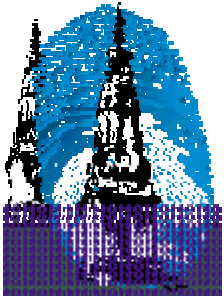


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**ECONOMIC IMPACT OF THE PROTECTION OF UNORIGINAL
DATABASES
IN DEVELOPING COUNTRIES AND COUNTRIES IN TRANSITION**

Thomas Riis

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**“ECONOMIC IMPACT OF THE PROTECTION OF UNORIGINAL
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IN DEVELOPING COUNTRIES AND COUNTRIES IN TRANSITION”***

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The paper contains a study commissioned by the World Intellectual Property Organization (WIPO) at the request of its member States. This study contains the research and opinions of only its author and does not in any way reflect the views or position of WIPO.

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SUMMARY OF THE STUDY

The main concerns about possible negative effect of extensive database protection fall into two broad categories. Firstly, it is asserted that database producers already have substantial market power in niche market segments and the market power will be enhanced by statutory database protection to the detriment of users. The concern is based on prospective negative effects distorting the market mechanism, and is thus a possible reduction in social economic welfare. Secondly, statutory database protection necessarily restricts the dissemination of protected subject matter, and possibly the users' access to the information contained in protected databases. In particular, the scientific and educational communities could be affected in that respect. The concern relates to the possibly negative effects on technological development. A legal regime which impedes technological progress in the long run has a negative effect on economic development recognizing the importance of technology in economic growth. These concerns are particularly pronounced in developing countries on the mere fact that technological and economic development is a major national policy issue in such countries.

An economic efficient protective regime for databases as well as for other information goods depend on the economic conditions of the relevant markets. According to economic analysis of intellectual property protection, the optimal legal institution depends on supply and demand conditions, market structures and other economic features in a particular country. It is unlikely that markets in different countries share the same economic characteristics in respect of for instance supply and demand elasticities. And that pertains, in particular, to developing countries on one hand and industrialized countries on the other hand. Thus, differences in economic conditions call for different intellectual property regimes in order to be optimal at the national level; and there is a strong presumption that an intellectual property regime which is optimal in an industrialized country, is not optimal in a developing country.

Inherently unique databases, such as, *e.g.*, compiled observations of time-dependent or one-time natural phenomena, merit special considerations because legal protection of such databases involves the largest risk of monopolization of information.

Intellectual property protection involves social costs and social benefits. The main economic benefit of intellectual property protection is the provision of economic incentives—that is the stimulation of innovative (and perhaps also laborious) activities. This aspect of the economic function of intellectual property right should apply to developing countries as well as to industrialized countries. However it is argued that structural conditions in developing countries affect the incentive function.

As regards traditional analog databases, there is no obvious reason to believe that the incentive effect of intellectual property protection is reduced in developing countries due to structural conditions. That means that incentives for the creation of new databases within developing countries are provided by granting intellectual property protection of databases. As regards complex digitized database services provided *via* the Internet a similar incentive effect requires, firstly, that potential database producers have a certain amount of available information technological facilities (*e.g.*, computer systems and software) and, secondly, that the national database market is characterized by a high degree of computer and network penetration. Both points emphasize the importance of a wide-spread and effective information technology infrastructure. In general, these conditions are not satisfied in developing countries, and that implies that the incentive effect of intellectual protection of databases in developing countries is reduced due to structural conditions. The lack of an efficient and wide-spread information technology infrastructure, in the main, means that intellectual property protection

of unoriginal databases provides economic incentives only for the creation of traditional analog databases.

The social costs and benefits of intellectual property protection from the point of view of developing countries are difficult to quantify, and it cannot be concluded firmly that intellectual property protection of unoriginal databases is detrimental in an economic sense to developing countries and countries in transition. However, it appears that prospective economic benefits of uniform (high) intellectual property standards are comparatively lower in developing countries than in industrialized countries.

If international standards for the protection of unoriginal databases shall be instituted, it is expedient to consider prospective measures to be taken in order to reduce the social cost of such protection in developing countries and countries in transition. Intellectual property protection of unoriginal databases may be implemented in various ways; either by way of a *sui generis* right, a neighbouring right, or a norm of unfair competition (in common law countries a doctrine of misappropriation). In the study, a *sui generis* right signifies a right similar to the *sui generis* right of Article 7 of the EC Database Directive. By a “neighbouring right,” the protection of databases means a right that protects the compilation as such, and the scope of protection of such a neighbouring right does not extend beyond the compilation’s selection or arrangement. In addition a neighbouring right is contingent on conditions of protection which easily can be satisfied. Contrary to a *sui generis* right and a neighbouring right, unfair competition law does not confer an exclusive right on the database producer. On one hand, unfair competition law is a more flexible approach, but on the other hand it is also a more uncertain form of protection compared to the alternatives. Generally speaking, the strongest protection is provided by a *sui generis* right, and the weakest protection is provided by unfair competition law.

Given the uncertainty of the beneficial effects of intellectual property protection of unoriginal databases, one should probably not opt for the strongest form of protection—that is not opt for the *sui generis* right. Furthermore, by not choosing a *sui generis* regime, the risk of creating information monopolies is reduced. Arguably, a better balanced result could be obtained by a neighbouring right or by unfair competition law. A neighbouring right is a formal right that applies to all creations which satisfy the conditions of protection, and, in principle, the scope and the content of protection is not related to the characteristics of the specific creation and the pertinent market conditions. Under unfair competition law, protection is granted in due consideration of the circumstances of the specific case and thus the actual market conditions including the commercial interest of the database producer are decisive. The case-by-case determination of protection (under a unfair competition law framework) is more suitable to tailor a protective regime in accordance with economic reasoning, compared to a formal exclusive right. However, protection under unfair competition law leaves a large margin of discretion to the courts. Hence, unfair competition law creates uncertainty as to the actual protection, and uncertainty may reduce the practical value of the protection from the point of view of database producers, and consequently reduce the incentive effects of protection.

In the main, the economic impact of enhanced intellectual property protection also pertains to countries in transition, and as such the general concerns of developing countries regarding strong uniform intellectual property standards may have some merit in countries in transition as well. The prospects of transforming into a system with elaborated strong intellectual property right and deriving national economic benefits from that system seem better for countries in transition due to the fact that the countries in transition have relatively developed educational and scientific structures. Compared to developing countries these basic

structures minimize the risk that countries in transition will be locked in at a low technological (and economic) level. Therefore, the doubts as to the beneficial effects of protection of unoriginal databases may not be as outspoken in countries in transition as in developing countries.

Database producers may establish *de facto* protection of their creations by way of technical measures. Technical measures refer to, for instance, copy control flags, water marking techniques, and digital identification codes embedded in the content of a database. By such measures, which can be applied to digital databases, not to analog databases, the database producer may be able to control the use of his database. The economic function of technical (protective) measures is equivalent to intellectual property protection in the sense that the purpose of such measures is to exclude persons from the use of a database. Thus, the development of such measures may gradually substitute intellectual property protection, however, only in the market for digital databases. In the near future, there is no reason to expect that the market for analog databases will disappear, and hence intellectual protection will still play an important role in this respect.

STUDY

I. THE ECONOMIC *RATIONALE* OF INTELLECTUAL PROPERTY PROTECTION

According to mainstream economic theory the economic rationale of intellectual property protection is to provide economic incentives for the production of inventions, literary and artistic works, etc. In a world with no intellectual property protection, it is assumed that the creators of intangible goods to a large extent are precluded from obtaining sufficient proceeds from exploiting the goods on the market to cover the costs of creating the goods. The problem of negligible proceeds from the created goods is anticipated by the potential creators who consequently abstain from creating new goods. The lack of economic incentives are due to the fact that often the costs of creating new intangible goods are large whereas the exploitation of the goods by others, *e.g.*, by copying or imitation, normally involves insignificant costs in comparison.

Nevertheless, in a world with no intellectual property protection, undoubtedly, incentives, including economic incentives, for the creation of new inventions and new works would exist. The economic analysis of intellectual property protection presupposes that in such a world the economic incentives are insufficient and, accordingly, under investment in the creation of new inventions and works will result compared to the social optimum.

The incentive creating effect of intellectual property protection has been extensively debated in the economic literature. Most scholars agree that such an effect exist but disagreement is significant as regards the size of that effect.

Protectable subject matter of intellectual property law, inventions as well as literary and artistic works, is comprised of information. Contrary to other kinds of valuable goods, information goods have an important feature since an information good is not a scarce resource once it has been created. By using the economic term it is said that there is non-rivalry in the consumption of an information good. This implies that one person's use of such a good does not restrict the prospects of others to use the same good. According to traditional economic theory no one ought to be excluded from using goods which are not scarce goods; and, consequently, such goods ought to be freely available to everyone. The marginal cost of existing information goods are in the main zero, and from the point of view of the society at large, the price of a good ought to equal the marginal cost. However, if this notion stemming from traditional economic theory is adopted, the result would be inadequate economic incentives for the creation of new inventions, works, etc.

