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ECONOMIC IMPACT OF DATABASE PROTECTION IN DEVELOPING COUNTRIES AND COUNTRIES IN TRANSITION

Study prepared by Mr. Yale M. Braunstein
Professor, School of Information Management and Systems
University of California, Berkeley, United States of America

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* At the request of its member States, WIPO commissioned, in 2001, five studies on the economic impact of the protection of non-original databases in developing countries and countries in transition. This study, one of those five, 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

Countries adopt laws protecting intellectual property to encourage the production of creative works and inventions. Although it is sometimes argued that human nature would lead to the production of creative and useful works without the need for economic or legal incentives, there is a widely held belief that appropriate economic and legal institutions do provide incentives for artists, writers, and inventors to create and distribute a variety of products and services that help meet the needs and advance the cultural and economic level of society. National laws and international agreements provide for rights in intellectual property; these laws make use of copyright, patent, and other specific forms of protection for items as diverse as semiconductor masks, new plant varieties, and geographical indicators.

This study is focused on the economic impact of the protection of non-original databases in developing countries. Databases are collections or compilations of records that are organized for easy access and retrieval. Many of these databases are "unoriginal" in the sense that they do not meet the originality criterion under the principles of copyright recognized in the Berne Convention and the WIPO Copyright Treaty. As a result such databases are not protected by copyright. Although databases can be in any of a variety of formats, the growth of databases in electronic formats, both as standalone products on media such as CD-ROMs and as online products and services, has increased the need for their legal protection.

This study begins with a detailed examination of the economics of database protection. There are two economic properties that drive the need to protect information goods and services: *economies of scale* and *difficulty in excluding non-payers*, sometimes referred to as the "free-rider" problem. Without the adequate definition of property rights, the economic incentives for the production of useful and desired databases will be impaired. Furthermore, the specific provisions of the protection statutes will affect the economic welfare of society. Key findings in the areas of the economics of information organizations and the theory of optimal pricing are used as a basis to determine the appropriate scope of the protection of databases.

The first specific issue addressed is compulsory licensing and other restrictions on pricing. While a reduction in the level of licensing fees may seem, at first glance, to involve the traditional economic tradeoff of making one group (users) better off and another (producers) worse off, it turns out that this view is too simplistic. Restrictions on licensing fees (pricing) also reduce the incentive for the production and distribution of databases. Thus one result is a social harm unless the incentives are restored by another inducement, such as lengthening the period of protection. But, of course, provisions such as this also have a social cost.

Similar analyses apply to issues such as exempting one or more specific sets of uses or users. If one wishes to avoid the reduced incentives that arise from eliminating certain revenue streams, it is important to realize that dropping the fees to one group involves raising them to another. Given the relatively high fixed costs in production and distribution of databases, the general principle should be to spread the fixed portion of the costs over as many users as is feasible. As in other areas, economic factors such as high transactions costs can mitigate against charging every user for every use, but exemptions should be used sparingly.

Data from one source, the *Gale Directory of Databases*, are then used to examine the current levels of the production of (public) databases by geographical region, language, and type of producer (commercial, not-for-profit, etc.). Although the vast majority of databases is produced in North America and Western Europe, and approximately two-thirds are in the English language, there is also database production in the developing countries. Approximately 500 of the 12,000 databases in the directory (or 4% of the total) now come from Africa, Asia, Eastern Europe, and South America.

The focus then turns to the choices a country makes about the bases and mechanisms for database protection relative to those of its existing and potential trading partners. These choices can affect the economic welfare of the country and of its trading partners. International agreements to reduce barriers to the use of foreign works can improve the welfare of both the importing and exporting countries. It also appears that the existence of alternative database protection regimes is not a significant problem for developing countries.

The final analytical sections address a number of possible "special cases." These include databases with scientific and technical information or with culturally sensitive content, databases for which there might be a sole source, the problem of the possible "capture" of content that is produced with public funds or in the public domain into commercial databases, and the role of databases in the functioning of the Internet. Several aspects of these special cases are also addressed, at least implicitly, in the earlier chapters. In each case, the conclusion is that if exceptions to the general rules for database protection need to be made, these exceptions should be drawn as narrowly as possible.

Throughout the report, the economic analysis follows an overall logic that can be summarized by the following key points:

– A clear, adequate definition of property rights in databases enables markets for databases to develop and grow.

– Strong protection of the intellectual property rights (IPRs) in databases, without too many limitations or exemptions, will encourage the growth of local production of databases in developing countries, some of which already exists.

– Recognition of parallel rights for foreign producers of databases enables trade that is in the interest of both parties.

– The existence of differing approaches to the protection of databases across the developed countries is not likely to be a problem for the developing countries.

– Policies designed to deal with special circumstances such as sole-source provision or the possibility of capture should be narrowly drawn.

– It is important to recognize throughout the discussion of database rights that there is a distinction between the unoriginal databases that are the subject of this analysis, on one hand, and their content, on the other. The content in the database fields and records may be original works

already subject to copyright protection or it may be work that is in the public domain.

Debates about the benefits of IPRs for developing and small countries are not new. According to Machlup and Penrose, the patent systems in the Netherlands and Switzerland were disbanded for long periods in the Nineteenth Century. But, for the most part, the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) has led to a near universal view that national laws and international agreements that protect and respect IPRs provide advantages to countries of all sizes and at widely differing stages of economic development. This study uses the tools of economic analysis to show that these conclusions also hold for the protection of database rights.

STUDY

I. INTRODUCTION

This study is focused on the economic impact of the protection of non-original databases in developing countries. The analysis applies to developing countries at all stages of the development process, to the least developed countries, and to countries undergoing the transition from a centrally-planned to a free-market economy. Databases are collections or compilations of records that are organized for easy access and retrieval. For the purposes of this study, many of these databases are "unoriginal" in the sense that they do not meet the originality criterion under the principles of copyright recognized in the Berne Convention and the WIPO Copyright Treaty. As a result such databases are not protected by copyright. Although databases can be in any of a variety of formats, the growth of databases in electronic formats, both as standalone products on media such as CD-ROMs and as online products and services, has increased the need for their legal protection.

Databases are protected under the laws of several countries, both developed and developing, with copyright protection available for original databases and some form of special protection for non-original databases. For example, many western European countries have enacted *sui generis* database protection laws pursuant to Directive 96/9/EC of the European Council. Similarly, Mexico's Federal Law on Copyright includes a section that provides for the protection of non-original databases. There are several multilateral agreements covering the protection of intellectual property rights (IPRs), the most recent of which is the TRIPS Agreement. The TRIPS Agreement obligates the World Trade Organization (WTO) members to adopt at least minimum standards of protection for most intellectual property and to apply the principles of national treatment, the equivalent respect for IPRs held by citizens and foreigners. Although the TRIPS Agreement covers copyright (including special mention of copyright for original databases), patents, trademarks, and more specialized forms of intellectual property such as semiconductor masks, new plant varieties, and geographical indicators, the European Union takes the position that it does not apply to non-original databases.

This study begins with a detailed examination of the economics of database protection in Chapter II. There are two economic properties that drive the need to protect information goods and services: economies of scale and difficulty in excluding non-payers, sometimes referred to as the "free-rider" problem. Without the adequate definition of property rights, the economic incentives for the production of useful and desired databases will be impaired. Furthermore, the specific provisions of the protection statutes will affect the economic welfare of society. Building on our knowledge of the economics of information organizations and the theory of optimal pricing, I explore the implications of the key findings in these areas for the protection of databases.

