

CHAPTER 2

THE PROCESS OF ECONOMIC GROWTH

For many years, economists have tried to provide an explanation as to why some economies grow fast while others perform badly; in other words, why some countries are rich and others are not. Different theories and models of economic growth have been suggested. It may be that, taken together, economic history and new growth theory provide a more complete picture of technological change than either one can give on its own.¹

It is generally agreed that technology and knowledge have played an important role in recent economic growth.² This chapter will address the relation between economic growth and knowledge (or in the broadest sense, technology) by introducing several economic growth theories that have been proposed and discussed over the last 50 years. It will then examine the role of intellectual property (in particular, patents) in facilitating the creation of knowledge, paying particular attention to the recent technology revolution and to the increasing degree of sophistication in both “hard” and “soft” industries.

Intellectual property could be called the Cinderella of the new economy. A drab but useful servant, consigned to the dusty and uneventful offices of corporate legal departments until the princes of globalization and technological innovation – revealing her true value – swept her to prominence and gave her an enticing new allure. Not so long ago, protecting and managing intellectual property was a fairly quiet field of endeavor not given to making headlines or causing ripples on the stock market. However, in the space of a few years, IP issues have come to feature regularly as major news items and have taken their place as a key element in corporate strategy, affecting company ratings.

CLASSICAL THEORIES

In the days of classical economists such as Adam Smith, Ricardo, and Marx, capital played an important role in theories of growth. Although writing from different perspectives, classical economists believed that capital and technological progress contributed to the way an economy grew. Smith, for example, believed that improved technology would lead to increased labor productivity. He saw division of labor as the accelerator

of invention, and hence, technological progress. Despite the belief that technological progress contributed to increased productivity, classical economists, in particular Ricardo and Malthus, thought that in the long term, increased populations would outpace the productivity of labor, which would lead to what is known as the *law of diminishing returns*.³ Based on the law of diminishing returns, it was thought that there could not logically be infinite growth, and that growth would diminish at some point. Donella Meadows in *The Limits to Growth*⁴ postulated that limitless growth was not only undesirable, but also unsustainable. Unrestrained growth would exhaust the earth's supply of life-sustaining resources and would in the end annihilate the human race by driving it into extinction. A mood of pessimism prevailed in the face of an exploding world population that was seeking to be sustained by resources that were at best constant, but in reality could well be dwindling.

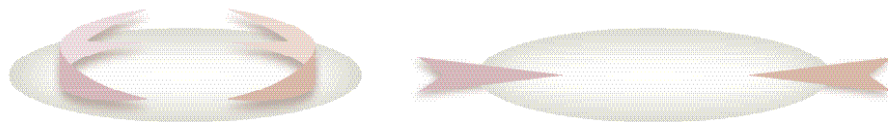
TWO SCHOOLS OF THOUGHT

It is important to look at how these earlier economists viewed the role of technology in the growth of an economy, because the insights they provided prepared the ground for growth theories that were developed in the last century while focusing on the contribution of technology to economic growth. These theories may be grouped into two models, known as exogenous and endogenous growth theories (see Chart - 2.1); both theories agree that technology is the engine of growth, but differ on how to treat technological progress as a factor in economic growth.⁵

Endogenous growth theory: According to this theory, technological change is included in the new capital stock. From this perspective, technological change is induced by previous economic conditions. In other words, economic growth originates from within the system, usually a nation-state, and technological progress is regarded as an endogenous factor. Endogenous growth theory focuses on education, on-the-job training, and development of new technologies for the world market, as major factors which determine the rate of growth of a nation-state.⁶

Exogenous growth theory: According to this theory, technological change contributes to increased output without any change to the input of labor and capital in the production process. In other words, technological progress leads to increased output while using the same amount of labor and capital. However, the theory does not specify any particular transmission mechanism by which technological progress takes place; rather, such progress is disembodied and assumed to fall like “manna from heaven”. This perspective sees technology as an exogenous factor.

CHART-2.1 TWO MODELS OF GROWTH THEORIES



Endogenous: Internal Power

Exogenous: “Manna From Heaven”

The work of Joseph A. Schumpeter, which is discussed below, has laid the necessary groundwork for the endogenous growth theorists. It explains why he saw technological progress as an endogenous process.

INNOVATION FOR CREATIVE DESTRUCTION

Schumpeter developed a growth theory centered on innovation and entrepreneurship. He saw a dynamic economy not as one in equilibrium, but rather, as one that is constantly disrupted by technological innovation.⁷ Entrepreneurs took advantage of a basic invention, be it a new product or a new technique, transforming it into economic innovation. Inventions were economically irrelevant until entrepreneurs got involved, to make them operational and to market them. In his view, entrepreneurs were motivated by the potential to make a profit. These new innovations would then be imitated, and in the process, this would lead to a boom in the economy, though the imitators would curtail the entrepreneurial profits.⁸ Although agreeing that several factors were necessary for economic development, Schumpeter regarded entrepreneurial zeal for profit as the driving force of most innovation.

Schumpeter considered that some degree of monopoly power would be necessary to enable entrepreneurs to continue innovating. However, he later predicted the demise of entrepreneurs and the emergence of a new mode of economic organization in which innovation and R&D would be conducted by large firms.⁹ This conclusion led some economists to see two Schumpeters: Schumpeter I, who saw entrepreneurs playing a leading role in technological progress; and Schumpeter II, who saw scientific and technical activities being undertaken by large firms.¹⁰ According to Schumpeter II, large monopolistic enterprises were the principal engines of technological progress, as they had the necessary resources to undertake complex technological activities and were also threatened by what he termed creative destruction (that is, innovations displacing inferior technologies).

