in the level of productivity must exist, i.e. technological laggards and technological leaders.
2. A difference in the annual growth rate or rate of increase of productivity between the laggards (poor countries) and leaders, such as the United States, must exist. The difference must be in favor of the laggards.
3. A long-run time horizon.

During 1999–2008, the annual average GDP growth rate of the United States was 2.6%; the East Asian countries’ growth rate was 9.7%. At these rates the Asian countries would double their GDP in 7 years while the U.S. would double its GDP in 27 years. It follows that eventually these Asian countries will catch up with the United States in terms of per capita income. Japan, Singapore, and S. Korea are best illustration of convergence.

Divergence is the opposite of convergence. It means that the gap between a country’s per capita GDP and that of the United States is widening. For instance, the former Soviet Union diverged from the United States after the collapse of the Gorbachev regime when its economic growth dropped and became negative from 1990 through 1998. A number of African nations, also evidence a divergent movement; over time, the gap in the per capita income between these countries and the United States has widened. Many states in Sub-Saharan Africa have, in fact, become poorer than they were a quarter century ago, although this trend has been reversed in the last decade. With the exception of a few countries like Botswana, South Africa and Uganda the African continent has been in stagnation for an extended period of time, which means their per capita GDP has remained stagnant over the last half of a century, with the recent exception of the Sahel-Sudan countries. A major reason for the economic demise of these countries is the absence of a well-developed political system and institutions that could enforce property rights and contracts. These countries also suffer from lack of individual liberty, rule of law and a limit on government power.

The case of divergence may be illustrated by comparing the United States with Paraguay whose GDP per capita remained almost completely flat for over a decade. During 1999–2008, the average growth rate of the GDP per capita of the United States was 1.58% while that for Paraguay only 0.52%. It follows that if those growth rates are not altered, Paraguay will further diverge and the gap between the two will widen.

Parallel movement is observed between Western European countries and the United States. It is clear that once a country’s per capita GDP reaches a certain level, high growth rates will taper off as the economy becomes larger relative to the change in output. Since growth is measured in percentage terms, the larger the base, or original GDP per capita, the greater the possibility that further changes in production will maintain the same level of growth.
instance, if a country produces 100 million dollars worth of goods and services in one year and increases that to 110 million the next year, the rate of growth is 10%. However if the country starts out with 1,000 million dollars of GDP and adds the same 10 million the next year, the rate of growth is only 1%. Many of the countries currently running about parallel to the US are advanced industrialized countries that the U.S. itself converged with as it grew rapidly after colonization. It is partly this tapering off of growth in the developed world that will allow developing countries to catch up, given the right circumstances. Once they converge, their growth rate will coalesce with the advanced countries. In this exercise, any country that reaches 70% of the per capita of the United States is considered that it has converged with the United States. Accordingly, once a country reaches that level, we have adjusted its per capita growth rates by decreasing them at the rate of 3% per year.

An excellent illustration of parallel movement is that of the United States and Great Britain.

VI. PRODUCTIVITY IS THE MOTHER OF GROWTH AND DEVELOPMENT

Why is the United States richer than European and other countries? There are two main reasons than Americans have grown richer than citizens in 19 advanced European countries.

First, Americans work more than others. For instance, the total number of work hours per capita of the United States (34.5 hours per week) is greater than France and Germany (28 hours of work per week). According to OECD (Organization for Economic Cooperation and Development) between 1970 and 2002, annual hours worked per capita rose 20% in the United States and declined 17% in Japan and 24% in France. Moreover, the proportion of working-age Americans who work has risen as more women enter the work force. As compared to Europeans, Americans work a longer workweek, have a higher labor-force participation rate, retire later and take fewer vacation days and holidays.

Second, the United States has higher productivity as compared to other countries which explains higher American wealth. U.S. productivity growth has accelerated since the late 1990s which has widened the U.S. lead in per capita income.

Productivity is the ratio of output over a weighted average of inputs. It is a function of the technologies used to make goods and services. There is a clear relationship between high productivity and economic growth. The more a country can produce, the more it has available for consumption or trade with other countries. Furthermore, if a country can learn to produce the same amount of goods with fewer inputs it can shift the saved resources into alternate production facilities, increasing its total productivity even more. There are five significant inputs that affect productivity: human capital or labor, land and natural resources, capital (structures and equipment), technology and entrepreneurship.