Chapter III presents data from one source, the *Gale Directory of Databases*, on the production of (public) databases by geographical region, language, and type of producer (commercial, not-for-profit, etc.). Although the vast majority of databases is produced in North America and Western Europe, and approximately two-thirds are in the English language, there is also database production in the developing countries. Approximately 500 of the 12,000

databases in the directory (or 4% of the total) come from Africa, Asia, Eastern Europe, and South America.

The focus of Chapter IV is on the choices a country makes about the bases and mechanisms for database protection relative to those of its existing and potential trading partners. These choices can affect the economic welfare of the country and of its trading partners. International agreements to reduce barriers to the use of foreign works can improve the welfare of both the importing and exporting countries. It also appears that the existence of alternative database protection regimes is not a significant problem for developing countries.

In Chapter V I address a number of possible "special cases." These include databases with scientific and technical information or with culturally sensitive content, databases for which there might be a sole source, the problem of the possible "capture" of content that is produced with public funds or in the public domain into commercial databases, and the specific issue of Internet routing tables. Several aspects of these special cases are also addressed, at least implicitly, in the earlier chapters. In each case, the conclusion is that if exceptions to the general rules for database protection need to be made, these exceptions should be drawn as narrowly as possible.

II. ECONOMICS OF DATABASE PROTECTION

The protection of IPRs, in general, and of databases, in particular, gives rise to a number of complex economic issues. This chapter presents those basic economic principles that underlie the case for the clear definition of those rights. These principles include the difficulty in excluding non-payers and the presence of economies of scale. At times the goods and services that exhibit these properties are referred to as "public goods" and arguments are made for the public provision of them. But "public goodness," if there is such a term, is not an all-or-nothing concept. It is important to understand that "difficulty" of exclusion is not the same as "impossibility" of exclusion and that there are varying degrees of economies of scale. This chapter starts with a discussion of the dual role of IPRs in enabling exclusion and providing incentives for the creation of intellectual property such as databases. It then addresses the terms of the rights, including their breadth and duration. The discussion then turns to the role of economies of scale and lessons from the literature on optimal pricing. The concluding section explicitly presents the implications of this analysis for the protection of databases.[i]

The need for statutory protection of rights or some equivalent arises from what economists call difficulty of exclusion from the use of printed material, software, databases, and other similar products whose initial cost of production is quite high but for which the cost of replication is very small. Ability to exclude means that the producer of such an item can prevent a potential user from employing it unless that person is willing to provide payment for the item. Difficulty of exclusion means that people can use or copy the database without payment and with little or no fear of untoward consequences. Such goods and services, particularly when they are expensive to create, normally will find no private suppliers. It should be obvious that organizations will be discouraged from investing in new products if they will be immediately available to anyone for the taking. To prevent this is, of course, the purpose of IPRs. From the economic perspective, IPRs are intended to protect the investment of entities that put resources into valuable new products, not only as a means to protect the interests of those entities, but perhaps even more

important from the social viewpoint, to encourage the production of valuable items from whose use it would be difficult to exclude anyone without such protection.

However, there is another side to the matter that plays an important role later in the analysis. These same products that seem to require IPR protection are also, generally, items which, in the view of economists, should be offered with maximum encouragement of widespread use. That is, the creation and updating of databases generally involve a heavy (sunk) cost of development to which little or nothing is added when there is an increase in number of users. This is in sharp contrast to other products such as food or clothing in which additional usage requires substantial additional use of resources–additional users are not free. Thus, economists argue, while goods such as shirts or potatoes should have a price that is close to the average cost as this reflects the cost of the resources needed to serve the additional users, there is something undesirable about a commensurately high price for the use of a database since that price will discourage widespread use even though such added use costs society little or nothing over and above the sunk cost of development.

(a) Specific Economic Issues

From the discussion above, one might conclude that there is the traditional tradeoff, often found in economics. In this case it might first appear that stronger rights for the producers of databases make the producers better off and the users worse off while weaker rights have the opposite effects. But this is not necessarily true. This simple tradeoff approach ignores the incentive effect from instituting or improving the rights. It is likely that well-defined database rights will lead to an increased flow of new databases, which has the potential of increasing the welfare of current and future database users, as well as improving the financial situation of the producers. This incentive effect provides both a rationale for developing the rights in databases and a cautionary note when considering any limitations on those rights.

I now turn to specific economic aspects of compulsory licensing, the possibility of restrictions upon pricing, and the notion of exemptions from the terms of the protection of databases. All of these possibilities share one common feature: each of them constitutes some restriction upon the avenues by which the holder of the IPR can pursue profits. This means that, if the IPR is to serve as an incentive for investment in the production of material subject to IPR protection, any provision of the sort now under discussion must weaken this incentive as it prevents the database creator from obtaining the full benefits of producing and distributing his product. To achieve any given degree of stimulation of such investment, a price ceiling, a requirement of licensing or other such restrictions must be offset by a commensurate improvement in some other inducement, e.g., it may call for a countervailing increase in the length of the period of IPR protection. However, lengthening this period is not without its social cost. The decision therefore becomes a tradeoff in which the advantages expected to flow from the restrictions in the IPR holder's market power are balanced against the social cost of the lengthened protection period.

Compulsory licensing and restrictions upon the price charged for a license must constitute a gain to those who decide to acquire a license as well as to their customers. This will necessarily

be so since those who obtain a license do so voluntarily, and hence to them it must be worth its price. Without compulsory licensing they would be deprived of this gain.

But one must be careful not to jump into the conclusion that because compulsory licensing or similar policies provide gains to database resellers and users they are a net gain to the community. It is equally certain that compulsory licensing must constitute a net loss to the holder of the IPR, at least in his own view of the matter, for otherwise there would be no need to compel him to issue licenses. There is, in general, no easy way to judge whether the net result will be a social gain or a social loss. Particularly since the purpose of IPRs is to protect the interests of the initial investors in the new product, this all argues for the desirability of proceeding with caution before adopting measures that erode these gains.

There is another argument that suggests a similar view, the near universal evidence that increasing complexity of regulatory provisions tends to undermine the effectiveness of the regulatory process. When a complex body of special exceptions impedes that process, detailed provisos and intricate modifications, the workings of the process are all too often sidetracked into concentrating on administrative detail rather than substance.

This becomes even clearer when one considers the possibility of exceptions: should certain classes of users be exempted from IPR restrictions either because they are considered particularly meritorious or simply because they cannot afford the fees? There may be cases where the political realities or some other special considerations justify such exemptions. However, there are two important reasons such general exemptions are difficult to justify on economic grounds. First, every such exemption effectively shifts the burden to someone else. Generally, if the prices of the database are to remain compensatory, every exemption will require a rise in the prices paid by other users. It may be highly desirable that society provide subsidies, say, to certain classes of users in developing countries, but there seems to be no reason to require the burdens to be borne by other users of the same database. Economists are not opposed to all subsidies, but where they support them they prefer general subsidies that are provided openly and explicitly and financed by the community as a whole, rather than subsidies that are concealed and extracted from some fortuitously chosen group from whom it happens to be convenient to obtain the funds.

There is a second reason why economists generally do not favor broad exemptions of particular classes of user. A price for the use of some protected material always tends to discourage its use: the higher the price, the less use will generally be made of the product. Now a zero price to one group of users compensated by a higher price to other users will cause a lopsided change in demand patterns that generally causes a larger overall social loss than a balanced spread of the price increases. There are carefully developed principles in economic analysis that indicate how the social losses from such distortions, can be minimized. These principles are generally inconsistent with broad exemptions.

(b) Compromises Required in Practice

As has already been noted, even if an ideal IPR system for databases can be designed in theory, one can be sure that it will require considerable compromise to make it workable in practice. Two compromises suggest themselves immediately, though others will undoubtedly arise in practice.