Intellectual property protection provide economic incentives for the creation of new information goods by conferring exclusive rights on the creator. The exclusive rights of intellectual property law has social costs because the exclusive rights enable the right owner to apply monopoly pricing. Under monopoly, pricing the price is higher than the competitive price and the output (that is the supply of already created goods) is smaller. Pursuant to traditional economic reasoning, monopoly pricing has two effects. Firstly, it transfers economic surplus from the consumers to the producer which is the economic *raison d'être* of intellectual property protection since the transfer of surplus is the means of providing economic incentives for the creation of new goods. The transfer of surplus as such has no effect on economic welfare. Secondly, the relatively high monopoly price is inextricably bound up with reduced output because the price is inversely related to demand, and the demand determines the

output. The reduced output resulting from monopoly pricing creates a so-called deadweight loss which is a loss of social welfare.

The pivotal policy issue in analyzing the economic function of intellectual property protection is to establish a balance that ensures users the widest possible access to non-scarce goods (that is to reduce the social cost of granting exclusive rights) and at the same time maintain economic incentives to the creation of new goods by legal arrangements like intellectual property law which permits exclusivity in the consumption of the goods. In other words, from an economic point of view, intellectual property institutions must include, on one side, the social costs of producing new knowledge, and on the other side utilization of the existing stock of knowledge.

Intellectual property institutions have developed in the Western countries in response to technological changes, and in this respect intellectual property institutions have shown a great adaptive capacity. Economic analysis governed by the principle of economic efficiency suggests great differentiation in the degree and character of intellectual property protection provided, based on the specific character of the protected subject matter, differences in technology and market circumstances. However, such diversity in intellectual property protection has not materialized. To a certain extent, the evolution of intellectual property law may be said to be determined by its particular history, but probably no less important in this respect is differences between legal and economic methods. Law is based on principles, and all legal conflicts have to be solved in consideration of the overriding concern of legal certainty in order to ensure that equal cases are treated alike and the foreseeability of law; this is rarely if ever taken into account in economic analysis. As put by one commentator:

“Unfortunately, the economist’s conventional approach of evaluating specific institutional arrangements and policies in isolation does not naturally accommodate consideration of these sorts of systematic concerns, with which traditional legal scholars so often are occupied.”¹

These considerations point to one cautionary note: that the optimal economic solution may not be the optimal policy recommendation.

II. THE ACCURACY OF ECONOMIC ANALYSIS

Economic analysis of legal phenomena can be used to identify the crucial factors or elements in the law—elements which at the same time have implications on social welfare. Economic reasoning is one approach to formulate legal politics, but, normally, rationales other than the efficiency criterion of welfare economics (*e.g.*, distributive justice) shall be respected.

Specifically, economic theory can be used to provide arguments which can qualify decisions concerning legal phenomena and, in this way, guide the decision-making towards higher economic welfare. Furthermore, economic analysis can systematize and enlighten complex issues and reveal contradictions.

Theoretical economic considerations and analysis can only explain and identify costs and benefits of, *e.g.*, a particular rule or a legal institution and thus help the policy makers along the way with their work. However, more specific results aiming at precise formulations

¹ David (1993), pp. 43.

of law, where the costs and benefits are quantified and weighted, require comprehensive empirical analysis.

In the present context the economic impact of a certain form of database protection is assessed on the basis of the aggregated consequences on a nation-wide scale. The economic consequences of a particular legal institution are different in various industries in an economy, and, in addition, the economic impact of the said legal institution differs from one country to another. Hence, when in the following economic reasoning is applied and economic considerations are elaborated in relation to various forms of legal institutions, the results are found on a general level.

These reservations imply that the economic analysis can not provide final answers to the specific formulation of legal regulation. The primary aim of this study is to find and qualify the relevant arguments. Applying the arguments in recommendations ought to be based on either empirical analysis or policy values.

III. THE COSTS AND BENEFITS OF DATABASE PROTECTION

Like other forms of intellectual property protection, the economic function of legal protection of databases is to stimulate the creation of new useful databases which presumptively would not have been created without legal measures that ensure an adequate return on investments in database production.

The main concerns about possible negative effects (the social costs) of extensive database protection fall into two broad categories. Firstly, it is asserted that database producers already have substantial market power in niche market segments and the market power will be enhanced by statutory database protection to the detriment of users. The concern is based on prospective negative effects distorting the market mechanism, and is thus a possible reduction in social economic welfare. Secondly, statutory database protection necessarily restricts the dissemination of protected subject matter, and possibly the users' access to the information contained in protected databases. In particular, the scientific and educational communities could be affected in that respect. The concern relates to the possibly negative effects on technological development. A legal regime which impedes technological progress in the long run has a negative effect on economic development recognizing the importance of technology in economic growth. These concerns are particularly pronounced in developing countries on the mere fact that technological and economic development is a major national policy issue in such countries.

The proper scope of database protection includes various dimensions. An important dimension is comprised by the notion of which types of acts that should be subject to the pertinent right. For instance, ought the legal regime to be established as protection against parasitic competitors in a strict sense meaning commercial entities supplying identical or similar database products and services on the market, or ought protection to extend to a wide variety of uses of protected databases including non-competing and private use?

IV. THE ECONOMIC CHARACTERISTICS OF DATABASE PRODUCTION

An economic efficient protective regime for databases as well as for other information goods depend on the economic conditions of the relevant markets. It appears that database production involves economies of scale. According to a study by the National Research Council of the United States of America (USA), the existing market for scientific and technical databases is characterized by natural monopolies and by a distinct lack of competition. The conclusion is based on the premises that the costs of entry (startup and servicing costs) are high and the niche market segments in which commercial exploitation becomes possible is low, and as a consequence sole source providers are the norm. The industry thus appears to be largely characterized by niche marketers who supply and dominate specific market segment.² This characteristic probably also applies to other kinds of databases than scientific and technical databases.

Numerous databases in the field of natural science are in fact compilations of observations of natural phenomena, *e.g.*, meteorological phenomena, sun spot cycles or earthquakes. The compiled observations are time-dependent or one-time natural phenomena and as such inherently unique. Consequently, such a database is impossible to recreate, and second comers on the market may find it impossible to independently create a competing database product or simply a database which can compete effectively without using the existing ones. Similarly (but maybe to a lesser extent) the problem of inherently unique databases applies to compilations of various economic data such as stock and price quotations. Inherently unique databases merit special considerations because legal protection of such databases involves the largest risk of monopolization of information.

V. TYPES OF DATABASES

An economic assessment of the impact of database protection calls for the identification of the kinds of databases deserving protection and for which type of protection is appropriate for each type of database.

Various types of databases can be ascertained. In the legal literature, normally, databases are distinguished according to whether the database as such is original in the copyright sense and whether the content of the database is original. Evaluating the economic consequences of database protection on the basis of the legal taxonomy is not expedient.

Certain kinds of databases are crucial to the working of society. For instance, a collection of the legislation of a society available for the members of the society is an important element in ensuring the rule of law. A comprehensive and updated collection of stock and currency quotations is a prerequisite for the functioning of efficient financial markets. These databases and others provide the *information infrastructure* of the society, and special considerations apply to the availability of the information comprised. As a matter of public policy the essential function of information infrastructure databases merits specific legal regulation ensuring reasonable access to the information in question. According to economic reasoning the need for intellectual property protection is particularly pronounced in relation to *commercial databases*. Commercial databases are produced by commercial enterprises and typically require a substantial amount of investment in respect of time and economic resources. Typically, these databases contain technical or economic information and are produced in order

² Bits of Power, Chapter 4 and 5. See also *Reichman & Samuelson* (1997), pp. 70, 116.

to meet the demand of the market and to yield an interest on the investments of the database producer.

The separation of information infrastructure databases and commercial databases implicitly assumes that information infrastructure databases are provided by public bodies as a form of public goods, contrary to commercial databases. This is not necessarily so. For example, as regards databases containing court decisions, the content of the databases is produced by public bodies (the courts), but often the resulting databases (law reports) are compiled, arranged and disseminated by private firms. In the context of intellectual property protection databases provided by public bodies are of minor importance because incentives for the creation and maintenance of such databases can easily and perhaps more efficiently be created in other ways than by establishing intellectual property rights (IPR). The term 'information infrastructure database' does not imply that the database is provided by a public body but is merely used to signify an aspect of a commercial database. The information infrastructure feature may be more distinct in some commercial databases than in others.

The issues on whether information infrastructure databases ought to be provided by public or private bodies, and to what extent government databases ought to be privatized is falling outside the scope of this study. However the design of database protection may influence the process of privatization of government databases (see below under V.E.).

The economic impact of database protection depends on the purpose of use of the database and on the description of the information contained in the database. Databases as well as most other intangible goods protected by intellectual property rights show a large variety in respect of the description of the protectable subject matter and the intended purpose of use. A database containing information on restaurants in a limited urban area presumably enhances the welfare of the consumers because the costs of the consumers of choosing the right restaurant is reduced. If the database provider charges consumers for using the database or denies access to the database the consumers' welfare is reduced correspondingly. Apart from the resulting deadweight loss, no further economic effect can be ascertained. As regards other kinds of databases further economic consequences may result. Thus, restricted or denied access to the content of a comprehensive database of gene sequences or protein sequence information may stifle the development in the biotechnological industry. It does not necessarily imply that such a database ought not to be protected or that protection should be subject to special limitations, but it suggests that the appropriate level of protection and in particular the appropriate scope of protection should be thoroughly considered because small changes in the scope of protection may have large consequences in respect of industry structure and future technological development. As the main rule protection of databases intended for commercial use have the potential for a significant larger economic impact on the society than databases intended for private use.