Recently, some economists, in particular William Baumol, have attempted to pick-up on Schumpeter's work by trying to introduce the role of the entrepreneur into the growth process. They have postulated that an IP system is to be regarded as an important factor influencing the behavior of the entrepreneur in encouraging innovators, applying the innovation, introducing it into the economy, and marketing the product in a creative or innovative way.¹¹

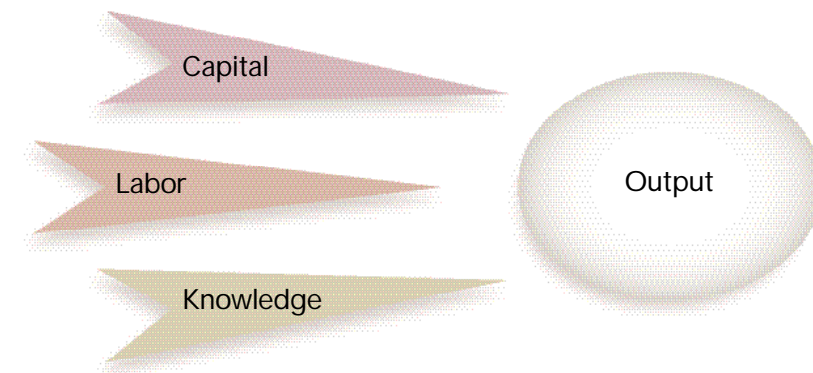
TECHNOLOGICAL PROGRESS – AN IMPORTANT ECONOMIC VARIABLE

In the 1950s, the neoclassical economists, led by Robert Solow, started focusing on technological progress as an important variable in economic growth. Unlike his neoclassical predecessors who treated capital as the main contributing factor in economic growth, Solow, based on his study of gross domestic product (GDP) data for the United States of America from 1909 to 1949, suggested that the growth in capital stock contributed to less than 20 percent of the growth of GDP per person employed, and argued that the growth in labor and capital explained only half of the growth in total GDP. He concluded that the remaining unexplained portion of growth, which came to be known as the *Solow residual*, resulted from technological progress.¹²

Solow introduced technological improvements as an exogenous variable into his growth model and changed the way economists perceived the contribution of technological progress in the economic growth of a nation-state. His findings were later supported in a study by Edward Denison, which concluded that, between 1929 and 1957, 40 percent of the increase in per capita income in the United States of America was due to the “advance of knowledge”.¹³ Today, these figures are likely to be much higher. Thanks to constant and rapid innovation, more than half of US economic growth is currently generated by industries that were hardly in existence a decade ago.¹⁴

Basically, the Solow model (see Chart - 2.2) focuses on four variables: output, capital, labor, and knowledge. It analyses how capital, labor and knowledge combine to produce output, the level of which can determine the growth of an economy over a period of time. This model assumes that technological progress occurs when there is an increase in the amount of knowledge, and that the production function constantly returns to scale in relation to capital and effective labor.

CHART-2.2 THE SOLOW MODEL



According to Solow, the growth of an economy depends on the rate of growth of capital, labor, and technological improvement. Solow believed, and tried to prove, that an economy would grow if a large share of its total output was devoted to investment or if there was a rapid growth of technology. Technological progress was the key factor leading to economic growth. Growth had little to do with the state of the internal economy, and progress in science and technology depended little on monetary or fiscal policy (that is, economic policy).¹⁵ In other words, treating technological progress as exogenous meant that the implementation of economic policy did not directly influence technical progress, but technical progress could influence economic policy. That is why the Solow model did not attempt to define where technology was coming from; it just recognized when technological progress had occurred and assumed that it was growing at a constant rate.¹⁶ The inclusion of technological progress in the Solow model meant that a country with a higher rate of technological growth (hence greater productivity growth) would experience a higher standard of living than those countries without such growth.

In explaining the applicability of his model, especially in relation to the rising standard of living as far as output growth and consumption growth were concerned, Solow introduced an assumption of technology growth as being exogenously determined and thus increasing the productivity of labor. This assumption meant that the natural rate of growth was not only composed of the biological rate of population growth, but also included the rate of technological progress; this is known as effective labor. The neoclassical economists are of the view that government policy does not have an effect on the growth of technology.¹⁷ Furthermore, the neoclassical approach emphasizes such issues as competitive behavior, equilibrium dynamics, and the way diminishing returns affect the accumulation of labor cost and capital.¹⁸

NEW ENDOGENOUS GROWTH THEORIES IN THE 1980s

In the 1980s, after several economists¹⁹ made contributions on the importance of technological progress to economic growth, new growth theories, also known as new endogenous growth theories, emerged, formulating technological progress as an endogenous variable, which could be influenced by government policy. These theories suggested that a country's long-term growth rate could be influenced by government policies, among others the protection of intellectual property, taxation, maintenance of law and order, and fiscal and monetary policies.

Paul Romer introduced a model which suggested that the accumulation of knowledge was the driving force behind economic growth.²⁰ Romer's paper reopened the debate on the contribution of technological progress to the economic growth of a nation-state. His model assumes a monopolistic competitive environment and suggests that R&D activities, and the accumulation of human capital through education and training, play important roles in generating long-term growth in per capita income. Like Solow, Romer also focused on labor, capital, technology, and output, and how the first three variables combine over a period of time to produce output. In an attempt to avoid the paradox encountered by the Solow model concerning the failure of less-developed countries to take advantage of existing technological progress, Romer postulated that technological progress in industry requires concerted, profit-oriented activity that yields two distinct components: (a) specific technical features embodied in products that can be patented and produced, excluding rival firms from the same activity; and (b) the knowledge that those features were essentially for the public good.²¹ In order to encourage people or institutions to be involved in knowledge creation, the principle of excludability had to be invoked. He argued that two ways can be used to exclude others: first, keeping the knowledge a secret and second, invoking effective intellectual property laws.

Romer concluded that for countries to promote growth, their economic policies should:

- encourage investment in new research, as opposed to encouraging investment in physical capital accumulation, and
- subsidize the accumulation of total human capital, as the higher the level of human capital a country possesses the higher its productivity, which translates into sustained economic growth.

Grossman and Helpman²² refer to studies made in several industries including machine tools, aircraft, synthetic chemicals, metallurgy, and semiconductors, which showed that the driving force behind investment in new technology was the potential of earning profit. They argue that among the factors which determine the profitability of such investment, and thus affect the pace and direction of technological change, are the institutional, legal, and economic environments. Various models of endogenous growth have been introduced so far and the debate on the relevance of exogenous or endogenous growth theories in explaining the factors determining the growth of countries is far from over.

A GLOBAL AWAKENING TO THE ROLES OF INTELLECTUAL PROPERTY IN THE 1990s

Looking back at the economic development achieved by some economically strong countries in the 1990s, there were, first, policy changes emerging from rapid knowledge creation and the adoption of new knowledge management practices and, second, changes due to the emergence of new technologies.