First, the economic principles of optimal pricing call not only for payments to be borne by all classes of users, but also for payments to be required for every use. For example, if a charge is imposed upon searching for and extracting a record from a database, such a charge should, ideally, be required for every such act. Yet (aside from the issue of fair use) with current technology it is literally impossible to monitor every instance of use. Consequently, user charges for the use of the database can only be approximated at best. One may be able to impose a flat fee on annual use of a database management system (DBMS), or one can base a payment upon the number of recorded uses. However, these all involve three serious compromises:

– First, there is no way of knowing whether it is the individual who uses the records in the protected database who actually bears the cost. Such a crude payment process must bear as heavily upon the person who uses the DBMS for his own personal database, as upon the person who uses a protected database.

– Second, payment will generally not correspond closely to the amount of use of material that is protected.

– Finally, there is no way of allocating the payments among the producers of the protected databases in proportion to their use. One is driven instead to resort to some sort of pooling arrangement such as the one used to compensate composers of music. The television networks for example, make fixed annual payments for performances of recorded music to the composers' organization that then divides these proceeds among the composers on the basis of some rule of thumb. This is all a very crude approximation to the theoretical ideal of payment proportionate to use, but enforcement and administrative problems leave no choice except some such compromise arrangement. This type of accommodation may frequently have to characterize payments under rights systems in the future.

A second compromise that seems unavoidable is the exemption of very limited usage, for example the extraction of a single record from a database. The main argument for such an exemption from the viewpoint of the economist is not that such a limited use is "fair," but rather that potential gains from payment for such limited use are likely to be swamped by the administrative and policing costs.

The main issue raised by the necessity of compromises such as these is whether they should be written into the rules of IPRs with an attempt to fix the boundaries of permitted compromise, or whether it is preferable to permit time and usage to soften the working rules formulated without exceptions. But this is a choice that lies outside the economists' area of special competence. It is therefore appropriate to turn from this outline of the general issues, to a more careful examination of those directly amenable to economic analysis.

(c) Implications of Economics for Structuring Protection of Databases

The major premise that underlies the discussion in this section of the report is that the applicability of long-cherished principles of incremental cost pricing to the pricing of databases is severely hampered for two basic reasons.

1. In most cases, the cost structure in the database industry is generally such that with prices set at the incremental cost of providing an additional user with the use of a database, the production costs will not be covered.

2. Once a property right is granted to the producer of a database, he is vested with a certain degree of market power. It is well known that a monopolist has no incentive to set prices at incremental cost. The question then arises as to the kind of pricing policies that the database producer should be allowed to set.

It is useful to examine some of the fundamentals of economic pricing and then show how those fundamentals bear on the question of property rights in databases.

Scale Economies in Databases

The production and distribution of a database is somewhat analogous to publication in the print-based world.[ii] The development of a database has large initial costs relative to both the cost of making additional copies and to the cost of periodic updating of the database. In addition to the scale economies in the production of databases, there may also be substantial complementarities in production. (Production complementarities occur when it is less expensive to produce two products together rather than separately.) The interrelation between scale economies and production complementarities can be seen in the operations of the abstracting and indexing services. For example, abstracting and indexing services often produce printed and machine-readable abstracts and indices as part of the same operation. Many of the development costs and editorial costs are common to the printed and computer-based products.

(d) Setting Prices to Cover the Costs

It is well known that marginal cost pricing has desirable properties from a societal standpoint. This is the situation where the price paid by the incremental user equals the resources used to provide the database to that user. Thus, if price for a commodity is equal to its marginal cost, all those who are willing to pay the price are willing to pay for the resources that are used to provide them with the commodity in question. Ideally, then, we would like to have all the commodities priced in this manner. But this is not possible in the presence of economies of scale. The cost per user (the average cost) declines as the number of users increases because of the low (marginal) cost of providing an additional copy of the database to another user (or serving the user online). The result is that the revenues from marginal-cost pricing are less than the level needed for the database producer to cover its costs and stay in business.

For a single-product firm, or for a multi-product firm in which all fixed costs can be rationally allocated among various products (i.e., when fixed costs are product specific), the simplistic prescription is to switch from marginal-cost pricing to average-cost pricing. By definition, a firm that charges a price equal to or exceeding the average cost can recover all its costs. Even setting aside the difficulties associated with the definition of the average cost, average cost pricing has little to recommend it. There are some general principles that should guide those responsible for setting prices. The rules to be developed apply to database producers that sell an identical product to various categories of users as well as to those that sell a variety of products. More importantly the same sets of rules apply:

– to a database producer that attempts to maximize the welfare of its consumers subject to the proviso that it earns an adequate rate of return;

– to a database producer that strives to maximize its profits.

The solution to this quandary, that marginal-cost pricing is economically "efficient" but not sustainable in the presence of economies of scale, is to employ what are known as "quasi-optimal" or "Ramsey" prices.[iii] Possibly the clearest statement of the Ramsey approach comes from the Baumol and Bradford (1970) pricing rule:

> For each product, the percentage deviation of quasi-optimal price from marginal cost must be inversely proportional to its price elasticity of demand.[iv]

In order to simplify our exposition of this basic rule, consider the very simple case of an entity that sells one commodity. That commodity, however, is bought by two distinct classes of users. For example, a database is sold both to profit-making firms as well as to nonprofit research institutes or it is sold to users in developed countries and those in countries whose economies are still developing. What distinguishes those two groups is, however, not their financial goal or the income level of their country but the responsiveness of their demands to changes in the price for the database. (In economics the measure of responsiveness of demand to price changes is known as the elasticity of demand.) A remarkable result in economic analysis is that the following "properties" hold for the optimal prices, regardless of whether one is seeking to maximize societal benefits or maximize the profits of the database producer:

– the database should have a (non-zero) price in each market

– both prices should be greater than the marginal cost of providing the database to the user

– the price should be lower in the market with the higher elasticity of demand.

(e) The Implications of Optimal Pricing for the Protection of Databases

There are important lessons to be learned from the theory of optimal pricing for the proper structuring of IPR laws for databases. First, remember the basic assumption, supported by some empirical evidence, is that in the production and distribution of databases, marginal cost pricing is not feasible because of a significant fixed cost component in the total cost. This fixed cost will have to be recovered from the users/buyers of the database.

The purpose of IPR protection is to secure a return to the developers of databases sufficient to induce them to provide those products to the market. Consequently, the content and scope of the protection should be such as to secure the necessary return while maximizing the efficient allocation of resources. From the standpoint of society that misallocation will be minimized if the prices to all users follow the inverse elasticity rule described above. This implies, in particular, that the scope of the protection should be quite wide because without such protection it will not be possible to charge the prices that are desirable under the inverse elasticity rule. Specifically it should enable the holder of the IPR to collect payment for the use of his product. The principle, therefore, is: *Unless there are strong reasons to the contrary, the recovery of the fixed cost component of the total costs should be spread over as wide a set of customers and users as feasible.* (The contrary reasons include the costs of collection, presence of externalities, and income distribution considerations.) This prescription is consistent with the theory of optimal pricing.

An increase in the elasticity of demand (the responsiveness to price changes) reduces the profit maximizing percentage mark-up of a price above incremental cost. Consequently such policy may have the desired effect of lowering the price in that sector of the market in which it is important from a social standpoint that the loss in consumer's surplus be minimized. Unfortunately, if taken too far, the policy prescription just stated may suffer from what is perhaps a fatal difficulty: it is possible that the flow of new products will be adversely affected by the reduction in prices to certain users or by similar policies.