Human capital refers to the number of available workers and the quality of their labor, including its education, experience, discipline, and access to information. This is a significant resource for a country as more knowledgeable workers are able to produce more with the same amount of effort. For one thing, workers with better skills enable businesses to streamline the processes of production, making them faster and less wasteful. Also, workers with technical abilities are able to operate complex machinery and computer systems that can improve the
quality and usefulness of products. One reason that the productivity of a labor in Detroit is more than 40 times greater than its counterparts in many LDCs such as Bangladesh, China and others is due to the education, training, and know-how that are embodied in the Detroit worker. On the other hand, it is partly their better skill set that makes those workers more expensive as well as more productive.

LDCs often have trouble providing their citizens with good education and job training facilities because they lack resources and teachers. However, the productive structure of the economy influences human capital as well. For instance, the age distribution of labor varies from country to country. In most industrialized countries the average worker may be productive from the age of 14 to 65, although most people wait to finish high school (at age 18) or college (at age 22) before they actively enter the labor force. In many agrarian or semi-industrial societies, children may be set to work as early as 8 years of age, therefore many do not complete their primary school instruction, and few students persist through secondary school. On the flipside, in industrialized countries the population is living longer and most remain productive until they retire, usually in their 60s. In fact, in the US, about 10% of the population aged 60 and above continue to participate in the labor force. Life expectancy itself often curtails the number of productive years available to workers in LDCs. This is a loss in quality of human capital as well as quantity, since older workers have accumulated skills and knowledge in their many years.

Natural resources are significant productivity inputs, especially at the beginning stages of growth, as they provide a stock of assets for an otherwise poor country. National savings can be generated from the exploitation of natural resources making funds available for investment in the building of infrastructure, acquisition of capital goods and diversification of the economy. Once countries industrialize and reach a developed stage, the relative significance of natural resources often declines as has been the case for most notably in Japan, Israel, Hong Kong, Taiwan, and other service oriented economies. Other countries like Canada and Norway are rich in many natural resources and have developed without being heavily dependent upon a single natural resources or commodity.

Most of the LDCs are heavily dependent upon a single or a couple of natural resources or commodities. Oil proceeds have contributed significantly to the GDP of Saudi Arabia and other OPEC nations, without having much effect on the living standards of the majority of their people. Many countries in South America, Asia and Sub-Saharan Africa rely heavily on exports of primary products as sources of foreign exchange. Some like Botswana and South Africa have exploited mineral reserves, like diamonds or gold, but most are heavily dependent on the use of land to produce cash crops such as coffee and cocoa. Unfortunately, such primary products have a very low value relative to industrial goods or services and provide little value added to the economies of LDCs. Moreover, prices of natural resources often undergo short-term fluctuations that create uncertainty about foreign exchange earnings, reserves, and the exchange value of currencies, disrupting already fragile economies.

Capital goods are the structures and equipment that are used in the process of production of goods and services. Capital transforms labor and natural resources into products that can be sold for more than the combined worth of all three inputs. For instance, a farmer with a
suitable tract of land may be able to grow and harvest corn or wheat with the labor of his two hands alone. However, he will be able to produce those crops cheaper if he has capital goods such as tractors, combines and thresher. The historical movement from hand cultivation to the use of draft animals and rudimentary machines like plows to modern hi-tech farm machinery is an example of a change in the capital to labor ratio in agriculture. At each step farmers used less of their own muscle and more mechanical might, decreasing the costs of production by introducing economies of scale.

Such an increase in the capital-labor ratio is referred to as capital deepening, which improves labor productivity since more can be produced with fewer workers. As human capital grows, a steady capital-labor ratio creates capital widening, which maintains labor productivity, resulting in steady economic growth. A country’s ability to widen or deepen its capital base depends on the portion of its net national savings that is invested in new goods. If funds are not available to increase available capital as the labor force expands due to population growth, then the capital-labor ratio will decrease and productivity will decline. Also, capital deepening is constrained by the level of human capital. Giving a tractor to a farmer who is used to a plow will not do much good if he is not also trained to use the more productive machine.

**Technology** has already been shown to be one of the major causes of economic development earlier in this chapter. It is synonymous with knowledge, which is a function of education or the passing on of old ideas, in conjunction with research and development, which create new ideas. There are three types of knowledge/technologies that contribute to productivity: **engineering technologies**, managerial technologies and social technologies. When most people think of the word technology itself, **engineering technologies** are what come to mind. The term refers to the body of knowledge that has been accumulated from the fields of science and engineering, including the production of capital equipment, computers, and related hardware and software technologies. It was improvement in the engineering of farm tools that enabled the capital deepening discussed above.