One of the consequences of the new pattern of global trade that started at the beginning of the 1990s was the forging of a deliberate connection between trade law and IP policies when some advanced countries began to "use trade measures to curb piracy of intellectual property rights abroad."²³ Among other things, this led to the inclusion of the

TRIPS Agreement as one of the agreements in the framework of the multilateral trade negotiations under the Uruguay Round. That Agreement established global standards for IP protection that would be binding on both developed and developing countries, including enforcement and border measures.

The rapid development of new technologies has led to adaptation to, and in some cases criticism of, prevailing IP regimes. This comprehensive technological revolution touched many areas, among others, information and communication technologies, biomedical research and development of new drugs, digital technology, high-performance materials, artificial intelligence, and virtual marketing in cyberspace. The adaptation of IP protection to biotechnology and the protection of intellectual property in cyberspace, in particular, posed many profound challenges.

In the special case of biotechnology, the advent of new tools for research in genetic engineering has had a strong impact on agricultural and biotechnological research programs. In agriculture, the relevance of IP has traditionally been limited, as most R&D has been conducted by public sector institutions. Biotechnology, however, is increasingly private-sector driven and increasingly relies on IP. An additional level of complexity is introduced through the use of many biological or genetic research materials from the gene-rich developing world.²⁴

The combined application of computer and telecommunications technologies, as reflected by the Internet, poses another set of problems for IP regimes. With a few keystrokes one can anonymously download copyrighted material from numerous websites around the world.²⁵ Moreover, the scope and extent of liabilities between providers of information on the Internet and content right holders need to be better understood.

These developments are only a sampling of how the IP system is being integrated into the knowledge economy, and how it poses interesting challenges to industry, government policy-makers, scholars, and researchers in both developed and developing countries.

STATISTICS SUGGESTING THE RELATION BETWEEN ECONOMIC GROWTH, R&D AND IP

Some statistics support the relation between economic growth, R&D and IP. As discussed above, economists have explained the process of economic growth as being driven by two main sources: the supply of factors of production, namely physical capital and labor (or human capital), and technology. Many studies have shown that the influences underlying economic performance are affected by the interaction between the two sources of growth, and the relative proportions of labor and physical capital and technology.²⁶

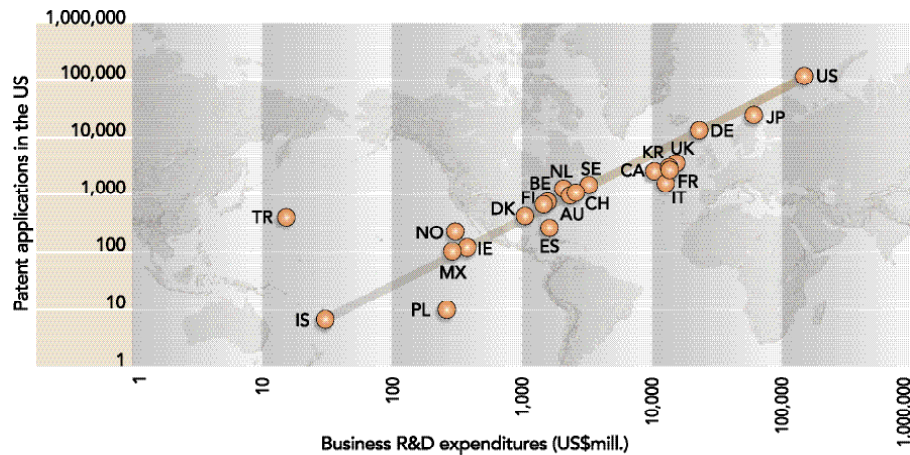
It has been postulated that IP significantly influences the appreciation in value and the accumulation in quantity of human capital, and the rate and direction of technological change.²⁷ Recent literature also describes the emerging attitudes toward IP protection in both developed and developing countries – for example, how the growth in patent filings is concomitant with the growth of knowledge activities (see for instance Table - 2.3),²⁸ and even how patent-related statistics can act as an indicator of the strength or weakness of the economy.

TABLE-2.3 GROWTH OF US UTILITY PATENTS BY SECTOR, 1982-1996²⁹

| Sector | Approximate Number of Utility Patents per Year | | Percentage Growth |
|------------------------|--|---------|-------------------|
| | 1982 | 1996 | |
| Advanced Materials | 250 | 1,200 | 333 % |
| Information Technology | 4,000 | 16,000 | 305 % |
| Health | 2,000 | 4,700 | 189 % |
| Automotive | 1,300 | 2,700 | 105 % |
| All US Patents | 58,000 | 110,000 | 89 % |

In the 1990s, an increasing number of policy-makers in countries with emerging economies recognized the role of the IP system as an important element of the institutional infrastructure for encouraging private investment in R&D, especially in the industrial and scientific fields. This is supported by the pattern of business R&D investment in the Organisation for Economic Cooperation and Development (OECD) countries, for example, which suggests that a strong correlation exists between the level of R&D expenditure and the level of patenting activity (see Chart - 2.4).

CHART-2.4 LINK BETWEEN BUSINESS R&D EXPENDITURE AND PATENT APPLICATIONS IN THE US (1997)³⁰

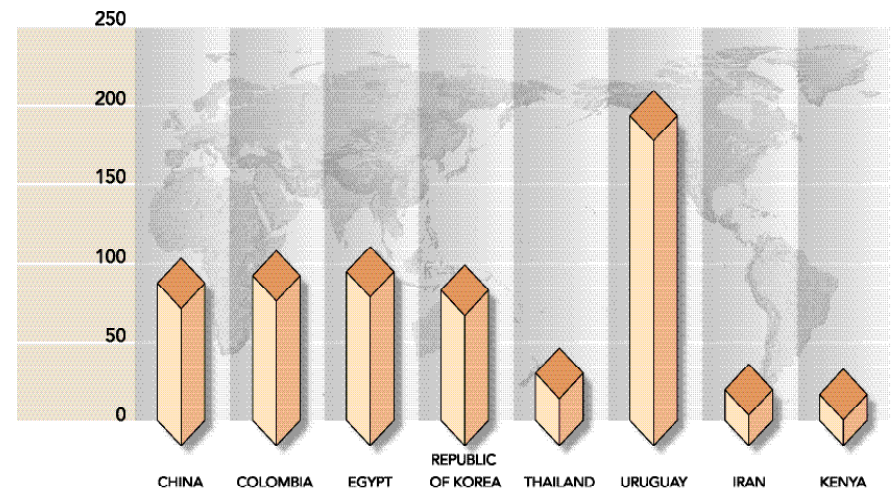


Legend: AU (Australia), BE (Belgium), CA (Canada), CH (Switzerland), DE (Germany), DK (Denmark), ES (Spain), FI (Finland), IE (Ireland), IS (Iceland), IT (Italy), JP (Japan), KR (Republic of Korea), MX (Mexico), NL (Netherlands), NO (Norway), PL (Poland), SE (Sweden), TR (Turkey), UK (United Kingdom), US (United States of America)

The influence of IP is also reflected in the increasing contribution of knowledge-intensive industries to gross national product (GNP) (for example, in the United States of America, this increased from 21 to 27 percent from 1982 to 1995). In the 1990s, the rapid expansion of a new global trading regime following the establishment of the World Trade Organization (WTO) also triggered much attention to, and increasing demand for, IP protection, especially in the high technology and other knowledge-intensive industry sectors.