(a) Research Databases

In assessing whether database protection restricts technological and scientific development research databases merits special consideration. By "research database," it is simply meant a database comprising the results of research activities. In particular within natural science research databases play a crucial role. Numerous essential research databases within natural science exist, *e.g.*, the Evaluated Nuclear Structure Data File (ENSDF) which contains sets of data on nuclear structure and radioactive decay data for isotopes. The data of ENSDF are obtained by a variety of experiments and are often spanning decades of

measurements. The evaluations are carried out by an international network of individuals and coordinated under the auspices of the International Atomic Energy Agency.³

Research databases is often of great value to private enterprises. Obviously, private firms benefit from research databases in their own research activities; this is no different than public financed research. But certain research databases may also be valuable in connection to decisions related to the production function of a firm. For example, production firms in many industries in their choice of primary produces and semi-products may consult research databases that provide product identification and safety information for chemical substances with a view to optimize the organization of the production and the final product. According to the International Council of Scientific Unions most data involved in the fields of physics, chemistry, and material science are numerical values of some property of a specified substance, material, or system of interacting substances. The data are generated in local research environment and disseminated through research papers in scientific journals and government reports. Since the beginning of the twentieth century the data from the primary literature has been compiled and republished in handbook format. This practice appears to be crucial for the progress of science and technology. A large number of such handbooks and compilations has been created to the benefit of the research community and affected industries. Continuously, the need for new handbooks and compilations aimed at a specific application arises, and, hitherto, it has been accepted that producers of new compilations can take data from existing compilations arrange the data in a form appropriate for the new application and publish the new compilation without infringing existing rights, and thus create a value-added product. Normally, this practice does not infringe prospective copyright in existing compilations, but if it is prevented by intellectual property protection (*e.g.*, a *sui generis* right), it will arguably be to the detriment of the society at large.

Restricted access to research databases may not only distort competition but also stifle technological and scientific development. Research projects in natural science often are organized in international networks including public as well as private research organizations and the scientific results are collected in a common database. Inherent values of the research community suggests free access to the resulting databases to the mutual benefits of the parties involved and to the society at large.⁴ However, divergent interests between public and private research organizations exist. The results of public financed research may on grounds of public policy explicitly be placed in the public domain. Private research companies demand an interest on investments in research activities that may be incompatible with free access to research results. The divergent interests between public and private research organizations have materialized in relation to the human genome project. Thus, the International Human Genome Sequencing Consortium and the private company Celera are split on the issue of whether Celera should be entitled to exercise intellectual property protection for the results of its sequencing efforts. At present, Celera claims and exercise proprietary rights in its contribution to the Human Genome Database.⁵

³ See Bits of Power, Appendix C.

⁴ Cf. the Policy Statements of the International Council of Scientific Unions, (http://www.codata.org/data_access/index.html)

⁵ However free, limited access is provided to qualified academic users, see *Bovenberg* (2001), pp. 361, and <http://www.celera.com/genomics/academic/pubsite/terms.cfm>.

(b) Observational Data

Extending database protection obviously enhances the potential for confining access to research results contained in databases which may be a significant issue in relation to private research organizations.

Various fields of research within natural science based on observational data have distinct international aspects because the sciences require the generation of globally compatible, accessible, and usable data sets related to, *e.g.*, terrestrial ecosystems, the physical environment, and human activities. Sciences such as food production, bio-diversity, the prevention and cure of communicable diseases, global climate change, and Earth system processes is thus strongly dependent on international collaboration of research communities in respect of collecting observational data. Restricted access or inequality among nations in access to the databases containing the pertinent research data may be damaging to the field of research as such. Developing countries play a crucial role in many of these sciences, for instance, in bio-diversity and Earth system processes research communities in industrialized countries rely heavily on observational data from developing countries. Open availability of existing data is a prerequisite for the establishment of institutional arrangements in developing countries with a view to collect future data within each field of research. Legal or technical constraints on the availability in developing countries of existing data, thus not only hamper the progress of science in developing countries but also indirectly damage research in industrialized countries.

Various research databases within natural science, including databases comprising observed values of natural phenomena, fulfil essential objectives of public policy. For instance, collections of meteorological data are serving the general public by making possible severe weather and flood warnings. Such government administered functions require very comprehensive collections of data. Weather forecasts for more than a day at a time require the rapid and repeated acquisition, processing and interpretation of very large amounts of synoptic observations on at least a continental scale. The necessary data include data on the atmospheric circulation which control weather over the entire Earth with significant variations on time scale ranging from hours to decade or longer, and spatial scales ranging from less than 1 km to thousands of kilometers.⁶

The long run study of weather phenomena (climate studies) requires to a large extent the same data as need for weather forecasts in addition to data on the oceans, land surface, and cryosphere of the entire Earth.

It is debatable to what extent such comprehensive databases of observational data have commercial utility and market value. Undoubtedly, the contents of these databases are essential inputs to many highly valued commercial products. However, it may be argued that the raw data as such has no significant market value until the relevant data has been refined and accommodated to the industrial needs.

⁶ Bits of Power, Chapter 3.

(c) Raw Data and Refined Data

Extremely huge amounts of observational data on meteorological activity are collected. Existing Earth observation and weather systems have the potential for collecting terabytes per day where one terabyte is 10^{12} bytes, or 1,000 gigabytes. It is roughly the equivalent of 40,000 4-drawers files holding 500 million pages of paper documents.⁷ Raw observational data is of paramount importance in research activities, but it is doubtful whether the raw data has any significant practical application in the industries. Obviously, precise and comprehensive weather forecasts and other predictions of meteorological phenomena is of great value to many industrial sectors, *e.g.*, agriculture, forestry, air traffic and shipping. However, it is not the raw data that is needed but the processed and refined data accommodated to the needs of the particular industry. Typically, the processed and refined data is not provided by the research institutions collecting the raw data since usually the activities of research institutions in accordance with the institutions' vision statements are not aimed directly at practical application and commercial value. While it can be assumed that public research institutions have an advantage in technology and basic science, the commercial firms have an advantage in packaging the information for maximum public utility. Hence, on economic grounds it could be argued that the market is the most efficient mechanism to govern the creation of processed and refined data products with commercial value, and that implies that these products ought to be produced by private companies with an objective of profit maximization.

The traditional economic arguments for and against intellectual property protection which are described above only applies to information goods created on market conditions and not to information goods created by way of public financing. Raw research data can in the main be assumed to be provided by public means, and whether the law provides sufficient economic incentives for the creation of new data is not essential. However, the economic considerations of intellectual property protection bear large relevance to new value-added products produced of raw research data reformatted, enhanced and marketed by private companies. If new value-added products are a result of the market process, and if the market process works efficiently, it ensures optimal production volume and product variety by meeting the market demand.

(d) Commercial Databases

A large variety of commercial databases exists. Many commercial databases used commercially reduce the firms' production costs. *E.g.* industry handbooks including registers of manufacturers of particular components facilitates the search for the first-best subcontractor.

Various extremely huge databases with financial data are supplied on the market (*e.g.*, Dow Jones, Reuters, Bloomberg and Bridge). The efficient functioning of the financial sector relies among other things on detailed and precise information on stock quotations, etc. Concurrently with the internationalization of financial markets, the demands for financial information transcend national borders. Financial database owners operate in a global marketplace where quality and accuracy of the data is essential to the economy and society as a whole. In addition, the value of financial databases in certain applications is highly time-sensitive. For example, arbitrage, which is a prerequisite for efficient financial markets, is accomplished by financial institutions and it requires up-to-the-second financial information.

⁷ Bits of Power, Chapter 2.

(e) Government Databases

By government databases is meant databases owned by the government, often, but not always are these databases infrastructure databases. Extensive database protection creates incentives for the transfer of control of many government databases to private parties. Privatization of public information is not necessarily inefficient but may counteract public policy. In most jurisdictions government information is subject to limited copyright protection, and since the originality requirement of copyright often is not satisfied as regards comprehensive information databases, there are reduced incentives for private companies to distribute and archive government information in accessible manner. However, adopting a protective regime for unoriginal databases creates such incentives. Government agencies act under budgetary constraints, and from the point of view of the agencies it may be economic expedient to divest themselves of the responsibility to disseminate, maintain and archive the public information provided the agencies obtain a right to use the now privatized information.⁸ Government agencies collect, compile, etc., information for internal as well as for public use. Privatization of the information restricts the public use of the information, and a danger exists that previous users of the data are priced out of the market. This reasoning suggests that protection of unoriginal databases results in reduced spending of government agencies in compiling and archiving information.

VI. THE DIGITAL CHALLENGE

The development of digital technology, among other things, has resulted in steadily decreasing cost of computing and communication and has greatly enhanced the capabilities for collecting and processing various forms of data. The cost of technology continues to decline even as the capabilities improve. The cost of reproducing, distributing, and searching material over a network are tending to zero, and accordingly, one can anticipate further expansion in what may be coined integrated information networks.