Economists have delineated two other knowledge bases that contribute to growth and development. **Management technologies** help producers set up their businesses and production facilities as efficiently as possible so that they run with less cost. Consulting agencies, schools of business administration/management, and similar organizations have made enormous contributions to reducing the cost of doing business and thereby contributed to improving efficiency and productivity. **Social technologies**, society’s organizational and institutional knowledge, help to ensure maximum social welfare and limit disruptions to the economy that can result from certain types of dispute settlement. These rules and norms include institutionalized union-management relations, seniority systems such as tenure, and provision of social services that create positive externalities like education and health care. It is important for a country to provide services that would not be available if only individuals determined the allocation of resources. This allows the country to use all its resources to the fullest extent possible.

**Entrepreneurship** is the driving force behind improvements in all four other productivity inputs. The growth of an economy, among other things, is a function of the number and quality of entrepreneurs that a country can produce. The great Austrian economist, Joseph Schumpeter has defined the role and significance of entrepreneur in economic growth. These individuals
are engines of development and their activities to improve their own circumstances also create business, employment, wealth, and progress for the entire economy. Because they are forward looking and willing to take risks on new ideas or products, entrepreneurs perform the following critical functions in a society:

1. Invention of new products/services.
2. Innovation—the commercialization of an invention.
3. Creation of new markets for an existing product/service.
4. Creation of new methods of production or operation.
5. Discover new sources of supply

Though many entrepreneurial attempts failed in the past, those that have succeeded shape the present. The continued creative force of entrepreneurship has the potential to construct a better future for everyone.

The political, economic and social environment in a country determines whether entrepreneurs will flourish in a society. The establishment of free markets with well-defined property rights and viable credit opportunities allows entrepreneurs to identify and fund potentially beneficial projects. Incentive structures are also important. In some countries, the prevalence of graft and a state monopoly on resources takes potential entrepreneurs out of the productive side of the economy and engages them in solely extractive employments. Finally, investment in human capital improves the quality and efficiency of entrepreneurship by passing on the accumulated knowledge—in fact the technologies that already exist—so that energies can be focused on truly new ideas.

VII. UNDERSTANDING THE MOMENTUM OF MODERN TIMES

One key to our ability to sustain development in the future is to locate sources of development in the past. Interestingly, economic development has been picking up momentum at an increasing rate over the last century. The trend has been especially visible in the economies of the United States and Western Europe. Since 1900, the amount of capital per worker has increased by a factor of 3 in these regions as real wages have increased consistently during the 20th century. Moreover, the combined GDPs of these states have increased at an annual average rate of 2.5% to 3.0% from 1900–2000 while population growth has tapered off globally. The positive effects of development have stretched beyond the industrialized world. During 1965–1998 average income in the LDCs more than doubled, and during 1990-1998, the number of people in extreme poverty fell by 80 million. Since 1970 some 2 billion people have graduated from $1, $2, and $3 per day income of poverty.

From the experience of the last century, it is safe to assume that the long-term trend in growth will continue barring the recurrent of the great recession of 2007–2009 and as long as this momentum can be maintained. If this happens, all people will get richer. That is, per capita income will rise and so will per capita equity across the globe. There have already been instances in which countries that did not participate in the original shift to industrial production have
been able to catch up to those who started the trend toward development. Japan grew faster than the United States in decades after World War II, and now it is better off in terms of GDP per capita in spite of the devastation of World War II. Many scholars attribute Japan’s success to its ability to adapt and improve on production technologies already in use elsewhere.

In fact, the proliferation of inventions, innovations, and technological changes at a rapid rate has been the major source of economic growth in the last century. Invention is the creation of new knowledge, products or ideas, innovation is the commercialization of an invention; and technological change refers to additions to the existing body of knowledge. Beginning with the advent of the industrial revolution, these three factors began to appear at an increasing rate and have continued to fuel economic progress in spurts since then. Some social thinkers have surmised that the human race has already achieved maximum growth and the process of growth will cease in the near future. Empirical evidence shows that there is still a great capacity for technology-driven growth, both through dissemination of current processes and creation of new ones. In fact, economic growth is only limited by our ability to deal with the externalities created by increasing productive capacity.