This analysis provides a guarded argument against various exemptions that have been contemplated in the design of database protection law. Those exemptions simply exclude various groups from contributing their share of the total cost of producing and disseminating the product. The proponents of such exemptions must implicitly assume that there are unexplored profit margins in the other segments of the market for databases in which the producers can make-up their lost revenue, and that there is a clear case for this sort of cross subsidy by one type of consumer to another. This logic leads to the following principle: *Exempting some users from payment or arbitrarily restricting the charges that can be assessed against them leads to increased costs and charges to the less-favored users.*

As I discussed above, similar remarks apply to the proposals for compulsory licensing. Under compulsory licensing, the prices charged in all markets may well turn out to be uniform. Such pricing is not necessarily desirable either from the standpoint of profits or social welfare measured by the size of consumer's surplus generated in the database industry. This follows from economic finding that in the presence of scale economies some form of price discrimination is generally preferable to uniform prices. The effect of compulsory licensing serves to reduce profits but the undesirable long-run effect of such licensing may be a reduction in the flow of new

databases to the market place. Therefore: *Compulsory licensing and other artificial restrictions on prices reduce the profits of those products that reach the market. However, the uniform prices that result may not be socially desirable. Furthermore, the total effect of such restraints may be undesirable if it impairs the flow of innovations and new databases.*

Given all of the above, the economically justified conclusion is that the protection afforded to the producers and disseminators of databases should not include unreasonable restrictions on the admissible pricing schemes. If the pricing practices employed by the producers are found undesirable, there are several possibilities. Domestically, they could be attacked directly, using the existing antitrust laws. In addition, if it is found that legal prices charged by the producers are undesirable for reasons of income distribution or externalities that are generated by some users of databases, then those problems should be also addressed directly, through subsidies, for example, for some classes of users or producers. Internationally, specific users or groups of users could negotiate reduced-price licensing agreements. For example, educational and research institutions regularly obtain licenses at a discount to databases for use by their constituencies. So long as the negotiated price for these special licenses are greater than the *marginal* cost, they can be in the interest of all parties.

III. DEVELOPING COUNTRIES AS PRODUCERS AND USERS OF DATABASES: DATA & ANALYSIS

There are a variety of possible approaches to counting and classifying databases and the records that they contain. The *Gale Directory of Databases* lists 12,111 databases as existing in 2001.[v] Of these, 494 databases (approximately 4.1% of the total) were produced in Africa, Asia, Eastern Europe, and South America. (See Table 1.) This probably overstates the number of databases from developing countries as some number of databases from Japan, possibly as many as 100, are included in the count reported for Asia. Similarly, databases are counted as having only one country of origin, regardless of the number countries from which their records may have been obtained. Nevertheless, it is clear that databases are already being produced in the developing countries and are being distributed worldwide.

Table 1: Databases in the Gale Directory by Geographic Region (2001)

Region	%	Number
Africa	0.0	4
Asia/Asia Minor	3.4	413
Australia	1.7	211
Eastern Europe	0.5	56
North America	60.4	7,321
South America	0.2	21
Western Europe	33.7	4,085
Total	100.0	12,111

Source: Martha E. Williams, "The State of Databases Today: 2002" in *Gale Directory of Databases.*

A similar picture emerges if one looks at the languages in which the databases were produced. An overwhelming majority (68%) of the databases were produced in English. European languages accounted for most of the remainder. (These data are normalized so that each database is counted only once. For example, if a database's primary language is English, but it contains records in English, German, and French, it is counted as an English language database in this table. See Table 2.)

Table 2: Databases in the Gale Directory by Language (2001)

Language	%	Number
English	68.2	8,261
German	5.3	636
French	4.7	573
Finnish	3.2	385
Swedish	2.8	338
Danish	2.8	334
Spanish	2.2	264
Norwegian	2.0	247
Korean	1.6	191
Italian	0.8	101
Other	6.4	781
Total	100.0	12,111

Source: Martha E. Williams, "The State of Databases Today: 2002" in *Gale Directory of Databases.*
Note: Percentages calculated from reported numbers.

Over the past 25 years the production of databases has become increasingly commercial in nature. Williams classifies the producers ("database publishers") as government, commercial, not-for-profit, and mixed. Although the *numbers* in each category have increased over time, there is a marked shift in *percentage shares* to commercial producers. (See Table 3.) Regardless of the type of database producer, it is important to realize that much of the content of the databases is originally generated by governmental activity and remains available from the governmental agencies that produce the data. (The issues arising from "capture" of this sort are discussed in Chapter 5.) The publishers–whether commercial, not-for-profit, or mixed–operate by adding value such as classification and indexing, user interfaces, delivery systems, and formats and then reselling the data as a commercial database product.

Table 3: Database by Producer Status-1977 and 2001 (in percent)

Producer Status	1977	2001
Government	56	8
Commercial	22	82
Not-for-Profit *	22	8
Mixed °	n/a	2
Total	100	100

Source: Martha E. Williams, "The State of Databases Today: 2002" in *Gale Directory of Databases.*
Notes: *Includes academic.
°Includes international organizations such as the United Nations

There are a number of problems that arise when one attempts to make use of these data. The first was hinted at above: the data presented here focus on the database producers (the "publishers") and not on the providers of the content. The fact that a database producer is located in one specific country (or region) does not imply that all the data come from that country (or region). Certain data elements ("content") may have been obtained from other countries, either for a fee or–for publicly available content in the public domain–without payment.

The second problem is that these data ignore, or at least vastly understate, non-commercial database production, including the collection and compilation of various data sets by the government. This is explicitly acknowledged by Williams:

> The U.S. government produces many more databases than those represented in the GDD [Gale Directory of Databases]. Government programs generate satellite data, and research data of many types; while government data is theoretically available to the public much of it is not announced or listed as available through vehicles such as news releases, news letters, journal articles, websites, etc. and so does not become included in directories.[vi]

A related issue is that directories focus on publicly available databases. Although, at first glance, these might seem to be the major beneficiaries of strong database protection, it should be realized that protection laws would also affect the development of other databases. Let us use the example of the national genetic database in Iceland, which I shall discuss further in Chapter V. This database, based on the collection and analysis of genetic material from a island nation of just over a quarter of a million people, already has at least one licensee, but would not be considered as a public database product.

The final problem is related to the second and is caused by the growth and the influence of the Internet. The growth of databases and more informal sets of data on the Internet has overwhelmed the compilers of directories. These databases may be hidden behind web-based interfaces or constructed on demand. While it is true that both the availability and the use of the

Internet and the content published online are heavily weighted toward the developed countries, the Internet has probably moderated the movement toward fee-based databases. Governmental agencies and a wide variety of not-for-profit organizations and non-governmental organizations (NGOs) provide free access to data on their websites. Furthermore, many database providers provide access to some or all of their products via advertiser-supported web pages.

IV. THE PROBLEM OF "COMPETING" PROTECTION REGIMES

This chapter casts several of the questions concerning the appropriate form(s) of protection for databases in terms of an international trade problem. There are many bilateral and multilateral agreements whereby countries have extended protection to intellectual property created by citizens of other nations. IPRs issues became increasingly intertwined with trade issues during the Uruguay Round of multilateral trade negotiations in the 1986-1994 period. This culminated in the establishment of the WTO and the TRIPS Agreement which defines the subject matter to be protected, establishes basic measures to insure legal remedies are available, and makes disputes subject to the WTO dispute settlement process.[vii] Although TRIPS covers patents, trademarks, copyright, trade secrecy, and specific areas such as new biological entities (plant varieties) and semiconductor masks (integrated circuit designs), it provides that copyright protection only extends to databases that are creative in their selection or arrangement. These are not the non-original databases that are the focus of this study.