The digital technology has affected the character of database products in other ways. Databases in digitized form are more amorphous compared to the functional rigidities of traditional print media databases since database users from a huge collection of data can extract and arrange data in ways meaningful to them. In other words users can make their own tailor-made extractions from a comprehensive database as a whole. The change in the character of databases in this respect has two effect. Firstly, it blurs the distinction between collection and application functions which in the end blurs the distinction between the use of a database and the production of a new database. Secondly, it increases the potential for creating new value-added database products. This potential is further emphasized by the fact that digital technologies foster new database functions, such as reformatting, filtering and linking, which have no counterparts in print media. Compared to the market for traditional print media databases, the market for digital database products and services has the potential for becoming more lucrative and competitive as regards value-added products.⁹

The development of digital technology and in particular the expansion of the Internet makes data and research results potentially available at very low cost all over the world provided the existence of a fundamental telecommunication infrastructure.

⁸ See Bits of Power, Chapter 4 and 5, and *Reichman & Samuelson* (1997), pp. 112.

⁹ *Cf. Reichman & Samuelson* (1997), pp. 64 f, 124 f.

Computer and network penetration in developing countries is low compared to industrialized countries. According to data from the World Bank Group,¹⁰ in 1999 there were only 0.42 Internet host and 16.6 personal computers per 1,000 inhabitants in developing countries compared to 60.3 Internet hosts and 345.7 personal computers per 1,000 inhabitants in high income countries.¹¹ The world average per 1,000 inhabitants was 9.4 Internet hosts and 68.3 personal computers. A large difference also exists in the basic telecommunication infrastructure; thus, in 1996 there were only 52 telephone lines per 1,000 inhabitants in developing countries compared to 540 in developed countries.¹²

The relatively low cost of modern computers and software may result in developing countries leapfrogging multiple generations of equipment and software approaches. However, it requires that initial investments are made in the telecommunication infrastructure as well as in dissemination of computers and effective digital networks. However, structural features in developing countries prevent fast improvements of information technological foundations. An illustration is provided by the fact that the cost of telephone services bears an inverse relationship to the *per capita* income of a country. International calls originating in developing countries frequently cost many times as much as international calls originating in industrialized countries.

The rapid development in information technology enables easy and widespread copying of information goods. However, the new technology is not only a threat to owners of intellectual property but also an opportunity because new information technology provides the basis for creating technological measures to the protection of intellectual property such as copy control flags (for instance the Serial Copy Management System), encryption, authentication and watermarking.

Technological measures can be applied by providers of online database services to restrict access to database contents. Compared to traditional information distribution systems, presumably, such technological measures enhance the information provider's ability to control the information and thereby charging information users. Digital identification codes may be embedded in the content of a database enabling online database providers to track and charge for every instance of electronic access. If technological measures are sufficiently effective, database producers may not need copyright law at all, even if the databases in question qualify for protection.¹³ As traditional information distribution system are replaced by integrated information networks, it may imply that important information will no longer be readily available to those who need it, but who lack the ability to pay for it. In this way technical measures may create an additional risk of monopolization of information.

The global growth of the Internet has rendered some intermediary commercial entities superfluous since the delivery of products and services easily can take place directly from the supplier to the user. As a consequence it has been increasingly difficult for the database supplier to control the services and products on the market and prevent unauthorized use hereof.

¹⁰ [Http://devdata.worldbank.org](http://devdata.worldbank.org).

¹¹ A table on international Internet connectivity can be found on www.peterlink.ru/info/bookmarks/help/table.html. Apparently, the table was compiled in 1996-97.

¹² Cf. Braga, Fink & Sepulveda (2000), pp. 16 note 14.

¹³ Cf. Reichman & Samuelson (1997), pp. 70 f.

In this regard the expansion of the Internet suggests that limiting database protection to regulate the behavior between competitors only, and not to include behavior between suppliers and users is inadequate. This notion provides an argument for not relying on unfair competition law as the most appropriate form of database protection.

VII. DATABASE PROTECTION

(a) The Danger of Monopolization of Information

It is a fundamental principle in copyright law that copyright protects the expression of the work and that the protection is not extended to the underlying ideas, methods, information, etc. The principle is normally referred to as the idea/expression-dichotomy. However, a clear cut distinction between idea and expression is always difficult to establish no matter which type of work is under consideration. In the database context the distinction between idea and expression is even more blurred as new technologies permit more intelligent computer-based analysis of text.¹⁴ The crux of the problem is illustrated by the United States of America (USA) case *West Publishing v. Mead Data Central*¹⁵ where the court found that the page numbers and page breaks of West's case reports was copyrightable expression. Mead Data offered in its online Lexis service cross-cites to the interior of opinions appearing in West case reports. Obviously, West had no copyright in the opinions as such, but presumably West had copyright to the compilation of the opinions due to the creative effort of the arrangement. However, Mead Data did not copy an entire volume's arrangement or a substantial part hereof. Nevertheless, West obtained a preliminary injunction against Mead Data. As a consequence, presumably one can use Lexis to find the citation but must still look at West's publication to obtain the citable page number for a quotation.¹⁶

The danger of monopolization of information is large under a legal regime which protects the contents of a database provided that the protected database is the sole source of the information. However, often this is not the case, alternative sources of the information exist, and many databases contain citations to the underlying source from which they were developed. A *sui generis* right (similar to the one contained in Article 7 of the EC Database Directive) permits a potential competitor to use the citations of a protected database and go directly to the sources identified in the existing database avoiding blind alley and false starts in tracking down the relevant sources.

A public policy objective according to which third parties ought to remain free to compile an unoriginal database exactly like one already in commerce may be at odds with the economic characteristics of database production and give rise to the danger of *de facto* monopolization of information contained in databases. In a comment on the *sui generis* right of the EC Database Directive *Reichman & Samuelson* claim:

*"[The freedom to compile a database exactly like one already in commerce] ignores the economic realities of the database industry. Startup costs are relatively high, the prospects for market-sharing have seldom been realized, much valuable data is unavailable from public sources, and the existence of one complex database seems empirically to constitute a de facto barrier to entry that is seldom overcome."*¹⁷

¹⁴ Cf. Barton (1993), pp. 269.

¹⁵ 799 F.2d 1219 (8th Cir. 1986).

¹⁶ Cf. Barton (1993), pp. 269.

¹⁷ *Reichman & Samuelson* (1997), pp. 94.

Prospective intellectual property protection of unoriginal databases may, if not drafted carefully, create mini-monopolies over information which in the long run has the potential of diminishing research and development capabilities at scientific and educational institutions.¹⁸ Arguably, developing countries are particularly vulnerable to this effect.¹⁹

(b) Original Databases

Copyright protection of original databases is firmly grounded in Article 2(5) of the Berne Convention; and furthermore databases are eligible for protection according to Article 5 of the WIPO Copyright Treaty and Article 10(2) of the Agreement on Trade-Related Aspects of Intellectual Property Rights.

Common to most types of databases is that they are most valuable if comprehensive in their field of application, reliable, up-to-date, and logically organized. A database with these properties requires significant and continuing investments of labor and other resources. However, the need of protection is at odds with fundamental copyright principles. Comprehensive databases tending to exhaust their respective field of application most likely will not satisfy the conditions for protection under copyright law—that is they will not be considered as original in the copyright sense. As regards anthologies, etc., the originality requirement is stated in Article 2(5) of the Berne Convention: “Collections of literary or artistic works... which, by reason of their selection and arrangement of their contents, constitute intellectual creations shall be protected as such.” The content of a comprehensive factual database is to a certain extent predetermined and thus cannot reflect the creativity of the author which is an integrated part of the originality requirement, at least in the civil law systems. A somewhat similar requirement has been applied in USA copyright law following the Supreme Court’s decision in the *Feist* case.²⁰ A comprehensive, logically organized collection like, e.g., the financial markets quote and trade information thus risk to fall short of the originality standard.

The creator of the most idiosyncratic and selective database can rely on copyright protection of his creation, contrary to the creator who diligently has compiled a very comprehensive database within a certain field of application. The fundamental copyright principles do not take into account that the latter database creator has a larger need of protection than the former at least in a commercial context. Accordingly, copyright rewards and protects artistic creativity and not practical or scientific utility and for that matter commercial value. Protectable subject matter under copyright law arguably promotes cultural development, but with a view to databases *prima facie* copyright law is not designed to promote technological and economic progress.

¹⁸ Cf. Reichman & Samuelson (1997), pp. 95.

¹⁹ Cf. Maskus (2000) pp. 228, 238.

²⁰ *Feist Publications, Inc. v. Rural Telephone Service Co.*, 499 U.S. 340 (1991).

(c) Unoriginal Databases

Non-exclusivity in the consumption of information goods suggests that incentives must be created to encourage the production of comprehensive factual databases. Economic incentives can be provided by a legal regime designed to reward the mere accumulation of facts, statistics, bibliographical information, names and addresses and the like.

Intellectual property protection of unoriginal databases may be implemented in various ways; either by way of a *sui generis* right, a neighboring right, or a norm of unfair competition (in common law countries a doctrine of misappropriation).