The view of development has not always been so optimistic. Adam Smith (1776), the father of economics, held that economic growth would eventually cease. David Ricardo (1817) and Thomas Malthus (1798) thought that economic growth would be locked into a stationary state with wages of the labor remaining at subsistence (the Iron Law of Wages). These classical economists’ prognoses and predictions have so far turned out to be incorrect.

**THE NEO-MALTHUSIAN VIEW**

However, to this date, pessimistic views about the miserable conditions of the human lot persist. In modern times, there are two major theories about the limits of economic growth. The longest-standing group of pessimists is founded in the Malthusian tradition and bases its predictions on population’s time bomb. This issue is discussed at length in the next chapter, where we argue that, contrary to past expectations, the end of population growth is in sight. In fact, there is a major concern among rich countries about declining population growth or zero meaning that the average number of children per woman is 2 or less. Others have based their predictions not on the infinite growth of population, but on the finite nature of the earth’s resources.

In the 1970s, Professor Jay Forrester of MIT under the auspices of the Club of Rome used a sophisticated computerized systems dynamics model to argue that economic growth on earth had reached its peak at the end of the 1960s and was going to decline from there on due to limited resources. Obviously, his model has not proven accurate. Discovery of new sources as well as new substitutes have expanded the production possibilities frontier since Forrester did his work. It is not clear now whether or not people will be able to continue to increase consumption indefinitely while dealing with capacity issues such as global warming, acid rain, the ozone hole, deforestation, and other forms of ecological degradation caused by increased production. There is no doubt that these issues are serious in spite of expected stabilization of population growth because incomes are predicted to rise, increasing consumption and demand.
for goods, which in turn increases productive pressures on the environment. However, there is a mitigating factor, in that environmental awareness is also positively related to income growth. It is hoped that future development will employ ecologically friendly technologies so that it will be compatible with the environmental carrying capacity of the earth. The neo-Malthusian concerns relate to externalities such as global warming, and nuclear proliferation where global cooperation are needed and hard to get.

Table 1.2: World Poverty Counts

<table>
<thead>
<tr>
<th>Dollar</th>
<th>World Population</th>
<th>One 2006 Dollar</th>
<th>$1/day</th>
<th>$2/day</th>
<th>$3/day</th>
<th>$5/day</th>
<th>$10/day</th>
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### Dollar World Population

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<th>$1/day</th>
<th>$2/day</th>
<th>$3/day</th>
<th>$5/day</th>
<th>$10/day</th>
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<td>2,423,597</td>
<td>3,915,190</td>
</tr>
</tbody>
</table>

| Change | 1970-2006 | -250,490 | -617,138 | -782,951 | -594,159 | 89,008 | 1,129,748 |
| % Change | 1970-2006 | -62.20% | -63.78% | -48.03% | -29.90% | 3.81% | 40.56% |
| % Change | 1990-2006 | -62.20% | -63.78% | -48.03% | -29.90% | 3.81% | 40.56% |

VIII. THE PROCESS OF GROWTH IS CYCLICAL RATHER THAN SMOOTH

It has been observed over the last two centuries that economies, in general, have experienced a long-term growth trend moving along a potential GDP path that is defined by the productive capacity of each country. On the other hand, the year-to-year movement of real GDP does not follow a smooth path, but rather short-run fluctuates around that trend. The first recession was in the form of a bubble in stock price and it took place in 1720 in Europe and largely attributed to irrational exuberance or high expectation of future growth which is not much different than the real-estate prime mortgage bubble of 2007 including corruption and misinformation.

Business cycles are the short-term movement in real GDP around its long term trend. Empirical evidence indicates that periods of recession or bust (below long-term trend) and boom (above long-term trend) take place at variable but recurring intervals. These economic fluctuations or swings in real GDP impact important attributes of an economy such as production, income and employment. Academics, businessmen, statesmen and others have exerted much effort in attempts to prevent or shorten bust periods and to extend and enlarge economic boom time horizon. However, though cycles are sometimes responsive to these attentions, recessions continue to occur at varying intervals in every country in the world.
Individual periods of recession or growth may be part of both short and long term cycles. Scholars have posited many explanations for and predictions about the cyclical nature of GPD fluctuations over the years. From 1920 through 2004, the US economy experienced 17 recessions including the great depression that lasted from 1929 to 1933 and the great recession of 2007–2009 which took everyone by surprise including the chair of the Federal Reserve Board, Ben Bernanke. It is noteworthy that Mr. Bernanke stated in a Time Magazine interview that he did not anticipate the 2007-2009 great recession when he became chairman of the Fed in 2006 although the federal Reserve Board possesses the most complete and on time information on the U.S. and global economy including many economic indicators that are designed to guide the Fed on economic trends. Information that is available to the FED to evaluate economic analysis, trends and forecast cycles includes leading, lagging, coincidental and diffusive indexes. An important new indicator of the 2007-08 recession is corruption of the business community.