In the copyright area, the three major multilateral agreements are the Berne Convention, the Universal Copyright Convention (UCC), and the WIPO Copyright Treaty.[viii] The Berne Convention has been in force since 1886 and was most recently revised in 1971; the UCC was negotiated in 1952 and was revised, parallel to the Berne revision, in 1971. The fundamental provisions of the two conventions convey the same protections to works created by nationals of member states as exist for works created by citizens of the home country.[ix] Article 5 of the WIPO Copyright Treaty, adopted in 1996, provides for protection of original compilations of data.

There are marked differences across countries in the establishment and enforcement of property rights in non-original databases. Pursuant to European Council Directive 96/9/EC the member states of the European Union have enacted *sui generis* statutory protection for electronic databases. Although the United States Supreme Court, in its 1991 decision in the *Feist* case,[x] denied the applicability of copyright law to databases, legislation has been introduced in the U.S. Congress to establish database protection via a misappropriation model.[xi] Laws in other countries such as Brazil and India have different philosophical or legal bases.

It is not the purpose of this chapter to evaluate claims that one approach or another is better or that one international agreement has provisions superior to those of another. Instead, I shall focus on how one nation's choice of mechanisms for protection, either similar to or different from those of its potential trading partners, affects the welfare of that nation and of the rest of the world.[xii]

(a) The Economics of Consistency and Cooperative Action

There are three approaches relevant to the question of whether one might gain from establishing barriers to the use of foreign works and from establishing consistent mechanisms for property rights:

– the economics of international trade and customs unions

– the theory of clubs, and

– the economics of compatibility.

Valuable insights can be drawn from each of these approaches. For example, in the international trade literature, economists have analyzed whether tariffs or other trade barriers are economically justified. They have computed the gains and costs of bilateral and multilateral reductions in any barriers that might exist.[xiii] The principal findings of interest to the IPRs issue are (1) that protection can be economically justified if there are distortions in the domestic economy (such as economies of scale in the production of the goods being protected) and (2) that, while jointly reducing tariff barriers with one or more trading partners makes the members of the union better off, an even greater increase in welfare can be brought about by alternative actions.

The theory of clubs focuses on gains from joint ownership and consumption. It includes as a variable the degree to which ownership and consumption rights might be extended over differing numbers of individuals.[xiv] There is an optimal sharing group with more than one, but less than an infinite number of members. Within this framework, one can both model the decision of whether to join the club or undertake consumption alone and compute the efficiency gains from group action.

In the technical compatibility literature the user prefers to consume or sample from a "portfolio" of products or services. Braunstein and White have constructed positive models of the likely behavior of unregulated decision-makers when confronted with the choice between producing a product that is either compatible or non-compatible with others in the marketplace.[xv] The social gains from compatibility are due to the avoidance of costly translation devices or the creation of duplicate stocks in a variety of languages or formats. (This can be contrasted to the Chamberlinian social welfare gain from the reduction of the number of varieties in the market. In Chamberlin's case, there are lower unit costs from scale economies, but the savings are independent of whether the consumers prefer a portfolio or are specialty buyers.[xvi])

(b) Economic Models

The models I develop in this section are primarily based on those in the theory of international trade, although they also draw on the theory of clubs and compatibility literature. An important assumption of each model is that imported works are not available unless there exists some mechanism for the enforcement of property rights. In other words, the possibility of one nation unilaterally declaring works produced by foreign creators to be in the public domain is assumed not to exist.

The rights mechanism as a barrier to trade

First assume that a particular country (A) wishes to guarantee property rights to domestic creators of databases. The issue is the extent to which the related laws and institutions in A will require creators (rights holders) in other countries to incur costs if they both wish to protect the rights to works that they have created elsewhere and wish to sell in A. Whether it is in A's interest to design its property rights mechanism (laws and institutions) to impose barriers on foreign creators will depend on the existence and nature of distortions in economy A. Economists approach these questions with models similar to those developed by Meade to determine the optimal tariff in the presence of such distortions:[xvii]

In these models the "optimal barrier" maximizes either the welfare of country A or the welfare of all the trading partners, both in the presence of the distortion. For example, "world" economic welfare is maximized when the economic cost of the rights mechanism (in percentage terms) is equal to the rate of distortion in the domestic market adjusted by a factor that is based on domestic elasticities of supply and demand.[xviii]

This result can be applied to the following scenarios:

– Consider identical databases (X and Y) that can be produced in A and abroad. An optimal rights mechanism would impose costs on the imported databases that, on a percentage basis, were somewhat less than the relevant distortion in the domestic database industry. There are two caveats that are important in the interpretation of this result. First, the barrier must be one that adds costs to each unit of the imported good sold. If the barrier merely raises a one time fixed cost to sell any of the product, it is simply a deadweight loss to society. Second, this would be a "second-best" optimum employed because of the assumption that one cannot correct the distortion in the domestic economy. From the point of view of maximizing economic welfare, it is generally more efficient to correct this distortion by direct means such as subsidy.[xix] (Of course, domestic subsidies can have adverse foreign trade and political repercussions, but that is beyond the scope of this paper.)

– If domestic databases (X) and databases produced abroad (Y) are less-than-perfect substitutes, again the second-best optimum occurs when there is a barrier. In percentage terms, the barrier should be less than the magnitude of the domestic distortion in X; the greater the degree of substitutability between X and Y, the higher the optimum barrier.

– Now let A produce hardware (X) domestically and import databases (Y) that run on that hardware. Since X and Y are complements, the cross-elasticity of demand between the two becomes negative. This leads to the optimal value of the "barrier" being negative. In other words, country A should not only reduce the costs of foreigners protecting their databases but should encourage imports by means such as subsidies.

It is worth noting at this point that the economist's concern with maximizing economic welfare may not be shared by policy makers. The results in each of the three scenarios above will change if there are other objectives. For example, if the objective is to attain a given level of domestic production of the importable good, either a trade barrier, a production subsidy, or a combination of the two can be the efficient mechanism depending on whether there are changes

in the terms of trade.[xx] Similar results obtain when the objective is a specific reduction in the volume of imports.[xxi]

(c) Advantages of an international agreement

When a nation extends property rights to foreign creators (rights holders) of databases, it can utilize one or more of the following options: unilateral action, bilateral agreements with other nations, and multilateral agreements with groups of nations. As noted above, there is widespread reliance on multilateral agreements (conventions) for IPR in specific areas including copyright and patent.

The following model draws on the analyses of customs unions in the trade literature:[xxii]

> Country A trades with countries B and C. There are barriers to trade in databases due to the expense a national of one country must incur to secure property rights in the other countries. (B and C can be groups of countries.) A and B agree to a mutual reduction in barriers to works by each other's nationals, but this reduction is to be discriminatory, i.e., it does not extend to the works of C's nationals.

At first the agreement seems to make economic sense so long as the costs of entering and enforcing the agreement are less than the gains resulting from the lowered barriers. The cooperative action of A and B will tend to divert trade such that imports from C will be, at least partially, replaced by imports from the other member(s) of the cooperative arrangement even if the costs of production are less in C. Secondary effects may include price reductions in the exports from C and increases in bargaining power A and B each have when negotiating future reductions in the barriers that exist in trade with C.[xxiii]

But again, the action is not first-best. In fact, A and B can obtain greater increases in their economic welfare by reducing the barriers to imports in a non-discriminatory manner than they can by granting mutual preferences to each other.[xxiv] If the amount of the non-preferential reduction in barriers is designed to result in the same levels of consumption and domestic production as would result from the mutual, restrictive action, there would not be the possible diversion of imports from low-cost producers to higher-cost members of the cooperative arrangement.