(i) *Sui Generis* Right

By definition, a *sui generis* right has no predetermined content. In the following paragraphs a *sui generis* right applicable to unoriginal databases signifies an exclusive right to the extraction and/or re-utilization of the contents of a database similar to the *sui generis* right of Article 7 of the EC Database Directive (96/9/EC) and of Article 3(1) of the Basic Proposal for the WIPO Treaty on Intellectual Property in Respect of Databases. Under such a *sui generis* regime a third party can rarely avoid the expense of regenerating pre-existing data but regeneration of data may be precluded *de jure* if the data are not legally available from public sources, or *de facto* if the cost of independent regeneration is prohibitively high in relation to the gains expected from the resulting compilation.

On one hand, a *sui generis* right protecting the content of a database is likely to stifle the creation of value-added products and services to a larger extent compared to intellectual property protection under a neighboring right regime or under unfair competition law. In this respect the *sui generis* right resembles a patent right. To the extent that database markets are natural monopolies a *sui generis* right protecting the content of a database may engraft at legal monopoly onto the preexisting monopoly. On the other hand, a *sui generis* right is the most extensive form of intellectual property protection of databases and, accordingly, the most valuable one for the database producer.

(ii) Neighboring Right

By a “neighboring right,” the protection of databases means a right that protects the compilation as such, and in addition a right contingent on conditions of protection which easily can be satisfied. Compared to copyright protection, a neighboring right implies a low originality threshold with no requirement of creativity. The scope of protection of such a neighboring right does not extend beyond the compilations selection or arrangement. From the database producers point of view the primary value of a neighboring right lies in a prohibition against literal copying. A competing database producer may, in principle, rearrange the content of a protected database and put the rearranged database product on the market without infringing the neighboring right.²¹

²¹ The *sui generis* right of Article 7 of the European Parliament and Council directive 96/9/EC of March 11, 1996, is said to be inspired by the so-called catalogue rules in the Nordic copyright acts. However, the catalogue rule was originally a neighboring right with the characteristics as described above. The catalogue rule is now amended in conformity with the *sui generis* right of the Database Directive.

A neighboring right as well as a *sui generis* right grants an exclusive right which may be transferred, assigned or granted under contractual license.

(iii) Unfair Competition Law

Protecting databases under a norm of unfair competition resembles a doctrine of misappropriation. Even though protection of unoriginal databases is granted under unfair competition law in many countries, large differences may exist as to the scope of protection. The differences are emphasized by the fact that unfair competition law largely is based on case law and as such the database provider is exposed to a larger degree of uncertainty as to the actual protection.

Provided that it is found optimal or desirable that database protection regulates behavior between suppliers and users in addition to behavior between competitors, it can be argued that unfair competition law is not an appropriate legal regime because unfair competition law exclusively deals with competitor relationships. However, in that case the database producer can establish supplementary protection by entering into contractual licenses under a contract law framework.

Seeking protection of unoriginal databases under contract law may provide reasonable protection in so far as the database producer can control copies of the database put on the market. Distributing databases on the Internet potentially reduces the database producer's control of copies; however this disadvantage for the database producer may be counterbalanced by technical measures (*e.g.*, copy control devices) which provide an important means to maintain control of copies. Depending on the efficacy of the technical protective measures contract law may prove to be an increasingly advantageous legal regime for protection of digital databases.

(d) Delimiting the Scope of Intellectual Property Protection

Governments can delimit the scope of intellectual property protection by regulatory means in order to reduce market concentration emanating from exclusive rights and ensure adequate availability of protected subject matter. Various methods may be employed. Public policy objectives may be incorporated into intellectual property law by way of compulsory licenses. In principle, compulsory licenses can be tailored to ensure particular public interests, however, the national states' use of compulsory licenses is confined by the international legal instruments of intellectual property law.

Alternatively, adverse market effects of intellectual property protection may be reduced by establishing measures of price control such as reference prices or administrative price ceilings. Such measures are adopted by many countries to reduce prices in the pharmaceutical industry. Excessive prices and other forms of abusive behavior may also be countered with competition law principles.

Compulsory licenses and price control measures require that the pertinent bodies deciding on license fees and price levels respectively, have access to comprehensive information on market conditions, business practices, etc., in order to reach efficient decisions on the matter. This information is not necessarily available and the bodies cannot rely on the involved parties to supply the information; consequently, regulatory failures may result.

Limiting the scope of intellectual property protection in one way or the other to promote public interests, diminishes the profitability of creators of goods protected by intellectual property law and thus reduces the economic incentives to create new information goods.

VIII. THE NORTH-SOUTH PROBLEM

The information market place is competitive and global. Valuable information flows easily across national borders; hence, issues of intellectual property protection are essentially international.

(a) Developing Countries and Intellectual Property Protection

Many developing countries have based their economic development policies on imitation and appropriation of intellectual property of firms from industrialized countries. Consequently, those countries have been much less supportive to strong intellectual property protection than industrialized countries. According to the traditional view of the developing countries, the cost/benefit trade-off of strong intellectual property protection is imbalanced in developing countries. Thus, it is said that the incentive effect of strong protection—that is the stimulation of indigenous innovation in developing countries—is negligible since the prerequisite scientific and technological infrastructure is lacking, whereas the developing countries bear the same costs as industrialized countries of strong intellectual property protection by the resulting restrictions on the diffusion of advanced technology.²² Developing countries fear that stronger intellectual property protection increases the costs of obtaining new foreign technology which is necessary to meet their national economic development objectives. The enforcement of high standards of intellectual property protection by industrialized countries is seen as a new modality of technological protectionism which freezes the existing international division of labor and the current comparative advantages in manufacture and commerce of manufactured goods.²³ On the same line, it is argued that tighter intellectual property protection only strengthen the monopoly power of large companies that are based in industrialized countries to the detriment of developing countries.²⁴ It is asserted that the major beneficiaries of better intellectual property protection, at least in the short run, would be transnational corporations.²⁵

Referring to various regional and national surveys on patent activity in African countries *Yusuf* finds that only an insignificant share of the registered patents were exploited through assignment or license in the African countries and, consequently in the main that the patents are not used for production purposes in the African countries. He then concludes that the available evidence indicates that the preponderant majority of patents registered in Africa are used by their owners to secure an import monopoly for their products in the country concerned rather than for local industrial exploitation and production.²⁶

²² Cf. *Wallerstein, Moguee & Schoen* (1993), pp. 14, and *Helpman* (1993).

²³ Cf. *Almeida* (1995), pp. 219.

²⁴ Cf. *Almeida* (1995), pp. 221 ff.

²⁵ Cf. *Braga* (1989), pp. 252.

²⁶ *Yusuf* (1995), pp. 272 f. Based on a survey from the 1980s *Seyoum* draws a similar harsh picture of the patent system in Africa: “On the whole, it is hard not to emerge from this analysis with the assessment that as a means of encouraging industrial innovation plus rapid technological transfer

Various commentators, however, have found that this skeptical view is mistaken (at least partly). It is asserted that the new significant technology could be generated from within developing countries.²⁷ Accordingly, (strong) intellectual property protection is necessary to trigger indigenous innovation in developing countries. The core of the disagreement on the effect of (strong) intellectual property protection in developing countries concerns the notion on how technological development is realized in developing countries, and that is whether technological development can occur within developing countries or may be imported from industrialized countries.²⁸

(b) Optimal Intellectual Property Protection at the National Level

The traditional view of the developing countries on a uniform (strong) intellectual property regime is not without merit.²⁹ Considering the economic function of intellectual property protection the elasticity of supply and the elasticity of demand of new intellectual goods are decisive in determining the social optimal intellectual property regime. In this context the elasticity of supply is the technical concept describing to what extent an increase in economic incentives stimulates the creation of new goods. The elasticity of supply is contingent on various economic conditions such as income levels, market structures, rates of technological development and at the most general level social welfare functions and preference orderings. There is no reason to believe that these economic conditions are similar in different countries and particularly not in developing countries on one hand and industrialized countries on the other. The same applies to the elasticity of demand which describes the resulting changes in demand from changes in the price, keeping in mind that stronger intellectual property protection permits higher prices. The intricacies of the economic function of intellectual property protection is illustrated by *Nordhaus* who elaborated a formal economic model for optimal patent protection.³⁰ Adjusting patent life in order to obtain the optimal solution he found among other things that the length of protection for a given product should be inversely related to the elasticity of demand and the social rate of discount. It is unlikely that markets in different countries, *e.g.*, with divergent levels of income and preferences would have similar elasticities and that the social rate of discount would be similar in different countries.³¹ *Prima facie* differences in the economic conditions call for different intellectual property regimes in order to be optimal at the national level.³²

Even within largely similar countries in respect of economic conditions, etc., specific intellectual property laws have evolved in a particular historical-institutional context. Namely related legal institutions (*e.g.*, property law, torts, procedural law) have influenced the costs and benefits of maintaining an appropriate level of intellectual property protection. For example, the lack of a broad principle of unfair competition in common law countries (most notably in the United Kingdom (UK)) has expanded the scope of copyright protection to claims which in civil law jurisdictions would be decided under the law of unfair competition.

into East Africa, the existing patent system has been of little significance.," *Seyoum* (1985), pp. 712.

²⁷ Cf. *Sherwood* (1993), and *Rapp & Rozek* (1990).