It is just like no CIA analyst anticipated the Soviet invasion of Afghanistan in 1979, no economic analyst at the FED anticipated the 2007–09 great recession. Bernanke described the magnitude of the 2007–09 great recession as follows:

Virtually every large financial firm in the world was in significant danger of going bankrupt. And we knew—and I knew based upon my experience as a policy maker, I knew that if the global financial system were to collapse, in the sense that many of the largest firms were to fall, and the financial sector essentially stopped functioning, I knew that the implications of that for the global economy would be catastrophic. We would be facing, potentially, another depression of the severity and length of the Depression from the 1930s.

Time, December 28, 2009.
Karl Marx (1818-1883) predicted these economic cycles and expected them to cause the eventual downfall of capitalism. His predictions did not materialize. Joseph Schumpeter (1936) studied the causes of long cycles and attributed periods of strong growth to positive incentives for entrepreneurship in an economy. John Maynard Keynes’ (1883–1946) prognosis was that insufficient aggregate demand was the cause of these cycles and identified counter cyclical roles for the government that are still in use today, and perhaps saved the Western and global economy in 2007–09 recession.

A recession is a significant decline in employment and real income including GDP, real income, employment, industrial production, and wholesale-retail sales. The National Bureau of Economic Research (NBER) is the official body that identifies U.S. recessions. Modernly, countercyclical tools of governments include four options: monetary policy, fiscal policy, international policy, and market policies. Business cycles have been caused by supply shocks such as the oil embargo of the 1970s, or productivity shocks that occur when inventions and innovations reach maturity. Over investment can exacerbate and lengthen downturns, as when the exceedingly enthusiastic speculative environment of the 1920s collapsed into the chaos of the Great Depression. Presidential elections and other political events can influence cycles, as can monetary institutions, like the Federal Reserve Board (the “Fed”) in the U.S., that tinker with the supply of money. At least eight of the seventeen cycles in the US since 1920 have been caused by the Fed due to its miscalculations in manipulating the supply of money. Nevertheless, governments continue to endeavor to reduce the duration and severity of these cycles worldwide. While the Fed cannot prevent cycles, it has learned to implement effective countercyclical doses whenever necessary.

IX. MAJOR IMPEDIMENTS TO GROWTH

In order for all countries to achieve their full economic potential, some major impediments to development will have to be erased. These include absence of the rule of law, market failures, wars, regional rivalries, superpower interference, terrorism, and inappropriate allocation of resources on a global scale. The major impediment to growth in the LDCs is corruption by domestic governments. There are two prominent types of governmental corruption in the LDCs. First, government officials have siphoned billions of dollars from the national treasuries and graft and placed the funds in non-traceable accounts in foreign banks (the Philippines’ former president Fernando Marcus is a prime example). According to the Los Angeles Times, $10 million are leaving Afghanistan on a daily basis while the central government seeks foreign aid from rich countries. Though some corrupt officials stop at graft, others abuse their power by acting arbitrarily against their own citizens, violating human rights and repressing free speech (for example the former president Idi Amin of Uganda).

In many authoritarian states, in Africa and elsewhere, government action is channeled into support for predatory interest groups rather than provision of public goods. Governments exchange political support for special privileges as well as monopoly rights that prevent the formation of free markets. In almost every advanced industrialized country, political institutions have been created to limit governments’ discretionary power. The division of power between the
legislative, the judiciary and administrative branches is one example of a successful, balancing approach to governance. Similar structures have been constitutionally imported into many LDCs, especially those with roots in colonialism, but the lack of a civil society both willing and able to hold politicians to their stated good intentions has been the downfall of many a hopeful regime.

Allocation of resources to the military (ranging from 50% of GDP in Iraq to 1% of the GDP in Japan with a world average of 6% of the GDP) has no feedback into economic growth and has been injurious to global growth because of its high opportunity cost. Allocation into the military is sensitive to actual or potential warfare with a neighbor. Economic growth would be enhanced if resources were reallocated into nonmilitary sectors both on a global and country-by-country basis. However, the despotic nature of many regimes requires them to turn these armaments against insurgents and civilians in their own populations in order to maintain their power. Also, the chaotic nature of the international system has not yet been altogether overcome and many countries, the U.S. among them, do not believe it is safe to go weaponless in such a dangerous world.