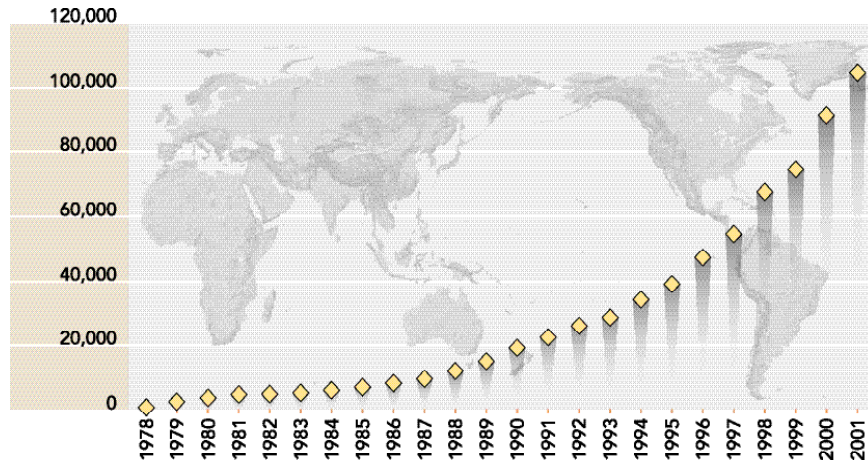
The propensity of firms to patent their inventions has similarly increased worldwide. Patent applications and grants have increased even in developing countries where patent filing rates have traditionally been very low (see Chart - 2.5).

CHART-2.5 TOTAL PATENT APPLICATIONS IN SELECTED DEVELOPING COUNTRIES (PERCENTAGE INCREASE FROM 1994 TO 1998)



The upward trend in patent applications is particularly noticeable in Japan, the United States of America, and Europe. In Japan, it took 95 years to grant the first million patents, whereas it took only 15 years to grant the next million. A very similar trend is noticeable in the filing of international applications under the Patent Cooperation Treaty (PCT) administered by WIPO (see Chart - 2.6). The PCT had a membership of 117 States as of August 2002. WIPO received over 103,000 PCT applications in 2001, a 14.3 percent increase from 2000. For the eleventh consecutive year, inventors and industry from the United States of America (38.5 percent of all applications in 2001), Germany (13.1 percent), Japan (11.4 percent), the United Kingdom (6.0 percent), and France (4.4 percent) topped the list of the biggest users of the system.

CHART-2.6 INCREASE IN PCT APPLICATIONS SINCE 1978



However, use of the PCT in developing countries that have started to accumulate knowledge and gain economic power is increasing (see Table - 2.7). For example, the number of PCT applications filed by developing countries in 2001 rose by 70.6 percent, with the largest number generated by users in China, the Republic of Korea, and South Africa. Compared to the 2000 statistics, the increase was particularly high in China (188 percent), India (103 percent) and the Republic of Korea (53 percent).

TABLE-2.7 NUMBER OF PCT APPLICATIONS FILED BY PCT USERS IN SELECTED DEVELOPING COUNTRIES

| Country | 2000 | 2001 | Growth |
|-------------------|------|------|--------|
| Brazil | 161 | 193 | 20% |
| China | 579 | 1670 | 188% |
| India | 156 | 316 | 103% |
| Mexico | 71 | 107 | 51% |
| Republic of Korea | 1514 | 2318 | 53% |
| Singapore | 225 | 271 | 20% |
| South Africa | 386 | 418 | 8% |

Current data regarding the importance of IP in economic development is still limited, however. Visible and demonstrable evidence of economic payoff attributable to IP protection is currently not sufficiently developed.³¹ It is difficult to analyze the role of IP in the economic development process because of complexities in separating or disaggregating the effects of IP protection from other factors that impact developing economies.³² Some experts argue that the role of IP in economic development is likely to be case-specific, with variations both from industry to industry and among countries.³³ Others, however, contend that the strength or weakness of the IP situation has a strong effect on foreign direct investment (FDI),³⁴ and that a low level of IP protection will preclude certain types of investment in various industries.³⁵

The difficulty in analyzing the economic aspects of intellectual property is attributable to the complex interplay of many factors. The nature and extent of this complexity can be clearly seen by examining the role of the patent system in the performance of the economy.

Typically, a patent system is established for the following reasons: (a) to promote creativity and inventiveness by offering exclusive ownership rights and a reasonable period for recovering R&D costs for the invention, (b) to promote investment to commercialize new inventions through limited exclusive rights in working the invention and marketing it, and (c) to diffuse knowledge and information through publication of patent applications and grants for the benefit of other R&D and society as a whole. These reasons could seem to be more applicable and relevant to the developed economies than to the developing and least developed countries due to a number of factors surrounding local creativity and inventiveness in the latter countries,³⁶ including a different IP paradigm that arises with the emerging demand for protection of “rural inventions” and traditional knowledge. Indeed, in developing countries, the majority of patent applications are filed by foreigners from developed countries,³⁷ and the conditions for promoting local innovation in many fields are far from ideal, due to constraints in resources and other factors (limited access to research material, facilities, and prototyping possibilities, lack of relevant technical and managerial skills, disorganized markets, and so forth).

Critics of the patent system hypothesize that, because of these factors, the economic rewards for innovation will flow from the developing to the developed countries, and that capital investment in developing countries is likely to center on foreign-owned or controlled enterprises. The latter, of course, is expected to result in the payment of royalties to foreign-owned enterprises.³⁸ Taken in isolation, these factors would seem to present a bias against developing economies.