²⁸ See *Lai* (1998), pp. 134.

²⁹ Cf. *Deardoff* (1992), pp. 36. See also the formal analysis of *Chin & Grossman* (1988).

³⁰ *Nordhaus* (1969).

³¹ Cf. *Frischtak* (1993), p. 97 f.

³² Cf. *Gerhart* (2000), *Bronckers* (1994), p. 1248 f, and *Evenson et al.* (1990), p. 86.

(c) Extending the Geographical Scope of Protection

It is reasonable to assume that most of the commercial significant inventive and “creative” activities which trigger intellectual property protection take place in industrialized countries. The notion of uniform intellectual property protection may be viewed as extending intellectual property protection in industrialized countries to developing countries provided that the activities which trigger intellectual property protection take place in industrialized countries.

The existing intellectual property regime in industrialized countries arguably has developed in order to satisfy the needs of the industries and the more general social needs *inter alia* in light of the technological development and has thus balanced the social costs and benefits of the system. Apparently, no contemporary authoritative studies conclude that the intellectual property protection of the industrialized countries are either too strong or too weak³³ and hence, presumably, the level of protection in the industrialized countries is adequate. Establishing similar standards of intellectual property protection in developing countries strengthens the protection from the point of view of right owners in industrialized countries because the geographical scope is just one dimension of intellectual property protection; another dimension is, *e.g.*, the term of protection.³⁴ Where the right owner is granted intellectual property protection in his own country (or a group of countries) but not in all countries in the world, the intellectual property regimes pre-supposedly must be designed to provide sufficient economic incentives for the creation of new information goods. When intellectual property protection subsequently is extended to other countries, the right owner, in addition to the monopoly profits from sales in the original countries, is entitled to monopoly profits from sales in the new countries of goods which would have been created anyway. The additional profits distort the balance of the social costs and benefits of the intellectual property system because the harmful effects of monopoly pricing are extended to new countries.³⁵ Simultaneously, additional economic incentives for the creation of new information goods are provided, but there are diminishing returns to this effect. That means that the extra creations that can be stimulated by extending intellectual property protection to new countries, becomes smaller. In other words the costs due to extending monopoly pricing to existing creations comes to outweigh the benefits of generating new ones.³⁶

In this scenario (which presupposes that commercially significant creations eligible for intellectual property protection in the main originate in the industrialized countries) extending the geographical scope of intellectual property protection can only be substantiated by economic reasoning if the economic incentives in the industrialized countries are deemed to be insufficient.

(d) Technological Capabilities in Developing Countries

This far we have a *prima facie* case that an intellectual property regime which is optimal in an industrialized country is not so in a developing country. The implications of this notion on the optimal intellectual property regime for developing countries depend on the

³³ See however *e.g.* Maskus (2000), pp. 65, claiming that “in important respects the American [intellectual property] regime has become overly protectionist by almost any utilitarian standard.”

³⁴ Cf. Deardorff (1992).

³⁵ Cf. Gerhart (2000), pp. 310, 312.

³⁶ Cf. Deardorff (1992).

specific economic conditions of the countries in question. The paramount objective for developing countries in this respect is to enhance the pace of technological diffusion in order to increase technological and economic development. It is a prevalent view that an economy that industrializes should be able to move from importation through absorption and adaptation of technology through to the stage of innovation on the path to sustained industrialization.³⁷ In this process intellectual property protection may at various stages promote as well as hinder the development.

Weak intellectual property protection in a developing country is only beneficial to that country if it has the necessary capacity to imitate creations of foreign countries. In certain more advanced fields of high technology the capacity to imitate may be lacking. If the prerequisite technical skills to imitate are not available, a free rider strategy will not succeed. Accordingly, in order to benefit from foreign technology, the technology in question has to be transferred to the developing country concomitant with the pertinent know how. A foreign company will not transfer its valuable proprietary technology to a developing country without reasonable safeguards as to the protection of that technology. Thus, the least developed countries may gain from establishing intellectual property protection in various fields of high technology.

Three points on a scale of domestic technological levels may be identified. On the lowest level a country has no capacity to imitate. Such a country, for instance, does not have the engineers and scientists to reverse engineer and copy complex inventions; but may, however, be engaged in simple counterfeit production. On the next level the country has the capacity to imitate, and at the highest level, additionally, the country has the scientific and technological infrastructure necessary to stimulate indigenous innovation. From a national point of view, countries on the middle level provide the strongest case for weak or no intellectual property protection. Available evidence on the strength of intellectual property protection in force in various countries supports this notion. The findings of *Maskus* suggest that countries tend to weaken their patent laws as income rise and then strengthen them after a certain point.³⁸

In the study of *Maskus* the technological level was presupposed to be related to the per capita income. A more precise, however, still a rough measure of the technological level of a particular country may be found in the scientists' share of the work-force. In 1986 the industrialized countries USA, UK, France, Federal Republic of Germany and Japan had between 3.09 and 8.80 scientists and engineers per 1.000 workers engaged in research and development. The low-income developing countries Indonesia, Pakistan, Kenya, India and Bangladesh had between 0.02 and 0.2 scientists and engineers per 1.000 workers engaged in research and development; similar figures was found in middle-income developing countries.³⁹ These figures indicate no significant difference between low-income and middle-income developing countries in respect of national technological capabilities.

As regards traditional (analog) databases protected by intellectual property rights this taxonomy bears little relevance because such creations can be imitated and the contents can be appropriated without any technical skills. Therefore, all types of developing countries may benefit from free-riding on foreign databases. However, on the other hand all types of

³⁷ Cf. Deepak Nayyar in Mitchel B. Wallerstein, Mary Ellen Mogee & Roberta A. Schoen (Eds.) (1993), pp. 165.

³⁸ *Maskus* (2000), pp. 88-109.

³⁹ Cf. Zigic (2000), Appendix C, pp. 57 f.

developing countries are also likely to enjoy the dynamic benefit of intellectual property protection.

In respect of complex digitized database services provided via the Internet an incentive effect comparable to the one which applies to traditional, analog databases, require, firstly, that potential database producers have a certain amount of available information technological facilities and, secondly, that the national database market is characterized by a high degree of computer and network penetration. A national database producer in a developing country with a low degree of computer and network penetration will not create complex digitized databases for the home market, because there will be no demand for such product in the home market. He may create complex digitized databases for export. However, in that case domestic intellectual property protection is irrelevant; what matters is intellectual property protection in the export markets.

In general, these conditions are not satisfied in developing countries. In order to enjoy the full (dynamic) benefits of intellectual property protection of databases a developing country must have an effective and wide-spread information technology infrastructure; otherwise the incentive effect is comparatively lower in developing countries than in industrialized countries. The notion emphasizes the significant role of an effective information technology infrastructure in technological and economic development. The lack of an effective information technology infrastructure in a developing country prevents the national database producers from participating in the world market for complex digitized database services, impedes leapfrogging and sustain a low-technology lock in. Provided the world market for database services at present and particularly in the future concerns complex digitized database services and only to a minor extent analog databases, strong uniform intellectual property standards result in a situation where database users in developing countries will have to pay royalties to foreign producers, whereas national database producers can find no users outside the country of the database producer and, consequently, gain no foreign royalty payments.

As regards digital databases *de facto* protected by way of technical measures such as copy control and access control devices, which in practice probably includes all commercial online database services, technical skills are crucial in order to gain access to the content of the databases. However, the level of intellectual property protection in a developing country does not influence the prospective benefits such a country may derive from a *de facto* protected database, provided the technical measures are in fact effective, because the technical measures fulfil the same economic function as intellectual property right which is to ensure exclusion in the use of the protected subject matter.

(e) Leapfrogging

As mentioned above free (or relaxed restrictions on) access to foreign technology usually is an important issue of public policy of developing countries as a means to promote national economic development. Provided that it is of global interest that developing countries overcome technological lag and other economic disadvantages enhanced diffusion of scientific and technical knowledge is a primary issue. Relaxed restrictions on access to foreign research databases and databases with significant industrial application creates a potential for developing countries to accelerate leapfrogging and avoid technological and economic “lock out.” The national systems of economic development in developing countries are in the process of formation and by leapfrogging the developing countries avoid inefficient intermediary stages of development.

It may be argued that leapfrogging by way of relaxed restrictions on access to foreign research databases and databases with significant industrial application influences the institutional and economic structure of developing countries in a way where further development is based on import of foreign knowledge and where the institutional and economic structure does not accommodate indigenous growth. Such an argument is of a rather speculative nature since it relates to a very complex dynamic economic analysis on the long run consequences of a particular legal regime. Economic analysis on this issue, in particular, thus provides equivocal results.

(f) Unidentical Demands

The economic considerations described above presupposes that the demands in industrialized countries and developing countries respectively in respect of creations eligible for protection under intellectual property law, are more or less identical. If certain kinds of information goods are more demanded in developing countries, then from the point of view of developing countries an additional benefit accrues from adopting strong intellectual property protection covering those kinds of goods because in that case intellectual property protection stimulates precisely those creations that are of particular importance to the population of developing countries, and thus will yield a greater benefit to developing countries than to industrialized countries.⁴⁰ Probably the strongest case for establishing high standards of intellectual property protection in developing countries is where the demands in developing countries for certain categories of information goods exceed the demands in industrialized countries. However, it requires that a category of information goods can be identified and not just one or more particular products.