(d) Optimal number of members in an international agreement

Buchanan's theory of clubs, stating that there is a finite optimal size of a club, depends on his assumptions of decreasing per-member costs with increases in the membership of the club and a concave benefit function that first increases with the size of the club and eventually decreases.[xxv] The first assumption is certainly valid in the case of a cooperative agreement reducing barriers to the exercise of rights in databases because of the relatively low marginal cost of providing additional copies of the works. But the second assumption does not hold. This can be seen by applying the logic in the case above: additional benefits accrue to each importing country from any, even non-mutual, reduction in barriers that raise the costs of obtaining works

produced elsewhere. Even if the benefits to an existing member do not increase as new members join the agreement because of, say, a lack of demand for the foreign works, the benefits do not decline. Since costs will decline as the fixed component is spread over larger numbers, the optimal size is infinite.

(e) Which cooperative agreement to join?

If nation A has the option of joining one or more cooperative agreements that mutually reduce barriers to the exercise of IPRs, it is in A's interest to join as many such agreements as makes sense when each agreement is evaluated on an individual basis. (It should be noted that many countries are members of both the Berne and UCC.) This is true regardless of the differences, say, in the legal underpinning between the EU database protection law and the legislation introduced into the U.S. Congress.

But what if the agreements are mutually exclusive? For instance, this could arise if one agreement was patterned after patent law and required disclosure and another was based on trade secrecy and forbade disclosure. This model combines the approaches of the technical compatibility and customs union literature.

> Assume countries A, B, and C produce 50%, 30%, and 20%, respectively, of the world's databases and that there are high barriers to trade in any direction. Country A wishes to chose between a barrier-lowering agreement with either B or C, but there are mutually-exclusive mechanisms for the provision of property rights in those countries. What is the desirable course of action?

If there is specialization such that the only demand in A is for the works of just one of B or C, then A should seek a cooperative agreement on a low-barrier, possibly common, property rights mechanism with that one country regardless of whether that country produces more databases than the other country. But if the demand in A is for a "portfolio" of databases originating from other countries (say, roughly in proportion to their output), A should seek an agreement with whichever partner for whom the product of the volume of trade times the per-unit savings from the lowered barrier is greater. As the coalition adopting a common mechanism grows, it will put increasing pressure on other countries to join the dominant coalition.[xxvi]

(f) Concluding Comments

I have shown that economic models based on the international trade, theory of clubs, and technical compatibility literature can provide insights into the rationales for using property rights laws and agreements to create or reduce barriers to the use of works produced by foreigners. The principal findings are that the optimal size of these barriers depends on (1) the degree of substitutability between domestic and foreign works, (2) the degree of complementarity between intellectual works and other goods (such as computer hardware), and (3) the magnitude of any distortions in relevant parts of the domestic economy. International agreements to mutually reduce barriers to the use of foreign works can improve the welfare of the agreeing nations.

However, broader action of this sort, even if unilateral, can result in an even greater increase in welfare.

I have also shown that there is no finite limit to the optimal size (in terms of number of members) of an international cooperative agreement to reduce barriers through the adoption of common property rights mechanisms. The choice of which cooperative agreement(s) a nation should join depends on the pattern of demand for imported works in that nation, the volumes of works produced by the members of the agreements, and the size of the potential reduction in any barriers. The growth of a coalition adopting a common rights mechanism can, in itself, put pressure on additional nations to join that coalition.

V. SPECIAL AREAS OF CONCERN

This chapter examines the economic questions underlying specific issues related to the protection of databases. The first section addresses concerns about whether there are certain aspects of databases with scientific and technical information or with cultural content that make them qualitatively different from other databases. I then turn to the appropriate policy responses to situations where a database is the sole source of certain information and where a private entity "captures" public information. The final section addresses issues specific to the routing tables used in the Internet.

(a) Databases with Scientific and Technical Information or Cultural Content

At times arguments have been presented that certain types of information need to be widely disseminated and, as a result, property rights for that information should be prohibited. One classic example is the prohibition against copyright protection for works of the government of the United States of America (USA).[xxvii] On the other hand, there have also been arguments that certain information is the cultural patrimony of a nation and should not be treated as an economic commodity nor made available for commercial exploitation. Variations of this argument are that the information should not be used by any commercial or for-profit entity, that it should not be used outside of the country or region from which it came, or that it should remain under the control of certain specific groups. Each of these arguments has been applied, in one context or another, to databases.

To a large degree these questions are not about economics. But they do have an economic dimension. In many cases, one can view them as applications of the extremes in pricing: prohibiting protection is the analog of setting the price at zero, while blocking distribution is the analog of having an infinite price. Intriguingly, however, both policies have the same effect on the revenues of the database producers–the revenues will be zero. In one case this is from no price; in the other it is from no sales or license fees. The long-run result of no revenues, as we have discussed in Chapter II is little or no incentive for the production of the affected databases.[xxviii] (I shall refrain from commenting on my beliefs about whether this is desirable in any specific case.)

Two areas in which these arguments have been applied are scientific and technical information (STI) and cultural content. In both areas there is a mix of underlying motivations. Some people and organizations create intellectual property for motives that are either not profit oriented or are, at most, only indirectly related to the possibility of financial reward. Others are motivated by the prospects of financial gain. It is sometimes argued that there is no need for IPR to motivate those in the first group. While this may be true, it does not mean that it is in society's interest to prohibit the exercise of IPR. The incentive effects that I discussed at length in Chapter II will lead to the creation of additional STI and cultural content by members in the profit-seeking second group, while not causing less to be produced by the first group. Furthermore, even under a strict IPR regime, those in the first group are not prohibited from placing their output into the public domain.

There is another version of this argument that is sometimes raised in discussions about the establishment of database rights. This case first claims that there are few, if any, prospects for the development of databases with STI or cultural content in developing countries, or in small countries. As a result, the only beneficiaries of rights protection will be the database producers in the developed countries that have large, rich markets. There are several counter-arguments to these claims. First, the data presented in Chapter III indicate that there are public databases already available from many small countries and from developing countries in the regions of Africa, Asia, Eastern Europe, and South America. For example, it is interesting to note that almost 200 databases are produced in the Korean language.

A related argument is that cultural patrimony and indigenous scientific knowledge are or should be the collective property of a specific culture, group, or nation, akin to communal grazing lands. Proponents of this position then argue that it is, therefore, reasonable that members of the community use the material freely while non-members, such as those in developed countries, pay for use. Intriguingly, this approach can be easily seen as consistent with the lessons of optimal pricing covered in Chapter II. To the extent that cultural patrimony and scientific knowledge are organized in databases of the sort under discussion, the establishment of rights in the databases can accommodate a dual market/dual price approach. This is directly analogous to having a compulsory or blanket license at a low or zero price in the home market. The only significant problem is that due to the reduction in incentives that I described in the discussion of compulsory licensing in Chapter II.

Property rights can also help many researchers and other database developers to keep control over their work. Database rights are not only justified by market potential, if any, but also by their ability to protect the database creators from misappropriation of their work. National treatment and reciprocity provisions can enable the developer of a database in one country protect his rights in other countries.

To make this argument more concrete, I shall describe a few databases from developing countries with either STI or cultural content. In each case I shall focus on the database, illustrating that there is intellectual property to be protected that is separate from the content of the "records" in the database.

(i) The Palace Museum, Beijing

The website of the Palace Museum in Beijing (URL: *http://www.dpm.org.cn/index.html*) provides a guide to the halls of the Imperial Palace and to special exhibitions. For example, the "Painting Gallery" has 21 paintings from the Yuan and Ming dynasties. It states:

Moving with the times, the Palace Museum's internal administration has been significantly reorganized since 1997. Where previously there were three departments covering conservation, exhibition and research, these have now been split up into the department of antiquities; the department of paintings and calligraphy; the palace department; and the exhibition, promotion and education department. With substantial investment, the latest technology was deployed by the newly established resources and information center to set up the Palace Museum website. The website you are now browsing enables all, even those in distant lands, to enjoy a sightseeing tour of this mysterious palace and feast their eyes on its splendid treasures. The creation of a technologically state-of-the-art virtual Imperial Palace is no longer just a dream.