However, the patent system offers practical and positive advantages, especially to developing countries. For instance, it facilitates transfer of technology and patent licensing through an active use of patent information (see more in Chapter 4). Moreover, it can be utilized as a practical guide to investment decision-making by corporations looking for lower factor prices in developing countries for their manufacturing activities.³⁹ In many ways, the patent system functions as an indicator of the level of protection afforded to the introduction or transfer of proprietary technologies to developing countries, and as a rough assessment of the risk of working a particular invention without full patent protection in a particular sector where there is an observed high rate of patenting activity. The quality of the national patent law attests to the seriousness of a government's commitment to encourage both innovation and respect for the IP related to it, and its belief in the positive role played by the patent system in national development.

IP AND INVESTMENT

Economists have not adequately dealt with issues directly related to economics and intellectual property. Among the few who have addressed this subject, there are differing opinions. Some are supportive of the positive relationship between intellectual property and innovations and inventions, and others have different views.⁴⁰ Many researchers have suggested a direct link between enhanced IP protection and an increase in inward FDI in certain countries.⁴¹ A steady and steeply rising increase in FDI in India has been evident (except for a dip in 1999 due to the adverse impact of the east Asian crisis) ever since patent and trademark reform was introduced in the early 1990s. The equivalent increase in Brazil is more dramatic, with a spectacular growth in FDI following the introduction of a

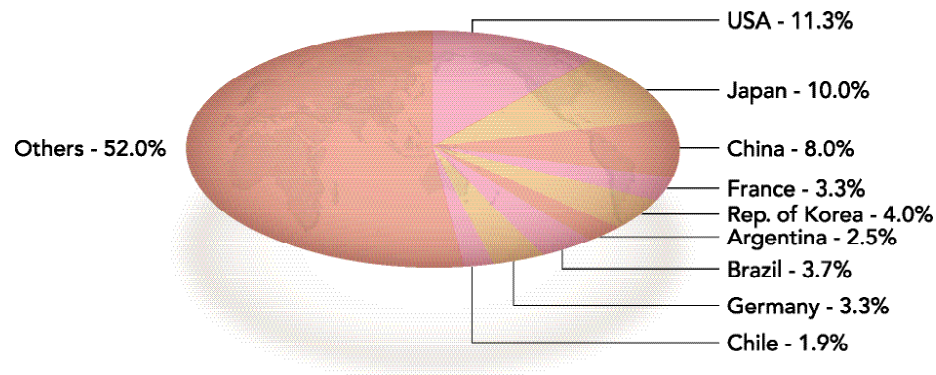
new industrial property law in 1996, which provided patent protection for 20 years, as well as pipeline protection for drugs not yet on the market.

It is common knowledge that investment in R&D is quite an expensive undertaking. Investors will under-invest in such activity if they are not assured of reaping the lion's share of the resulting benefits.⁴² It can be convincingly argued that IP protection plays a catalytic role in stimulating R&D.⁴³ Furthermore, protection of intellectual property has the potential to contribute positively to a country's efforts to attract FDI, increase foreign trade, and provide the necessary conditions for transfer of technology. The combination of all these factors contributes to a greater potential for increased growth. In the case of Japan, for example, the rate of technological development since 1945 can significantly, though not entirely, be associated with intellectual property and, in particular, the patent system, which was widely used in the "catching-up" process.⁴⁴

The relationship between international economic activity and IP for developing countries in the post-TRIPS era was recently examined by W. Lesser of Cornell University, in a paper commissioned by WIPO. He examined in particular the link between stronger IP protection and two international factors: FDI and imports. Lesser reports his findings that "the relationship between the IP score and both FDI and imports is both positive and significant" and concludes that "...taken in the context of previous studies, [the result] is compelling evidence that stronger [intellectual property rights] IPR do indeed provide some domestic benefits for developing nations."⁴⁵

There are many other positive aspects to the question of intellectual property and its benefits in the economic equation, especially if one looks at intellectual property other than patents. Take the case of trademarks, for example. Trademarks are an important component of the IP system and have a strong influence on private investment and marketing decisions. They have been in use for many years in many countries, both developed and developing (see Chart - 2.8). IP executives consider the market value of their trademarks as part of their intellectual and intangible capital (see "The World's Most Valuable Brands" in Chapter 5).

CHART-2.8 SHARE OF INDIVIDUAL COUNTRIES
IN TOTAL TRADEMARKS REGISTERED IN 1996



The value added from the cultural industries (literature, music, art, etc.) should similarly be considered. In developing countries, this economic sector has grown considerably as suggested in Table - 2.9 concerning the book publishing sector. Copyright and related rights of authors, performing artists, producers of sound recordings, broadcasters, and other creators have been in the limelight for some time because of the economic losses attributed to piracy of works protected by copyright, particularly, software, music, and film. Based on OECD data, the proportion of counterfeit goods in total sector sales has reached 33 percent for the music sector, 50 percent for the video sector, and 43 percent for the software sector.

TABLE-2.9 ANNUAL BOOK TITLE PRODUCTION IN
SELECTED COUNTRIES

| Country | 1991 | 1997 | % Change |
|-------------|---------|---------|----------|
| Argentina | 6,092 | 11,919 | 96% |
| Brazil | 13,893 | 51,460 | 270% |
| China* | 96,761 | 120,106 | 24% |
| India | 53,394 | 57,386 | 7% |
| Italy | 40,142 | 45,844 | 14% |
| Lithuania | 2,483 | 3,827 | 54% |
| Philippines | 3,320** | 3,770 | 14% |
| Russia | 28,716 | 36,237 | 26% |
| Sweden | 11,866 | 13,210 | 11% |
| UK | 67,704 | 100,029 | 48% |

Source: International Publishers Association

* China: figures for 1993 and 1996

** Relates to 1992

Overseas investments and the amount and kind of technology transfer by Germany, Japan, and the United States of America seem to be affected significantly by a recipient country's system and level of IP protection.⁴⁶ In spite of the lack of quantitative evidence regarding the impact of IP protection on developing economies, there seems to be agreement that a positive, two-way, and mutually-reinforcing relationship between IP and international trade exists, i.e. IP protection enhances international transactions and vice versa.⁴⁷ Moreover, there are short-term and long-term gains and losses that should be considered. As regards patents, the literature has shown that "patent protection enhances economic growth rates once a particular level of development has been reached."⁴⁸ Recently, there have been indications that IP protection may also be directly or indirectly influenced by wide and intensive discussions on IP policies, e.g. the debate on IP in the fields of biotechnology and genetic resources, plant variety and farmers rights, the emerging patent debate over the human genome mapping projects, genetic resources, biodiversity, traditional knowledge, folklore, and other areas of intensive intellectual and commercial activity.