Nevertheless, budgets for defense, preparation for wars and actual wars are impediments to economic growth and constitute both implicit and explicit costs and a drain on resources. An encouraging point about wars is that their duration and number of casualties per war have declined over time.

X. BENEFITS OF DEVELOPMENT DO NOT TRICKLE DOWN EVENLY

Benefits of development do not trickle down evenly and this problem exists both in rich and poor countries. It has been generally observed that as development takes place, the distribution of income and wealth also improves. Examples include Korea, Singapore and many of the newly industrialized countries of the Far East. However, in most of Latin American and Africa, the benefits of development have not trickled down. Instead, the gap between the rich and the poor has widened.

On a global scale, it has been observed that the issue of poverty remains in spite of remarkable economic growth over the last century. Poverty, as defined by the World Bank, refers to an income of $2 or less per day. Currently, 2.9 billion people live on less than $2 per day worldwide. That is, of the total global population of approximately 6.8 billion people, 48.3% are living below the international poverty line, which does not account for poor people in developed countries who are not able to meet their basic needs on much more than two dollars per day. It follows that poverty remains a problem worldwide. In the next 25 years nearly 2 billion will be added to world population and 40% of it may be in poverty. Minimum wage ($5.75) in the U.S. is less than 50% of the living wage ($13/hour) that has been adapted by some local governments.

What some have called a living wage is about the same as the subsistence wage that was defined by David Ricardo in 1817, just enough to get by on and survive. There is no theoretical basis for distribution; it is an equity issue decided by a society’s cultural, religious and ethical milieu. Many theories relating distribution of wealth to economic growth have been used to
Convergence, Economic Development and Growth

prop up various claims to fair and equitable treatment over the years. The longest running
dispute in the US has been between the “pump priming” concept espoused by liberals who
favor redistribution of wealth and the “trickle down” economics of conservatives who believe
that rich people drive economic growth and so should be allowed to control most of a nation’s
wealth. Empirical evidence regarding the relationship of poverty and growth has so far been
inconclusive, although, in market terms, most people are better off now than they were only a
few decades ago.

XI. BENCHMARK FOR LONG-TERM GROWTH

Over the last century and a half, the annual growth rates of rich countries have averaged to
approximately 2.5%–3% per annum. Indeed, there have been some periods in which single
countries have experienced growth rates as high as 10 percent or more, as reported by the former
Soviet Union (1950-1970) and China (1994–2008). On the other hand, periods of negative
growth in per capita income have also been observed in advanced countries, especially during
the oil crisis of the 1970s. Once cyclical fluctuations and individual shocks are accounted for,
historical experience points to the benchmark growth rate of between 2.5% and 3% as a healthy
indicator of the country’s economic performance. This is especially true when countries reach
an advanced stage with much bigger base, like the U.S. and Western Europe.

In this study, we present short studies of 25 countries from every region of the globe. Each
case presents the current level of development, including real GDP, GDP per capita and popu-
lation size along with the corresponding growth rates for these factors. Using recent growth
rates, we extrapolate the trend for future growth and compare each to the expected path for
the U.S. to show whether it is convergent, divergent or parallel. Economic indicators related to
trade, finance and productivity are then taken into account, along with information on social
and political assets, in order to gage the likelihood that the current growth rate represents a
long-term trend. It is hoped that by bringing together information on the development of each
country as well as factors often theorized to affect growth, much will be brought to light when
the cases are examined side by side.

XII. UNIVERSAL PROSPERITY COULD BE REACHED BY THE END
OF THIS CENTURY

Empirical evidence suggests that there is an inverse relationship between economic growth and
the rate at which human populations increase around the world. If current trends continue, the
apocalypse predicted by Malthusian doomsayers will have been effectively diverted and there is
a possibility that universal prosperity could be attained by the end of the 21st century. In Part
III of this book, it is shown that the majority of the 25 countries studied here have the ability
to converge with United States in terms of GDP per capita within a hundred years. With some
feasible adjustments to their economies, the remaining countries could also attain such levels
of wealth, but there are a number of African countries that may require direct international de-
velopment assistance to jumpstart their flagging economies. The price tag on that development
assistance would be less than a single percentage point of the combined military budgets of every country in the world. This is a small amount relative to the overall prosperity and peace.

