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Intellectual Property Rights and Genetic Resources - an Economic Analysis

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Abstract
In an economic perspective, intellectual property rights cause positive incentives concerning the preservation of biodiversity. Furthermore, economists assume that upon an appropriate distribution the intellectual property rights „would produce largely North-to-South flows whereas the existing regime produces primarily North-to-North flows (and substantial South-to-North flows)“ (Swanson 1995a, p. 173). At any rate, in this discussion the questions of fundamental approval or rejection of intellectual property rights of biodiversity and the question of just distribution of these property rights should be very well separated.

Keywords: Intellectual property rights; Biodiversity; Genetic resources

1. Introduction
Intellectual property rights in connection with genetic resources are recently increasingly discussed under the aspect, of how far they can provide incentives for the preservation of biodiversity. This discussion takes place against the background of two international agreements, the TRIPS-agreement (Trade-Related Intellectual Property Rights) in the framework of the GATT (General Agreement on Tariffs and Trade) of January 1995, in which an international harmonisation of intellectual property rights (including the possibility of protection by patent for plants and animals in article 27 IIIb) was negotiated, as well as the Convention on Biological Diversity of Rio de Janeiro of 1992. This biodiversity convention provides in article 16 (“access to and transfer of technology”) the recognition of an „adequate and effective protection of intellectual property rights“ (paragraph 2). Such rights are explicitly to support the aims of the agreement, and not to oppose them (paragraph 5). However, exactly herein lies an up until now not entirely solved discrepancy between GATT and biodiversity convention, as is not least made obvious by the corresponding discussions at the conferences of the parties (most recently 1998 in Bratislava). This essay investigates the problems of the intellectual property rights on genetic resources from the point of view of economic theory. In chapter 2 general considerations on intellectual property rights from an economic point of view will first be made, in order to analyse in chapter 3 especially the question of the distribution of these rights. Chapter 4 discusses the question of the adequate form of intellectual property rights, chapter 5 sums up the essential results.

2. Intellectual Property Rights from an Economic Point of View – General Considerations
When economists concern themselves with property rights, they are always interested in the incentives generated by specific distributions of rights. One of the standard theorems in this context says, that whenever no or only insufficient property rights are defined for an economic usable resource, an incentive for excessive utilisation of this resource exists, since, simplified, everybody can help himself. A considerable part of the destruction or regardingly endangering of biodiversity can be traced back exactly to these open access problems. However, the definition and enforcement of property rights is not free, but in turn causes so-called transaction costs. (For example costs for surveillance or enclosure). The theory goes on

to say, that the more valuable a resource is, or, more precisely, the greater the difference between the utitlity of the resource and the costs for the enforcement of property rights is, the greater is the incentive to define property rights on this resource.

We can now precisely experience this statement of theory for the case of the biological resources, the "biodiversity": By developments in biotechnology the possibilities for the utilisation of this resource improve, for example in medicine or in the seeds sector; the utility increases. At the same time the improved possibilities for the identification of useful substances on the level of the DNA facilitate the definition of property rights, i.e. in the language of the economists, the costs for the enforcement of property rights decrease. Therefore, in accordance with the theory, incentives are generated for the side of the pharmaceutical or seeds industry, regardingly, to obtain property rights on biological resources.

The former practice was in principle, that interested firms from the "North" helped themselves to the genetic resources of the countries of the "South" without any kind of compensation, in order to finally, after having developed a product from the primary matter, protect it by patent. This was usually not without consequences for the developing countries themselves, if e.g. seeds, that native farmers traditionally used, were suddenly patented (Bhat 1999, p. 392). For a long time the idea, that biological diversity was the "common heritage of mankind" served as the justification of this practice. By now, a different distribution of rights has been agreed on at least formally (e.g. in the biodiversity convention), according to which the respective countries of origin obtain the property right on their genetic resources. By now, interested parties have to pay for the access to these resources, the most famous example would currently be the contract between the American pharmaceutical corporation Merck and the Institute for Biological Diversity in Costa Rica.