Intellectual property has become a common feature in business regulation, especially in Europe and the United States of America.⁴⁹ It influences the behavior of firms when dealing with investment in innovation projects or product differentiation,⁵⁰ mergers and acquisitions (see Box - 2.10), technological alliances, joint ventures, and licensing.⁵¹

BOX-2.10 IP-BASED MERGERS AND ACQUISITIONS

In November 1997, Texas Instruments paid a staggering US\$395 million for Amati Communications, a small California-based company founded by Professor Cioffi at Stanford University. The figure surprised many as it appeared extremely high given Amati Communications' annual sales and financial situation. Why would a large semiconductor company pay such a high price for a small Silicon Valley start-up? The answer is simple. Amati Communications held 25 key patents on Digital Subscriber Line (DSL) technology which Texas Instruments considered crucial for entering the DSL market. The 25 patents covered some important areas of next-generation modem technology which have been adopted by the American National Standards Institute as the standard for DSL. Owning Amati Telecommunications' patents allowed Texas Instruments to acquire a leading position in the new technology as well as promising profits from licensing the technology to other firms.

Ownership of other forms of intellectual property, such as trademarks, may also be a decisive factor behind mergers and acquisitions (M&As). Indian tea-maker Tata Tea, for example, recently acquired UK-based Tetley Ltd. declaring that one of the main reasons for the acquisition was to obtain access to a global brand name and a global distribution network. The acquisition of Tetley enabled Tata Tea to expand its operations and obtain a globally recognized trademark to sell its products worldwide.

The past two decades have seen a great expansion in M&As, which have been growing at an annual rate of 42 percent and reached US\$2.3 trillion in the year 2000. Reasons for domestic and cross-border M&As are multifold, including advantages relating to economies of

scale and access to new markets. According to the *World Investment Report 2000*, "the second main motivation for firms to merge and acquire an existing company, rather than to grow organically, is the quest for strategic assets, such as *R&D or technical know-how, patents, brand names*, the possession of local permits and licenses, and supplier or distribution networks" [italics added].

Source: Rivette and Kline, "Rembrandts in the Attic"; *World Investment Report 2000: "Cross-Border Mergers and Acquisitions and Development"*, UNCTAD, 2000.

There are ways to stimulate innovative activity, such as government-funded R&D, encouraging use of savings and other resources of the inventor's family for capital investment, and more recently, facilitating the participation of the so-called "investment angels."⁵² However, the influence of IP has been growing steadily on its own, especially in knowledge-driven areas such as information technology, communications, and biotechnology.

IP PROTECTION AS GROWTH POLICY

Intellectual property protection is often seen as an instrument of industrial policy that has wide-ranging ramifications on the economy.⁵³

In the context of developing countries, two factors define the environment for acquiring technological capability. On the one hand, developing countries realize that to join the global trend towards greater free trade and to encourage foreign investment, adequate IP protection is essential.⁵⁴ On the other hand, the amount of technological knowledge that is in the public domain is much greater than just two decades before.⁵⁵

In every country there are bright people who have the ability to innovate, and it is hoped that the capacities of such people are invested positively for national economic development. The IP system can and does play a crucial role in this regard, in particular, by making available to them, through patent information, the most up-to-date technological information; the IP system should also prevent the "exportation" of knowledge-creating national capacities to other countries which can better exploit

them. In one country, for example, commercially significant innovations made at the national university were being disclosed abroad for patenting and development by others in Canada, Mexico, and the United States of America, since the local patent law was considered inadequate by university officials. This meant that value would be added abroad rather than in that country.⁵⁶

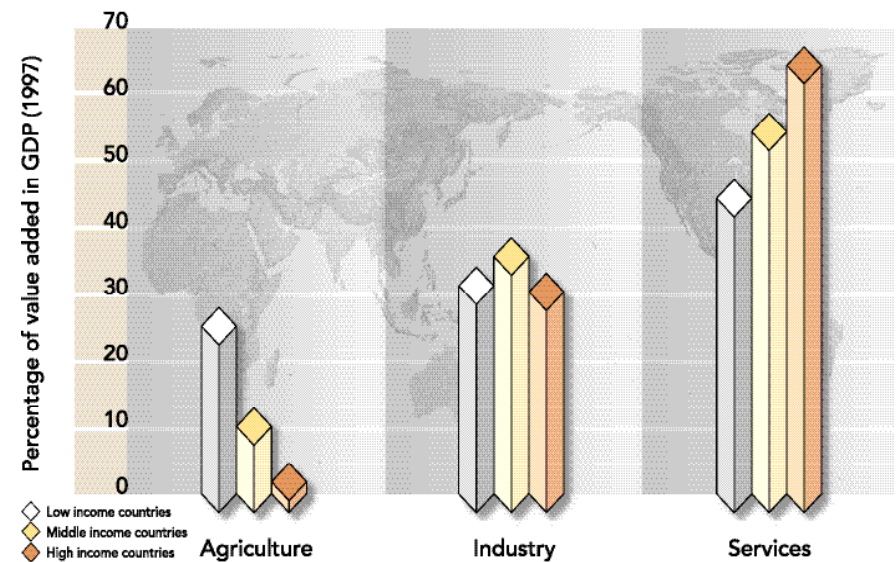
The effects of IP on economic development are sometimes tempered by the perceived availability and strength of IP protection.⁵⁷ For example, higher levels of IP protection for a firm's technologies and business methods could conceivably encourage the firm to invest in the training of its workers in order to enhance productivity and competitiveness. In the area of venture capital development, unless there is perceived adequate IP protection, individual inventors and small companies tend not to disclose their innovations during venture partnership negotiations for fear of losing ownership or control.⁵⁸ In the agricultural sector, where governments are traditionally reluctant to invest in research, funding from the private sector is often sought. However, in many cases, the private sector is unwilling to invest in research because it is not able to protect research outputs.