XIII. THERE IS LIGHT AT THE END OF THE TUNNEL

Relative to history of mankind, economic growth and the attendant process of convergence is of recent origin. Karl Marx (1867) labeled the development of economic systems over time an inevitable process of transformation of societies from feudalism to pre-capitalism, capitalism, mature capitalism, socialism and eventual communism. W. Rostow (1960s) identified five stages of growth of nations from traditional societies, precondition for take-off, take-off stage, and eventually, to mass consumption stage. In the 1800s, Great Britain pulled ahead of the pack by implementing the technological innovations of the Industrial Revolution. Other advanced countries followed and caught up with Great Britain. Beginning in the 20th century the real GDP of the advanced countries picked up and grew by a factor of 20 from 1900 to 2004 pointing to a remarkable growth performance as compared to the preceding periods in history. In the analysis of the convergence theory variables such as the rate of saving and investment, capital formation and other endogenous variables are implicit.

The theory of convergence in this book is explicated, showing empirically that the majority of the LDCs will catch up or have the potential to catch up with the rich countries within the 21st century or shortly thereafter, despite the fact that a large gap currently exists in the productivity levels and material well-being of the rich and poor countries. These are revolutionary ideas that are technologically feasible. Although current institutions and the prevailing intellectual construct and inertia may not be prepared to appropriately assimilate and absorb the potential for convergence, the implications of convergence for universal prosperity, world peace, national and international security, migration, production of goods and services, the environment and the development of resources are inescapable and enormous.

The road to global security lies in availing opportunity for every nation state to achieve a level of prosperity that will obviate any incentives for wars and conflicts. Rich countries do not go to war against each other and as more countries join the rank of rich countries, the underlying reasons for war will dramatically decline. Using the same argument, one could assert that the power of global economic convergence will disarm terrorism—when everyone gets on the boat, there will be no more reason to shake it.

The power of a theory is to explain and predict events. The convergence theory predicts how the per capita income of the LDCs would or could catch up with leaders and identifies conditions necessary for conversion to take place. The three conditions for convergence include (1) a difference in the level of productivity, (2) a difference in the rate of change of productivity and (3) a long-run time horizon. Based upon the data of the past 20 years, LDCs may catch up with the United States’ per capita income if the average per capita income of LDCs grows at an annual rate of approximately 3.5%–4% per year and their population growth rates fall below 1.5%. Based upon these criteria, country performances point to the following:
1. **Rapidly Converging Countries**
   These countries experience at least 4% average annual GDP per capita growth rates with a population growth rates tending towards 1.5%.

2. **Moderately Converging Countries**
   These countries also show better than 4% GDP per capita growth rate, but their population growth rates (higher than 2%) hold them back.

3. **Slowly Converging Countries**
   These countries suffer from high population growth rates and will not catch up by the end of this century. Reforming political and social indicators are key factors for these countries to accelerate convergence.

4. **Not Catching-Up Countries**
   These countries experience negative or very low GDP per capita growth rates and high population growth rates. Many African countries fall in this category. International intervention in the form of economic assistance is necessary to pull up these countries.

In 2005, the rich countries agreed to write off $50 billion of debt, and further committed to provide $40 billion of economic assistance. These decisions will indeed help but these countries have to further adopt political reforms, do away with corruption, and nourish democratic movements.

Finally, the prevalence of poverty especially among low- and middle-income countries remains a concern. Rich countries have pledged USD 16 billion a year to eradicate poverty by 2015, but they would have to double their commitments to reach that goal. On a positive note, there are signs that poor countries will have a better chance of attaining high levels of growth in the future, enabling them to eliminate poverty on their own effort. Open trade (See Appendix F) will be a key to future economic development helping poor countries to improve living standards, manage debt and attract investment. Income in developing countries that lowered trade barriers grew three times faster than closed economies in the last decade. According to World Bank, lowering trade barriers by the 146 members World Trade Organization is expected to generate an additional $830 billion of global income in agriculture and manufacturing trade, two-thirds of it going to developing countries. An additional $900 billion will accrue to developing countries from the services industries.

The most encouraging and optimistic global trends include (1) a declining population growth rate; (2) a continuing economic growth into the far future including a rise in per capita income, GDP and stock of wealth; and (3) a convergence of the per capita income of many LDCs within the current century.