This contract (or similar agreements) in turn generates numerous questions, that I do not want to consider in greater detail here, however (see for this Lerch 1996, 1998). From an economic point of view it can simplified be said, that such agreements can probably have a positive effect with regard to the protection of species diversity. It consists of the fact, that the countries that now receive money for permitting foreign corporations the access to their genetic resources, also have an incentive to invest in the preservation of these resources, for example by the demarcation of nature reserves. Besides this allocation effect a positive distribution effect exists since payments flow from the industrialised North to the economic poor, but "genetically rich" South. If one considers, that the access to the biological resources was formerly unregulated and that for example Madagascar receives no share whatsoever of the revenues of the cancer medicines Vinchrsitin and Vinblastin, that originate from the Rosi Periwinkle (Catharanthus roseus), this is definitely a certain improvement. However, at the same time it must be warned against a too euphoric interpretation of such agreements: They alone can neither be expected to provide a sufficient financing of nature preservation measures in developing countries, nor a real solution for the connected distribution problems!

From the point of view of the pharmaceutical or seeds industry, i.e. in the concrete case from the point of view of Merck, the option to patent a possibly discovered effective substance or, regardingly, the drug developed therefrom remains of course important in this context, in order to get the conducted research and development investments back by the connected monopoly position. Therefore, in this regard, patents are an instrument to define property rights on biological diversity. Generally it can be said, that the incentive to pay for the access to genetic resources is the greater, the higher the exclusivity of the gained disposition rights is.

The question now is, how patents (or intellectual property rights in general) are to be evaluated in this context from a welfare economics perspective.

The discussion about the advantages and disadvantages, about benefits and costs of the patent system is as old as the patent law itself. From an economic point of view two incentives can fundamentally be differentiated, that are touched by the patent law: The incentive for innovation and the incentive for the diffusion of innovations by imitation. Patents provide an incentive for innovation and therefore for the allocation of scarce resources for research and development, as they complicate the alternative, the imitation. Thereby, from a welfare economics point of view, the danger of an over-investment in research and development basically exists, as in an extreme case an "all-or-nothing-competition" evolves, in which the winner (i.e. the one who receives the patent) wins all by his monopoly position, while the competitors receive no compensation for their research investments. On the other hand, a missing patent protection can lead to insufficient investment in research and development, since from the point of view of the individual company imitation becomes cheaper than own research efforts.

With regard to the diffusion a common criticism of the patent law states, that it tends to obstruct a (macro-economic wanted) fast diffusion of innovations. In practice, it is attempted to counter this effect, for example by increasing yearly fees, that lead to the actual terms often being under the maximum terms (usually 20 years). This criticism is besides opposed by the argument, that with a missing protection by patent and accordingly less incentives for innovation also less inventions would be made. Besides, the disclosure duty provided in patent law is assumed to even facilitate the diffusion, while otherwise a too strong incentive for secrecy would exist (Eger et al. 1990).

With regard to patenting in connection with biological resources the biotechnological progress generates some specific questions. One problem is, that the patenting is partially to take place on the level of genetic codes, for example of a plant or micro-organism. Here, two cases must be differentiated: On the one hand there were applications, according to which DNA-sequences were to be patented, that had been decoded as such, but whose function was not yet known. This case must be differentiated from the patenting of a genetic blueprint in connection with a specific function, such as the application of the firm Monsanto, to patent the genetic code of the Tiki-Uba plant in connection with its coagulation-inhibiting function.

The first case, that lead to fierce discussions, especially in the USA, hits the limits of the patent law from a legal point of view, as it usually explicitly makes a specific "use" the precondition for the patentability. In addition, the problem of the distinction between invention and discovery exists, which I will elaborate on soon. For now, it can be stated from an economic point of view, that patents already on the level of a genetic code without an established use would probably be problematic in as far as the generally efficiency-promoting competition in the search for possibilities of utilisation of the genetic information would tend to be obstructed by them. Therefore, incentives would be generated to redirect research resources from the (rather expensive) systematic search for certain "useful" genes to the (at the current state less expensive) decoding of numerous genetic codes without known uses.

The second case, i.e. the patenting of a genetic code in connection with a specific use seems less problematic in this respect. However, the problem remains in how far it resembles a patentable invention or whether it is only the – according to European patent law not patentable – discovery of something already existing. The already difficult delimitation

between invention and discovery seems to be a central problem in this context. However, the problem not only concerns biotechnology, but in principle also the chemical synthesising of natural active agents. However, according to the current legal interpretation, the patent exclusion only applies to discoveries “as such” and a discovery is considered a patentable discovery, if a commercial applicability can be proved. Therefore, the decoding of a genetic blueprint with a proven, e.g. medical, function could according to current law probably basically qualify as a patentable discovery.