If it so chose, the museum could protect the organization of the materials and the databases underlying website.

(ii) African Alphabets

Saki Mafundikwa is the director of the Zimbabwe Institute of Vigital Arts (ZIVA). He is writing a book on the history of writing in Africa, which could presumably be protected by traditional copyright law when published. As part of the research for the book, he has developed databases of symbols, scripts, and signs used in a number of African languages. (URL: *http://www.ziva.org.zw/afrikan.htm*). His databases of alphabets and syllabaries required significant work and organization. It seems unreasonable to deny him the ability to protect this work if he wishes to have it.

(iii) Council for the Development of Social Science Research in Africa

The Council for the Development of Social Science Research in Africa (CODESRIA) produces several databases. These include:

– The Roster of African Social Scientists

– The Index of African Social Science Periodical Articles

– The Directories of Research Projects and Training Institutes in Africa

Currently, the printed versions of these publications are available directly from CODESRIA in Senegal and from their distributors in France and the U.K. CODESRIA has a website (URL: *http://www.sas.upenn.edu/African_Studies/codesria/codes_Menu.html*) hosted at the University of Pennsylvania. If CODESRIA had suitable database protection available, it might choose to make its databases available online or in other electronic formats.

(iv) Genetic Information in Iceland

The national database of genetic information was mentioned in Chapter III. The firm of deCODE Genetics is reported to have a 12-year agreement for the exclusive marketing rights to the database. If they relied solely on trade secrecy protection, the publication of parts of the database could result in the loss of their property rights. On the other hand, the EU *sui generis* approach allows for publication of records and sets of records without such a loss of rights.

This is an interesting example of a case where the discussion of the desirability of database protection has become intertwined with other political and social issues. The creation and marketing of this database is controversial, with questions being raised about issues such as the "commodification" of genetic information, the freedom of scientific inquiry, and privacy. The first two issues are variants of the questions raised above about the prohibition of protection and the blocking of distribution, but they are sometimes cast in moral terms, which I shall not discuss, and sometimes linked with concerns over monopoly power, which will be addressed explicitly in the sections on sole-source and capture below. Although one can make the argument that there are economic dimensions to privacy,[xxix] that is beyond the scope of this paper.

(b) Sole-Source

I now turn to the question of which policy instruments, if any, should be used to address the problems associated with unique databases provided by a single source. It is important to distinguish between databases for which there is no substitute of any sort and those that have no *close* substitute. The two defining characteristics are the closeness of the substitute, which can be measured in economic terms by the additional costs one might have to bear to use the substitute rather than the "original," and the importance of encouraging widespread distribution and use. It is also important to remember that the IPR protection under discussion is for the database, whereas the content may or may not be subject to copyright or other protection.

Similarly, one might also chose to distinguish between databases that, for some physical or legal reason, cannot be reproduced and those that are economically impractical to reproduce. Databases in the former group might include geophysical data from a single monitoring station or the medical procedure codes required by government health agencies. Databases of this sort might be viewed as being comparable to the "essential facilities" of antitrust law. But it is important to remember the distinction between the two groups and not draw the boundary for the essential databases too widely.

Assuming both the absence of reasonable substitutes and the importance of encouraging use, there are two policy options consistent with keeping the incentives for production inherent in the definition of IPRs: compulsory licensing provisions or similar restrictions, on one hand, and the use of anti-monopoly laws, on the other. The strengths and weakness of compulsory licensing *via* statute have been discussed in Chapter II. For the purposes of this discussion, the problem is not so much the loss of the incentive effect but, rather, the difficulty in making a statute that is narrowly targeted to affect only databases that are truly subject to the sole-source phenomenon and, therefore, have no substitutes.

The second approach is to rely on the use of anti-monopoly laws. A country can institute the protection of database rights and make such rights subordinate to the applicable laws that restrict the exercise of monopoly power. This would be most appropriate in the case of irreproducible databases. This approach, of course, relies on a working system to restrict monopolies. This option will not be available where such a system is not in place. But, the use of anti-monopoly laws, in those countries where such an approach is viable, has the major advantage of reducing the danger that negative economic effects from compulsory licensing will arise from its unintended application.

(c) Capture

The issue of the possible "capture" of public-domain data by adding value and including these data in a commercial database is related to the sole-source issue in that the existence of reasonable substitutes is a key factor. On one hand, if the underlying data continue to remain available and are a reasonable, albeit imperfect, substitute for the commercial database, capture is of little concern in practice. On the other hand, it is the uniqueness–whether in terms of organization or ease of use–provided by the database that gives value to its users, and this perceived value is, in turn, the incentive for the creation of the database.

Because the capture problem is one of degree, as with the sole-source problem, there is no single solution that is guaranteed to simultaneously provide a remedy and have no detrimental effect on the desirable incentive outcomes. The best approaches seem to be measures that insure the continued availability of the content from the original sources and requirements that database producers who incorporate substantial amounts of public-domain content provide a reasonable notice of the source to potential users.

(d) Exclusive Agreements for the Commercial Distribution of Public Data

Government agencies and commercial database producers have, at times, entered into agreements that grant the commercial entity the exclusive rights to produce a database containing certain sets of public data. This can be for either a printed or digital version of a database. One can view these arrangements as combining features of both the sole-source and capture situations described above. The argument is sometimes made that these agreements are necessary and in the public interest because:

– the government is not capable of, or–for philosophical reasons–should not be in the business of marketing products with commercial possibilities, and

– exclusivity is required to guarantee a sufficient return to warrant the necessary investment by the private party.

The arguments against these sorts of arrangements are that the government is giving away its "crown jewels," that it is picking winners instead or relying on the market, and that this approach creates a *de facto* monopoly, resulting in unnecessarily high prices to users of the database. While some or all of these criticisms may be true in any particular case, it is important

to realize that they are *not* arguments against property rights in databases, *per se*. Rather, they are criticisms about the contractual terms employed in the exercise of those rights. The appropriate solution, therefore, is to develop contractual and licensing terms in each situation that are consistent with national policy objectives.

To a certain extent many of the problems raised in discussions of issues related to sole source, capture, and exclusivity situations revolve around the extent to which the underlying information is available to the public. Certain information may be formally available to the public to meet various legal obligations, but the question should be whether there is sufficient public access. The problem often predates the exclusivity agreement and should be dealt with directly rather than via limitations on database rights.

(e) Internet Routing Tables

One specific area that has been raised as presenting problems for database protection is related to the routing of data packets on the Internet. The Internet domain name system is based on a link between the easily readable, text-like name of a website and its unique numeric Internet protocol (IP) address. For example, my university department's website can be reached by either *www.sims.berkeley.edu* or 128.32.226.87. There appear to be several inter-related issues relating to the role of database protection regarding the domain name system; I shall address each in turn.

First, there is the concern that the organizations that assign the domain names will consider the mapping between the names and the IP addresses to be a proprietary database and, therefore, will make use of statutory protection to keep control over these lists and refrain from making them available except for a fee. It is difficult to imagine how this might actually occur, as those registering their domain names do so precisely so that Internet users can find their sites. If one or more domain name registrars refrained from making the mapping information public, users would seek out other registrars who meet their needs by freely distributing this information. If the worry is that the existing registrars would collude by only cross-licensing each other and thus effectively barring entry of competing registrars, the solution is to address that issue either directly or via the antitrust laws.