Strong views prevailed in the 1970s that since "developing countries were not technologically at the forefront, the incentives provided by IP, and patents in particular, for investment in research and development were not meaningful".⁵⁹ In situations where only low levels of IP protection are available, as in most least developed countries (LDCs) and certain developing countries, companies often rely on older, off-patent or unpatented technological solutions. Many inventions from developing countries, particularly in state-funded universities, have not been recognized as patentable. Thus, potential technological advances often never get to see the light of day.⁶⁰ In a recent electronic conference on the subject, a recommendation was made to the World Bank that urging and assisting developing countries to establish higher levels of IP protection should be the preferred approach in the field of biotechnology, so that greater market value can be considered locally as biological resources are developed, rather than promoting what is essentially the continuing export of raw materials through material transfer agreements.

VISIBILITY OF IP IN POOR COUNTRIES

Chart - 2.11 shows the difference in economic output (value added in GDP) according to a country's income level. Because of these differences in the structure of output, developing countries may use and develop different types of technologies and consequently benefit from IP in different ways.

CHART-2.11 DIFFERENCES IN STRUCTURE OF OUTPUT ACROSS INCOME GROUPS



Source: World Development Indicators, World Bank

In the manufacturing sector, it is very likely that the main impact of IP protection would be on the modernization of machinery and manufacturing processes. But in the poorest regions of the world, where people live on less than a dollar a day, less than 5 percent of economic activity relates to manufacturing.⁶¹ Intellectual property activity will have to be relevant to the economic priorities of the country. It is clear, that while an IP regime can bring out the potential for innovation, creativity, and growth in the national economy, it is not by any means a cure-all. Not only are an

adequate legal infrastructure and progressive policies on protection of intellectual property required, but also active national IP policies and positive and widespread public conviction and awareness. Chapters 4, 5 and 6 address how IP, specifically in the patent, trademark, geographical indications, and copyright fields, can promote economic development.

- 1 Paul M. Romer, "Why, Indeed, in America? Theory, History, and the Origins of Modern Economic Growth," NBER Working Paper No. W5443 (January 1996); also *American Economic Review* 86, No. 2 (May 1996): 202-206.
- 2 Economic growth can be defined as "the increase in the real level of net national product, although the measure will then be sensitive to the way in which national product is measured." One should also bear in mind that the theory of economic growth is a long-run theory. David W. Pearce, ed., *The MIT Dictionary of Modern Economics*, 4th ed. (Cambridge, MA: MIT Press, 1992).
- 3 The law of diminishing returns states that when increasing quantities of a variable factor, e.g., labor or capital, are added to fixed quantities of some other factor (say land), first the marginal and then the average returns on the variable factor will, after some point, diminish.
- 4 Donella H. Meadows, Dennis L. Meadows, and Jørgen Randers, *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind* (New York: Universe Books, 1972).
- 5 For a review of different growth models, see Gonçalo L. Fonseca and Leanne J. Ussher, "The History of Economic Thought" <http://cepa.newschool.edu/het/home.htm>
- 6 Gladys We, "What is Endogenous Growth Theory?" (1994) <http://thumb.cprost.sfu.ca/~we/misc/endogenous.html>
- 7 Joseph A. Schumpeter, *The Theory of Economic Development* (Cambridge, MA: Harvard University Press, 1934). First published in German in 1911.
- 8 An example of disruptive technologies and creative destruction has been elaborated in a case study about the development of various types of memory discs. See Clayton M. Christensen, *The Innovator's Dilemma* (Cambridge, MA: Harvard Business School Press, 1997): Chapter 7.
- 9 Joseph A. Schumpeter, *Capitalism, Socialism, and Democracy* (New York: Harper & Brothers, 1942).
- 10 Some economists challenge this notion of two Schumpeters. For a detailed discussion see Richard N. Langlois, "Schumpeter and the Obsolescence of the Entrepreneur," (paper presented at the History of Economics Society annual meeting, Boston, June 21, 1987) <http://www.ucc.uconn.edu/~LANGLOIS/SCHUMPET.HTML>

- 11 F. W. Rushing and M. A. Thompson, "Intellectual Property Protection, Entrepreneurship, and Economic Growth," *Journal of Enterprising Culture* 4 No. 3 (September 1996): 267-285.
- 12 R. G. Lipsey and K. A. Chrystal, *An Introduction to Positive Economics*, 8th edition (Oxford: Oxford University Press, 1995): 637.
- 13 Edward Denison, *The Sources of Economic Growth in the United States and the Alternatives Before Us* (New York: Committee for Economic Development, 1962).0
- 14 "Industry Gets Religion," *The Economist* (February 18, 1999).
- 15 J. Bradford De Long, "A Short Review of Economic Growth: Theories and Policies," Preliminary Draft (Berkeley: University of California at Berkeley and National Bureau of Economic Research, 1996) – http://econ161.berkeley.edu/Econ_Articles/ACCF_Growth/Growth_ACCF4.html
- 16 Charles I. Jones, *Introduction to Economic Growth* (New York: W. W. Norton & Co, 1997).
- 17 However, Robert Solow elaborates that technological progress is at least partially endogenous to the economy and identifies the patent system as one of the instruments used to attract more resources into the research for new products and processes. Robert Solow, "Perspectives in Economic Growth," *Journal of Economic Perspectives* 1 (Winter 1994): 45-54.
- 18 Sinead Walsh, "Endogenous Growth Theory." <http://www.economics.nuigalway.ie/students/walshsinead/page03.html>.
- 19 For example, Nicholas Klador (1957), Kenneth Arrow (1962), Richard Nelson and Sidney Winter (1982).
- 20 Paul M. Romer, "Increasing Returns and Long Run Growth" *Journal of Political Economy* 94:5 (October 1986): 1002-1037 and Gladys We, "What is Endogenous Growth Theory?"
- 21 F. M. Scherer, *New Perspectives on Economic Growth and Technological Innovation* (Washington, D.C.: Brookings Institution Press, 1999).
- 22 G. M. Grossman and E. Helpman "Endogenous Innovation in the Theory of Growth," *Journal of Economic Perspectives* 8, No. 1 (Winter 1994): 27.
- 23 Carsten Fink, paper on general trends (April 27, 1998), electronic conference on Intellectual Property Rights and Economic Development, April 27-May 15, 1998, organized by the World Bank TechNet, World Bank Economic Development Institute, and the World Trade Organization – <http://www.vita.org/technet/iprs> (hereafter cited as Intellectual Property Rights and Economic Development).
- 24 Fred Abbott, *Intellectual Property Rights and Economic Development*.
- 25 Using MP3 compression software for downloading music on the Internet, and file-sharing programs and systems for example.
- 26 See, for example, the growth models in Solow, "Technical Change and the Aggregate Production Functions" and Romer, "Endogenous Technological Change."
- 27 Fink, *Intellectual Property Rights and Economic Development*.
- 28 See also *Global Patenting Trends in Technological Sectors*, US Department of Commerce, 1998.
- 29 Source: United States Department of Commerce, 1998. Advanced Materials sector patents related to biomaterials, high temperature superconductors, advanced ceramics, alloys, composites, diamond thin films, membranes and selected polymers. Information Technology sector patents related to digital, optical and analog computing hardware and software and semiconductor manufacturing and applications. Health sector patents related to drugs, medicines and biotechnology. Automotive sector patents related to engines, transmissions, brakes, steering wheels and tires, vehicle bodies and chassis, passenger accommodation and safety, pollution controls and automotive manufacturing technology.
- 30 Sources: OECD and United States Patent and Trademark Office.
- 31 Keith E. Maskus, *Intellectual Property Rights in the Global Economy* (Washington, D.C.: Institute for International Economics, August 2000).
- 32 Abbott, *Intellectual Property Rights and Economic Development*.