Further discussions, especially in connection with genetic altered organisms, relate to the question of the patenting of animal species and plant species, that was at first precluded by a passage in the European Patent Agreement. Finally, in July 1998, an EU-guideline was decreed, according to which gene-technologically altered animals and plants are also patentable in Europe, if “the application of the invention is not technically limited to a specific kind of plant or race of animals”. “Isolated components of the human body” are also patentable according to it. The guideline was to be realised by the 1st September 1999. However, suits of the Netherlands and Italy at the European Court of Justice are still pending. Now as ever considerable (ethical) objections exist against such patents, among others organised in the initiative “No Patent on Life”.

3. Whose Intellectual Property Rights ?

Regardless of such fundamental ethical objections in the context of intellectual property rights on genetic resources the question arises, who is entitled to the respective rights. It must be asked e.g. in how far a discovery was actually made by the company, that makes the patent application, or whether it took recourse to already existing traditional knowledge, e.g. of indigenous communities. Should a seeds corporation be granted a patent for decoding the genetic code of a virus-resistant species, that is already traditionally cultivated by native farmers, or does the intellectual property lie with the local population in this case?

The enormous importance that traditional (indigenous) knowledge about biological diversity has with regard to the current discussion about the biotechnological utilisation of genetic resources becomes obvious, when the contribution of this knowledge for the research of species diversity is considered. Farnsworth (1990) points out, that three quarters of all drugs produced from plants, currently in use were identified by the chemical analysis of plants that were already used in the traditional plant medicine. Michael Balick, director of the “Institute of Economic Botany” of the New York Botanical Garden indicates the “ethnobotanic filter” of indigenous knowledge as the starting point in the search for new active agents. Only six percent out of 18 plant species collected at random and tested in Honduras showed an effect, while it were 25 percent out of 20 ethnobotanically collected species. Paul Cox of the Brigham Young University found out, that 86 percent of the plant species that are used in the traditional medicine of Samoa showed pharmacological effects (Laird 1993, pp. 119, see also Sheldon & Balick 1995).

According to Posey (1993, p. 71) the market value of drugs from plants, that were discovered by indigenous peoples amounts to 43 billion dollars annually. Neither was the effectiveness of the Rosi Periwinkle against cancer discovered by chance by Eli Lilly, but as a result of the systematic analysis of the medicinal herbs used by native “medicine men” (Vogel 1994, p. 42, Aylward 1995, p. 103). This enormous importance of traditional knowledge is hitherto, as illustrated by the example of Madagascar, contrasted by the lack of an according recognition of (intellectual) property rights. „The medicines from tropical forest species are common, and require no biotechnological modification, but the question of who benefits - the foreign

developer, the government, the local businessman or the people who depend on this dwindling habitat, and who probably gave away a lifetime's experience and wisdom for nothing by describing the medicinal use of each species - is still rife.“ (Swingland 1993, p. 122).

The biodiversity convention of Rio de Janeiro also acknowledges the importance of the indigenous communities or, regardingly, the indigenous knowledge for the preservation and sustainable utilisation of the biological diversity. It speaks of the recognition of both the immediate and traditional dependency of native communities on biological resources as well as the advantages of the application of traditional knowledge and customs in connection with the preservation of biological diversity (article 8).

An additional problem in this context is, that indigenous communities are often as endangered by extinction as the biological diversity - „Many of the cultures from which traditional knowledge is collected are more endangered than the ecosystems in which they reside“ (Laird 1993, p. 121). As a delimitation against the genetically coded functions (GCFs) of biological diversity, Vogel speaks of „Cultural Coded Functions“ (CCFs) in connection with traditional knowledge. Vogel states: „In many respects, CCFs are more threatened than are genetically coded functions.“ (Vogel 1994, p. 42). The transfer of corresponding land property rights could therefore not only contribute to the preservation of biological diversity but mainly to the survival of endangered tribal populations.

It is crucial to note that the question of the (just) distribution of intellectual property rights must be analytically kept separate from the question of whether such property rights on discoveries of natural active agents are being considered acceptable at all. Here, unfortunately, the arguments are sometimes mixed up in the discussion. If one fundamentally rejects such property rights, e.g. by the popular argument, that such natural active agents belong to the “common heritage of mankind”, then this means that neither can the indigenous communities assert an intellectual property right on their traditional knowledge in connection with the utilisation of medicinal herbs or seeds. The analysis shows, that a well-meant formula like “common heritage of mankind” alone remains an empty phrase, if it is not specified who may participate in this heritage to what extent. Therefore, the formula itself does not dispense from the difficult task to regulate the individual utilisation claims on the common resource. The negation of intellectual property rights on biological resources leads precisely to the dilemma, that in the absence of such rights everybody may make a grab. Therefore, many economists see specifically intellectual property rights as an opportunity for the countries of origin of biological diversity or, regardingly, indigenous communities within these countries to assert their rights on these resources and to participate in a possible commercial utilisation. In the words of Swanson a regime of intellectual property rights for biological diversity would – if accordingly organised – „produce largely North-to-South flows whereas the existing regime produces primarily North-to-North flows (and substantial South-to-North flows)“ (Swanson 1995a, p. 173).