(g) Intellectual Property Protection as a Vehicle for the Dissemination of Knowledge and Information

Intellectual property protection is not exclusively a measure restricting the dissemination of knowledge and information. Various provisions of intellectual property law promote the dissemination of knowledge and information. For example, under patent law the inventor is granted temporary exclusive rights in exchange for disclosing the invention in the patent documents. In case patent protection was not available the inventor would have economic incentives to keep the invention secret and claim protection under the law of trade secrets. A patent excludes others from commercially using the invention as claimed, but the

⁴⁰ Cf. *Maskus* (2000), pp. 156 f, and *Deardorff* (1992), pp. 49.

technology behind the invention can freely be used by others to further develop innovations and create new patentable inventions. However, the lack of a scientific and technological infrastructure prevents the developing countries from taking full advantage of the disclosure provisions of modern patent law.

The extent to which the provisions on disclosure in patent law facilitate technology transfer is debatable. On the one hand the countries which grant patents on foreign inventions gain access to the foreign technological knowledge which is disclosed in the patent documents. On the other hand, the technological knowledge disclosed in the patent documents probably already is available at patent authorities in other countries. It is pointed out by *Braga & Fink* that the availability of domestic databases of foreign-owned patents in local language, could potentially stimulate the diffusion of knowledge especially among small and medium-sized firms in developing countries.⁴¹

Even though it appears that intellectual property protection is restricting technological development in the least developed countries, it is claimed to be a vehicle to transfer technology from industrialized countries to developing countries. A firm can choose between various methods to transfer technology to a foreign country in order to exploit the technology in such a country for productive purposes. Basically, this can be done by licensing, or by establishing a joint venture or subsidiary. By such means, in principle, the development of technological capabilities in developing countries may be stimulated.

The notion of intellectual property protection as a means of transferring technology from industrialized countries to developing countries is not convincingly supported by empirical evidence. In the African countries apparently the patent law has not created significant effects regarding dissemination of technological knowledge. The relatively strong *de jure* protection of intellectual property in African countries with respect to patents has not resulted in a high rate of patent registrations; nor does it seem to have facilitated technology transfer into these countries.⁴² It has been reported that intellectual property legislation of African countries is comparable to that of industrialized countries as regards the terms of protection, compulsory licenses for failure to work, subject matter of protection and provisions on government use.⁴³ However, no evidence has been found as to support whether judicial mechanisms has been established for the effective enforcement of intellectual property rights. Africa's share of the world total of foreign patent registrations is very low compared to other parts of the world including Asia and Latin America.

Anyway, in relation to databases the technology transfer argument bears little relevance since a protected database in comparison to a patented invention does not incorporate new technology as such.

Weak or inadequate intellectual property protection in a specific developing country may cause foreign companies to avoid supplying its products on the market in that country. However, the contents of databases can be assessed from databases available in other countries. Only in situations where a database has been adapted to the language of a developing country or in other ways is accommodated to the particular needs of a developing country, intellectual property rights in developing countries seem to facilitate the transfer of valuable information.

⁴¹ *Braga & Fink* (2000), pp. 50 note 55.

⁴² *Cf. Seyoum* (1985), pp. 712.

⁴³ *Cf. Yusuf* (1995).

(h) Foreign Direct Investments

In addition to the positive effect stemming from the transfer of technology from industrialized countries to developing countries, adequate intellectual property protection in developing countries may provide decisive economic incentives for foreign firms to make direct investments in developing countries, *e.g.*, by establishing joint ventures or subsidiaries or simply by investing in domestic firms in developing countries or by acquisitions. To many developing countries direct investment is an important means to expand economic activities and to advance economic development.⁴⁴

In principle, the issue of direct investments pertains to all countries but, normally, direct investment in industrialized countries is not an important objective of national economic policy. Hence, evaluating the economic impact of intellectual property protection implies an additional element in relation to developing countries. A strengthening of the intellectual property regime in a country on the one hand presumably increases the sales of the right owners' protected products since unauthorized products made by 'pirates' will be displaced by products made with the right owners' consent; this effect stimulates foreign direct investments in intellectual property related industries. On the other hand a right owner may reduce his sales in a foreign market due to the greater market power in a imitation safe environment.⁴⁵ If, however, a right owner choose to do so, it must be the result of a profit maximizing decision.

In spite of the intuitive appeal of the argument, the existing empirical evidence shows no significant relationship between intellectual property protection and foreign direct investment.⁴⁶ The survey conducted by *Mansfield* suggests that intellectual property protection is only one of a large number of factors influencing whether firms increase or reduce their direct investments in a particular country.⁴⁷ Other legal factors important to decisions on direct investments include provisions on *inter alia* taxation, foreign investment regulation and exchange control. The intellectual property legislations prevailing in the 1960s and 1970s in the African countries granted stronger protection than the intellectual property legislations prevailing in the Republic of Korea. Nevertheless, the licensing activity of foreign right owners was much higher in the Republic of Korea than in the African countries which supports the findings of *Mansfield* that the level of intellectual property protection is not a crucial factor in decisions on foreign direct investments in developing countries.⁴⁸ However, as regards the situation in Africa a reservation must be made about the prospects of enforcing the rights.

⁴⁴ In general on direct investments in relation to intellectual property protection, see *e.g.* *Mansfield* (1993), pp. 107-145, and *Correa* (1995).

⁴⁵ *Cf. Braga & Fink* (2000), pp. 37, 42.

⁴⁶ *Cf. Helpman* (1993), s. 1249, and *Braga & Fink* (2000), pp. 43, 47.

⁴⁷ *Mansfield* (1993). See also *Maskus & Konan* (1994), pp. 414 f.

⁴⁸ *Cf. Yusuf* (1995), pp. 271.

IX. TRANSITION ECONOMIES

(a) The Process of Transition

A transition economy may be defined as an economy in the process of transforming from a central planning system to a market based system. Transition implies that economic activity, prices and market operations are liberalized with a view to achieve effective enterprise management and economic efficiency. An important means in this process is usually privatization. An institutional and legal framework must be established to secure property rights, the rule of law, and transparent market-entry regulations.

Within the field of intellectual property privatizing publicly owned information goods presupposes the existence of rights to those goods—that is a regime of intellectual property protection—in particular if the government intends to obtain the economic value of the privatized information goods.

Intellectual property law can be viewed as a legal institution establishing a framework for exchange of protectable subject matter on the market. In that respect intellectual property law shares the intellectual foundation of the economic property right theory which normative content suggests that voluntary exchange of goods on the market ensures efficiency provided that clear property rights are established in those goods. Intellectual property regimes are congenial to a market economy. Other methods to stimulate the production of new knowledge and information exist. In the former socialist economies to a large extent new knowledge and information was produced by public research and development institutes reducing the need for providing economic incentives for the private production of information goods. According to the ideology of the former socialist economies the principle of non-exclusive protection was typically interpreted as the logical consequence of collectivization of the means of production and as a reflection of the objective of widespread and rapid use of information goods for the benefit of the economy as a whole.⁴⁹

In the first decade of the transition process, in general, the key macroeconomic indices for the countries in transition have been decreasing. Most of the countries in transition have experienced a substantial decline in GDP in the first half of the 1990's.⁵⁰

(b) The Cost and Benefits of Intellectual Property Protection in Transition Economies

The view of developing countries on uniform intellectual property protection according to which a high level of protection benefits foreign (Western) rightholders to the detriment of domestic enterprises is also voiced in transition economies.⁵¹

In general, the transition economies are distinguished from developing countries by the educational level and the size of the scientific sector.

The share of the population with a higher education was relatively large in the former centrally planned economies, at least within the technical fields. For instance, the

⁴⁹ Cf. "Protection of Intellectual Property in Central and Eastern European Countries. The Legal Situation in Bulgaria, CSFR, Hungary, Poland and Romania," OECD Documents, Paris 1995, pp. 18.

⁵⁰ Cf. *Zaiko* (1998), pp. 155 f.

⁵¹ Cf. e.g. *Szwaja* (1998), pp.130.

former East Germany had three times as many qualified engineers as the West. Thus, the “volume growth fetishism” practiced in the centrally planned economies was also a common feature in education.⁵²

In the former centrally planned economies research and development expenditures comprised a relatively large share of the national product. In 1986 applied research and development accounted for 3.00% of the GDP (Gross Domestic Product) in centrally planned economies compared to 1.85% in the USA, 1.71% in the UK, 1.94% in France, 2.60% in the Federal Republic of Germany and 2.75% in Japan. Not surprisingly the corresponding figures for low-income developing countries were very low, for instance 0.3% in Indonesia, 0.3% in Pakistan and 0.1% in Kenya.⁵³

In the transition process state subsidies to research institutes have either been drastically reduced or abandoned altogether. As a consequence many researchers have been forced to find work outside the research sector and that leads to a considerable waste of potential know-how.⁵⁴ For example, in Belarus in the years following the break-up of the Soviet Union the volume of budgetary finance for scientific research decreased by 5-6 times, and the number of scientific workers fell more than two-fold.⁵⁵

Prima facie it appears that the prerequisite technical skills to take advantage of foreign technology is available in transition economies. Nevertheless, it has been reported that the simple transfer of know-how to Russia has been ineffective,⁵⁶ indicating that the fundamental structures of knowledge production is deficient, and arguably transition economies do not have a large capacity to imitate foreign technology; though the evidence on this issue is anecdotal.