The second concern is that the operators of regional and backbone networks and/or the vendors of routing hardware will use database protection laws to control the distribution of routing tables they develop for their own use. These tables may be optimized for the specific architecture of the networks on which they are used or designed along with other firmware. This phenomenon is, in fact, something that should be encouraged. One way in which the producers of routing hardware or the operators of networks compete is by offering more efficient products and services. The existence of clear proprietary rights in the optimized databases that underlie these products and services can be a vital part of that competition. It is also possible that effective protection is already available via trade secrecy and that database protection laws will have no effect one way or the other. In any event, so long as the original, non-optimized data remain available, this should not be a public-policy concern.

Although I have not seen it raised, there is a final concern related to the first two that one could imagine. This is that in the future a merger between one of the domain name registrars and

either a backbone network operator or a routing equipment manufacturer might lead to an exclusionary arrangement that either keeps routing table information internal to the combined firms or raises the price to outsiders. Again, this seems difficult to imagine because of the competitive pressures described in the discussion of the first concern above. Nevertheless, some might fear this chain of events, citing the general reluctance of antitrust authorities to attack vertical mergers. But, if this situation were to arise, it seems likely that there would be strong calls for direct action on the tying and exclusive-dealing aspects of the arrangement, regardless of the general views on vertical mergers at the time.

VI. CONCLUSION

The economic analysis presented above followed an overall logic that can be summarized by the following key points:

1. A clear, adequate definition of property rights in databases enables markets for databases to develop and grow.

2. Strong protection of the IPRs in databases, without too many limitations or exemptions, will encourage the growth of local production of databases in developing countries, some of which already exists.

3. Recognition of parallel rights for foreign producers of databases enables trade that is in the interest of both parties.

4. The existence of differing approaches to the protection of databases across the developed countries is not likely to be a problem for the developing countries.

5. Policies designed to deal with special circumstances such as sole-source provision or the possibility of capture should be narrowly drawn.

6. It is important to recognize throughout the discussion of database rights that there is a distinction between the unoriginal databases that are the subject of this analysis, on one hand, and their content, on the other. The content in the database fields and records may be original works already subject to copyright protection or it may be work that is in the public domain.

Debates about the benefits of IPRs for developing and small countries are not new. According to Machlup and Penrose, the patent systems in the Netherlands and Switzerland were disbanded for long periods in the Nineteenth Century.[xxx] But, for the most part, the TRIPS Agreement has led to a near universal view that national laws and international agreements that protect and respect IPRs provide advantages to countries of all sizes and at widely differing stages of economic development. This study uses the tools of economic analysis to show that these conclusions also hold for the protection of database rights.

ENDNOTES

[i] Much of the material in this chapter is derived from Y. M. Braunstein, et al., "Economics of Property Rights as Applied to Computer Software and Data Bases," report to National Commission on New Technological Uses of Copyrighted Works (CONTU), 1977. (Available from NTIS.) An excerpt is reprinted in G. P. Bush & R. H. Dreyfuss, ed., *Technology & Copyright*, (Lomond, 1979).

[ii] For an empirical example, see L. B. Pulley & Y. M. Braunstein, "Scope and Scale Augmenting Technological Change," in M. Jussawalla & H. Ebenfield, eds., *Communications and Information Economics: New Perspectives* (New York: Elsevier, 1984).

[iii] F. Ramsey, "A Contribution to the Theory of Taxation," *Economic Journal*, 37:47-61 (1927).

[iv] W. J. Baumol & D. F. Bradford, "Optimal Departures from Marginal Cost Pricing," *American Economic Review*, 60:265-283 (1970).

[v] M. E. Williams, "The State of Databases Today: 2002" in *Gale Directory of Databases* (Detroit: Gale Group, 2001). Various years are available in print and through Dialog Information Services.

[vi] Williams, *op. cit.*, pp. xxviii.

[vii] C. A. Primo Braga, et al., "Intellectual Property Rights and Economic Development," World Bank Discussion Paper No. 412 (Washington, 2000).

[viii] The World Intellectual Property Organization (WIPO) is Secretariat to the Berne Convention for the Protection of Literary and Artistic Property, and UNESCO is Secretariat to the Universal Copyright Convention.

[ix] See, for example, Article II, Clause 1 of the UCC:
"Published works of nationals of any Contracting State and works first published in that State shall enjoy in each other Contracting State the same protection as that other State accords to works of its nationals first published in its own territory."

[x] *Feist Publications v. Rural Telephone Service Corp.*, 499 U.S. 340 (1991).

[xi] H.R. 354, "The Collections of Information Antipiracy Act." (106th Congress, 1st Session).

[xii] The material in this chapter is taken, in part, from Y. M. Braunstein, "Economics of Intellectual Property Rights in the International Arena," *Journal of the American Society for Information Science*, 40(1):12-16 (1989).

[xiii] For example, see J. Bhagwati, "The Pure Theory of International Trade: A Survey," *Economic Journal*, 74:1-84 (March 1964).

[xiv] J. M. Buchanan, "An Economic Theory of Clubs," *Economica*, :1-14 (February 1965).

[xv] Y. M. Braunstein and L. J. White, "Setting Technical Compatibility Standards," *Antitrust Bulletin*, 30:337-356 (Summer 1985).

[xvi] E. H. Chamberlin, *The Theory of Monopolistic Competition* (7th ed., 1956), pp. 68-100.

[xvii] J. E. Meade, *Trade and Welfare* (1955), Ch. 14.

[xviii] The equations showing this result are presented in Braunstein, *op. cit*.

[xix] For more on the theory of the second best, see R. G. Lipsey and K. Lancaster, "The General Theory of the Second Best," *Review of Economic Studies*, 24:11-32 (1956-57). It may be useful, at this point, to quote Haberler on the use of tariffs to protect "infant industries":
It should also be added that it is, *a priori*, probable that in many cases not a customs duty but an export bounty would be in order in as much as external economies may be realizable in the export rather than the import industries.... The fact that the infant industry argument is almost exclusively employed to recommend import restrictions and practically never to justify the opposite... shows clearly the bias of those who employ it.
(*A Survey of International Trade Theory*, Princeton, 1961, pp. 57.)

[xx] W. M. Corden, "Tariffs, Subsidies and the Terms of Trade," *Economica*, N.S., 24: (1957).

[xxi] H. G. Johnson, "Optimal Trade Intervention in the Presence of Domestic Distortions," in Baldwin, et. al., (eds.), *Trade, Growth, and the Balance of Payments* (1965).

[xxii] See, for example, J. Viner, *The Customs Union Issue* (1950), and R. G. Lipsey, "The Theory of Customs Unions: A General Survey," *Economic Journal*, 70: (September 1960).

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[xxiii] The conditions under which these results obtain are discussed in Meade, *Trade and Welfare*, Ch. 32.

[xxiv] C. A. Cooper and B. F. Massell, "A New Look at Customs Union Theory," *Economic Journal*, 75: (December 1965).

[xxv] Buchanan, *op. cit.*

[xxvi] Braunstein and White, *op. cit.*, pp. 345-347.

[xxvii] 17 U. S. Code, Section 105, states, "Copyright protection under this title is not available for any work of the United States Government."

[xxviii] This situation is qualitatively and economically different from one in which the database producer willing gives away a particular product, whether it is part of a promotional offering or a bundling strategy. These situations may arise, but do not affect the general argument that *forcing* revenues to zero reduce or eliminate incentives for database production.

[xxix] R. A. Posner, "The Economics of Privacy," *American Economic Review* 71 (2) (May 1981)

[xxx] F. Machlup and E. Penrose, "The Patent Controversy in the Nineteenth Century," *Journal of Economic History*, 10: 1-29 (1950).

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