It must be emphasised, however, that the possible positive allocation and distribution effects cannot be safely expected. A lot depends on the correct organisation of the intellectual property rights on the one hand and their embedding in extensive regulations for the protection of species diversity on the other hand. Bhat (1999) recapitulates after a model-theoretical analysis: „...increased patent protection and physical access either promotes the conservation of biodiversity or enhances its physical exploitation. Patent protection and resource access must, therefore, be developed carefully by biodiversity-rich countries to successfully balance their domestic conservation and socioeconomic goals“ (Bhat 1999:391).

4. Which Intellectual Property Rights?

Another important question is then, how far-reaching such intellectual property rights should be defined, if e.g. instead of the patent law a less exclusive form should be chosen, such as the plant breeders´ rights. Specifically in the agrarian sector good reasons can be found for this. The so-called „Farmers' Rights“ proclaimed by the commission on plant genetic resources of the Food and Agriculture Organisation (FAO) also stand in this context. These are defined as „the rights arising from the past, present and future contributions of farmers in conserving, improving and making available plant genetic resources, particulary those in the centres of origin/diversity“. This legal principle of the “Farmers’ Rights”, that should be set as an antipole against the commercial protection laws (plant breeders´ rights, patent law), has, however, not been concretised further. An international fund for plant genetic resources founded by the FAO, that is to support the institutionalisation of such “Farmers’ Rights” remained empty so far (Gotsch & Rieder 1995). Different opinions exist on whether the “Farmers’ Rights” should be interpreted as immediate legal claims of individual farmers or as a general claim for compensation.

A central argument of the critics of existing forms of intellectual property rights is, that it is hardly possible for developing countries, let alone indigenous communities within these countries, to assert their intellectual property rights via patents, because of their insufficient equipment with know how on the one hand and material means on the other hand. The complicated and cost-intensive procedure of patent application in different countries quickly exceeds, as Freudling (1995) reckons up, the possibilities of these countries or population groups, regardingly. Therefore, “quite different, more multifarious, also much more complex solutions” would be necessary for the assertion and enforcement of the intellectual property rights (Freudling 1995, p. 221, see also Khalil 1995, p. 233). In addition, it must be differentiated between private and communal intellectual property rights. In so far it is controversly discussed, in how far the protection of intellectual property rights of indigenous communities is possible (i.e. by patents, Copyrights, plant breeders´ rights etc.; see e.g. Silva 1995) in the framework of the existing institutions (especially TRIPS/GATT), or whether new, specific forms of intellectual property rights are necessary for this (see e.g. Stenson & Gray 1999).

5. Condensation

To sum up, it can be noted:

- Missing property rights on a resource generate strong incentives for its excessive utilisation. World-wide problems in the protection of species diversity can partially be explained by missing property rights.

- An increasing utility and/or decreasing costs of the enforcement of property rights as a result of technological progress in biotechnology generate incentives for the definition of property rights on biological resources.

- From an economic point of view intellectual property rights can in this sense be considered as an instrument for the establishment of disposition rights on genetic resources.

- Intellectual property rights can have positive allocation effects, by providing incentives for investments in the preservation of biological diversity.

- However, especially the distribution effects of intellectual property rights must also be considered. These can be negative in the sense of often stated fears, that they will further weaken the position of the "South" compared to the "North".

- However, intellectual property rights may also have positive distribution effects, if they allow the countries of origin of biological diversity or, regardingly, indigenous communities within these countries, to participate in the commercial utilisation of their genetic resources. This is imaginable in the form, that these countries themselves become the owners of intellectual property rights or that they, as in the case of Costa Rica, "sell" the right of patenting to foreign corporations.

Therefore, it depends on the organisation and distribution of intellectual property rights in detail and in the end it probably holds true: As little as the problems of species affliction can be solved by the establishment of intellectual property rights alone, as little can the ethical questions and distribution problems existing in this context be solved merely by a prohibition of patents. In both cases additional (international) regulations are required.

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