- 33 *Ibid.* Abbott also wrote "...Patent protection may have an impact on the development of a pharmaceutical industry that is different than its effects on the development of an automobile industry. Patent protection is likely to have a different effect on the development of a newly-industrialized economy as compared with a least developed economy."
- 34 Maskus, *Intellectual Property Rights in the Global Economy*, Table 4.9, 126
- 35 *Ibid.*, Table 4.10, 128.
- 36 Jayashree Wattal, in an e-mailed discussion paper (April 29, 1998), *Intellectual Property Rights and Economic Development*, identified several conditions that makes patent protection less relevant to low-income countries, notably (a) lack of really new or original ideas that are "protectable"; (b) no perceived or popular need to follow honest or fair commercial practices to respect IP, particularly as regards goods of foreign origin; and (c) the kind of creative and innovative ideas generated do not fit into classical IP regimes found in high-income countries.
- 37 More than 95 percent of patent applications in developing countries are filed by foreigners (based on 1997 WIPO statistical compilations).
- 38 Fink, *Intellectual Property Rights and Economic Development*.
- 39 Edwin Mansfield, "Intellectual Property Protection, Direct Investment, and Technology Transfer: Germany, Japan, and the United States", *International Finance Corporation Discussion Paper No. 27*, (Washington DC: The World Bank, 1995).
- 40 For a discussion of this perspective, see Fritz Machlup, "The Optimum Lag of Imitation Behind Innovation," (Copenhagen: Festskrift til Frederik Zeuthen, 1958).
- 41 See, for example Tony Samuel, "The Value of Protection", *Managing Intellectual Property*, (November 2000): 14.
- 42 J. Bradford De Long, "A Short Review of Economic Growth: Theories and Policies," Preliminary Draft (Berkeley: University of California at Berkeley and National Bureau of Economic Research, 1996).
- 43 F. W. Rushing and M. A. Thompson, "Intellectual Property Protection, Entrepreneurship, and Economic Growth," *Journal of Enterprising Culture* 4, No. 3, (September 1996): 267-285.
- 44 Ove Granstrand, *The Economics and Management of Intellectual Property: Towards Intellectual Capitalism*, (Northampton, MA: Edward Elgar Publishing, 2000): 170.
- 45 W. Lesser, "The Effects of TRIPS-Mandated Intellectual Property Rights on Economic Activities in Developing Countries," (WIPO Paper, April 2001, available at www.wipo.int/about-ip/en/index.html?wipo_content_frame=/about-ip/en/studies/index.html).
- 46 Mansfield "Intellectual Property Protection."
- 47 Maskus, *Intellectual Property Rights and Economic Development*.
- 48 See, Mark A. Thompson and Francis W. Rushing, "An Empirical Analysis of the Impact of Patent Protection", *Journal of Economic Development* 21 No. 2, (December 1996). See also David Gould and William C. Gruben, "The Role of Intellectual Property Rights in Economic Growth," Working Papers, 94-09, Federal Reserve Bank of Dallas, (1994), who conclude that intellectual property is a significant determinant of economic growth and that the impact is stronger in more open economies.
- 49 See, for example, US and EC policies on patents and parallel importation http://www.ipmatters.net/features/000526_parallel.html
<http://www.cptech.org/ip/health/pi/>
- 50 Maskus, *Intellectual Property Rights and Economic Development*.
- 51 In the chemical and pharmaceutical industries, over 40 percent of firms surveyed in Germany, Japan, and the United States of America felt that protection in certain developing countries was too weak to permit the licensing of its newest or most effective technology (Mansfield, *Intellectual Property Protection*)
- 52 Rich individuals interested in pioneering new business ventures or exploiting infant industry potential or opportunities (see also UNICE Annual Report, 1998).
- 53 "Economy" is understood in this case to fall within the broader context, to include general social welfare trickle-down effects from the use of new technologies and other creative and innovative ideas and their impact on the quality of human life (for example, impact on industrial productivity, educational opportunity, business growth, healthcare, decreasing poverty levels, and so forth.).

- 54 See, for instance, the perceived impact of the TRIPS Agreement on intellectual property policies in developing countries in Lesser, "The Effects of TRIPS-Mandated Intellectual Property Rights on Economic Activities in Developing Countries".
- 55 Richard Nelson, *Panel Discussion Summary, Intellectual Property Rights and Economic Development*.
- 56 Sherwood, *Intellectual Property Rights and Economic Development*.
- 57 Mansfield, "Intellectual Property Protection."
- 58 See, for example, "Benchmarking Industry-Science Relationships," Workshop II of the Joint German-OECD Conference (Berlin, October 16-17, 2000).
- 59 From the Introduction of Lesser, "The Effects of TRIPS-Mandated Intellectual Property Rights on Economic Activities in Developing Countries"
www.wipo.int/about-ip/en/index.html?wipo_content_frame=/about-ip/en/studies/index.html
- 60 Sherwood, *Intellectual Property Rights and Economic Development*.
- 61 Sherwood, *Intellectual Property Rights and Economic Development*.