In general the intellectual property legislation of countries in transition provides a relatively high level of protection,⁵⁷ but the enforcement of intellectual property rights seems to be ineffective. In the field of copyright and related rights piracy is a widespread phenomena in countries in transition.⁵⁸

Countries in transition share the concerns of developing countries regarding strong uniform intellectual property standards. In the main, the economic impact of enhanced intellectual property protection also pertains to countries in transition, however, the prospects of transforming into a system with elaborated strong intellectual property right and deriving national economic benefits from that system seem better for countries in transition due to relatively developed educational and scientific structures. Compared to developing countries these basic structures minimize the risk that countries in transition will be locked in at a low technological (and economic) level.

⁵² Cf. Staudt (1994), pp. 834.

⁵³ Cf. Zigic (2000), Appendix C, pp. 57 f, and Evenson et al. (1990), pp. 35.

⁵⁴ Cf. Bock (1994), pp. 858.

⁵⁵ Cf. Slonimski (1998), pp. 162.

⁵⁶ Cf. Bock (1994), pp. 861.

⁵⁷ See Altvater & Prunskienè (1998), and “Protection of Intellectual Property in Central and Eastern European Countries. The Legal Situation in Bulgaria, CSFR, Hungary, Poland and Romania,” OECD Documents, Paris 1995.

⁵⁸ Cf. e.g. Zolotkyh (1998), pp. 145, as regards the Russian Federation, and Shpak & Kapitsa (1998), pp. 175, as regards the Ukraine.

X. CONCLUSION

Many commentators conclude that it is very difficult to assess the overall desirability of harmonized standards of intellectual property protection at a worldwide level.⁵⁹ Nevertheless, this conclusion does not preclude that there is a strong case that optimal intellectual property regime in industrialized countries is not optimal in developing countries.

In the short run (in the static sense) developing countries which typically are technology-importing countries will lose social welfare by enhanced intellectual property standards, because higher intellectual property standards will lead to an increase in royalty payments to foreign right owners. Correspondingly, a more strict regime of intellectual property protection implies social welfare gain in technology-exporting countries.⁶⁰ The costs and benefits of enhanced intellectual property standards in the long run (in the dynamic sense) are more obscure.⁶¹ Long run benefits emanating from strong intellectual property protection in developing countries require that the protection in fact stimulates indigenous innovation which is most likely to occur in countries in transition and middle-income developing countries and least likely in the least developed countries.

But existing economic analysis does not provide clear-cut conclusions on how to design an optimal intellectual property for developing countries.⁶²

Most of the economic literature on the economic impact of intellectual property protection in developing countries pertains to patent rights, and in particular patents on pharmaceuticals. The conclusions in this literature are not necessarily valid in relation to databases. The essential economic function of intellectual property protection is unchanged irrespective of protected subject matter, however, the economic impact of a particular intellectual property right depends *inter alia* on the characteristics of the protected subject matter and the market conditions. The U-shaped relationship between the level of patent protection and income levels (as an approximation of the technological level) reported by *Maskus* (2000), presumably, cannot be extended to database protection because database structure and contents can be appropriated without any significant technical skills. Similarly, the technology transfer argument that supports high intellectual property standards in developing countries does not pertain to databases because databases do not incorporate new technology as such.

Probably the most fundamental issue of the North-South problem is whether stronger intellectual property protection in developing countries actually stimulates indigenous innovation. As regards traditional analog databases it seems reasonable to suggest that intellectual property protection of databases creates economic incentives in developing countries and thus stimulates national database production. The lack of an effective and widespread information technology infrastructure is likely to reduce the incentive effect of intellectual property protection in relation to complex digitized databases. The ways in which a developing country can develop an information technology infrastructure, in principal, is not a matter of intellectual property law, but relaxed intellectual property protection may facilitate a development towards such an infrastructure.

⁵⁹ Cf. e.g. *Maskus* (2000), *Braga & Fink* (2000), pp. 52, and *Maskus & Konan* (1994), pp. 439.

⁶⁰ Cf. e.g. *Maskus* (2000), pp. 181 ff.

⁶¹ Cf. e.g. *Evenson et al.* (1990), pp. 72.

⁶² Cf. *Correa* (1995), pp. 174.

Narrowing the focus to intellectual property protection of unoriginal databases the mentioned incentive effects pertain to factual databases where copyright protection proves inadequate.

If demands for factual databases in developing countries exceed demands for factual databases in industrialized countries, it could be beneficial for developing countries to adopt intellectual property protection of unoriginal databases. However, there appears to be no reason why demands for factual databases should be higher in developing countries than in industrialized countries. Even if this notion is wrong, a prospective benefit may be outweighed by the royalty out-flow resulting from the difference in the trade patterns on the database world market which is due to the lack of an efficient information technology infrastructure in developing countries.

The doubts as to the beneficial economic effect on developing countries of enhanced intellectual property protection is aggravated in connection to protection of unoriginal databases. Parts of the argument rests on the assumption that developing countries lack an effective information technology infrastructure, and this is not necessarily so for all the countries in question. Especially middle-income developing countries and countries in transition may have an information technology infrastructure though not as effective and wide-spread as the infrastructures of industrialized countries.

The reasoning raises grave doubts about the beneficial economic effects of intellectual property protection of unoriginal databases, particularly, in respect of the least developed countries, but it does not support a firm conclusion that this type of protection is detrimental in an economic sense to developing countries and countries in transition. However, it supports the notion that prospective economic benefits of uniform (high) intellectual property standards are comparatively lower in developing countries than in industrialized countries.

If international standards for the protection of unoriginal databases shall be instituted, it is expedient to consider prospective measures to be taken in order to reduce the social cost of such protection in developing countries and countries in transition.

Databases are powerful tools for research, educational, and commercial applications and for addressing major national challenges, and have become the building blocks of the information society. In the context of technological development research databases play a crucial role.

The raw scientific data (*e.g.*, meteorological and other observational data) are fundamental information building blocks in an economy. Normally, raw scientific data have no direct market value and, hence private companies have no economic incentives to create such data. The adoption of intellectual property protection does not create economic incentives if the protected subject matter has no market value. As a consequence, raw scientific data in many instances are provided by public research institutions or by public subsidies. When the resources for the creation of data is allocated by governmental decisions and not by the market mechanism, intellectual property protection has no economic rationale. The corollary of this is that data provided by public research institutions or by public subsidies should be exempted from intellectual property protection, thus, free access can be ensured.

Refined and processed scientific data with high commercial value may also be considered as information building blocks, however not quite as fundamental. Good economic reasons exist for protecting databases (original as well as unoriginal) that contain refined and processed scientific data with commercial value.

Undoubtedly, the promotion of technological and economic development is a primary policy objective in developing countries as well as in countries in transition. Strong protection of unoriginal database, *e.g.*, by way of a *sui generis* regime creates a danger that scientific and educational communities are priced out of the market or have to cut back on the scientific and educational activities impeding technological and economic development. Scientific and educational communities in developing countries and countries in transition are particular vulnerable to high prices on research database services due to scarce economic resources. In order to support the policy objectives of these countries protection of unoriginal databases ought to be combined with adequate safeguards that recognize the needs of the scientific and educational communities for unrestricted access to data at affordable prices. Hence, if protection of unoriginal databases are adopted in the form of an exclusive right (*i.e.*, a *sui generis* right or a neighboring right), it ought to be combined with statutory exemptions to the exclusive right.

There is a risk that intellectual property protection of unoriginal databases implies net social costs on developing countries and countries in transition and the social costs assumably are positively correlated to the level of protection. Given this risk one ought not to opt for the strong *sui generis* right. Besides, the danger of monopolization of information is largest under a *sui generis* regime.

Protection of unoriginal databases under a neighboring right regime and under unfair competition law prevents parasitical copying but allows the creation of value-added products and services. A major difference between these two forms of protection concerns the character of the right conferred on the database producer. A neighboring right is a formal right that applies to all creations which satisfy the conditions of protection, and, in principle, the scope and the content of protection is not related to the characteristics of the specific creation and the pertinent market conditions. In that respect, neighboring rights resembles copyrights.

Under unfair competition law protection is granted in due consideration of the circumstances of the specific case and thus the actual market conditions including the commercial interest of the database producer are decisive. The case-by-case determination of protection is more suitable to tailor a protective regime in accordance with economic reasoning, compared to a formal exclusive right.

However, effective protection under unfair competition law is more vulnerable to deficient judicial mechanisms. Unfair competition law leaves a large margin of discretion to the courts. National differences in the legal culture may be reflected in the protection of unoriginal databases under unfair competition law and result in different levels of protection in various countries. The uncertainty that pertains to the actual protection under unfair competition law may reduce the practical value of the protection from the point of view of database producers.

Arguably, the issue of intellectual property protection of unoriginal databases will prove to be of insignificant practical importance if valuable databases are digitized and the database providers are able to (and permitted to) establish effective technical measures for the protection of their database services.

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