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Analysis

Material transfer agreements: An economic and econometric analysis

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ABSTRACT

This paper uses econometric analysis for understanding the determinants that affect the payment mechanism in material transfer agreements (MTAs). These contracts regulate the exchange of peculiar ecosystem services (genetic and biological materials) between a provider and a recipient of the service. The paper uses a set of "model" contracts from the late 2000s, gathered from the U.N. World Intellectual Property Organization (WIPO) and the Convention of Biological Diversity (CBD). Empirical results show that the probability that a payment scheme is included in the contract negatively depends on the presence of an *acknowledgment obligation* to the provider of the material. Probably aware of the complexity and uncertainty of the recipient's research activity, the provider (and the CBD) requires to be compensated through the recognition of his/her important input to the research venture. In economics, this can be interpreted as payment in terms of moral satisfaction.

1. Introduction

This paper uses econometric analysis for understanding the determinants that affect the payment mechanism in material transfer agreements (MTAs). These contracts regulate the exchange of peculiar ecosystem services (genetic and biological materials) between a provider and a recipient of the service. The objective of the exchange often is the performance of R&D activities. The paper uses a set of "model" contracts from the late 2000s, gathered from the U.N. World Intellectual Property Organization (WIPO) and the Convention of Biological Diversity (CBD). The agreements are characterized by a very simple "core" structure. The main provisions regulate the contract duration, and (when stipulated) a price for the exchange and other (monetary and non-monetary) benefits. Most contracts, however, do not prescribe for a price, or any other monetary benefit from the exchange.

In economics, the role of contract terms is twofold: (1) aligning marginal incentives ex ante and (2) preventing wasteful efforts to ex post redistribution of existing surplus. The ex-ante pricing strategy, or better, the lack of an exchange price in most of the contracts' sample spurs to deepening the issue of ex ante marginal incentives to material transfer contracting, since the lack of an exchange price, means that incentives to contracting are non-monetary. In alternative, if from the economic point of view the exchange price represents a signal of scarcity, a lack of/or a low exchange price might represent an evident signal of a low valuation of the parties for the exchange. Understanding the mechanism of payment schemes in MTAs is central to understanding parties' marginal incentives to contracting and therefore, designing efficient agreements.

The economic literature has addressed the issue in several studies.

The issue of biodiversity as a commodity traded in the market place was firstly addressed by Heal (2000), who characterizes biodiversity from an economic perspective, with a focus, among the others, to biodiversity and biotechnology. The author discusses the capacity of economic institutions to realize the value of biodiversity and ensure that it is treated in a way commensurate to its importance.

In this direction, the economic literature on payment for ecosystem services (PES) (Pagiola et al., 2005; Engel et al., 2008, among others), has focussed on the definition of proper pricing methodologies that capture the intrinsic value of the natural resource to be exchanged and/or economically exploited. PES designers have often adopted stated preference methods, and particularly contingent valuation (CV) surveys, to estimate either or both of the following values: (a) the maximum amount that users of environmental services ("buyers") would be willing to pay for improvements in those services; and (b) the minimum amount that providers of those services ("sellers") would be willing to accept.

The seminal work by Dedeurwaerdere (2005) has enriched the debate, by emphasizing the need to integrating PES strictly monetary dimensions with the non-monetary facets, spanning from relational values (à la Williamson); to moral satisfaction, to the role of the logic of à la Douglas North. The literature on contracts that exchange ES for R&D is scarce and fragmented. Most contributions focus on the acknowledgment that the price of the exchanged resource is too low,

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and an attempt to explain the motivations supporting that premises or evidence. In this perspective, the paper by Simpson et al. (1996) adopts a theoretical framework for an application to bioprospecting contracts. Results show that values (revenues and conservation/non-use values) generated by private pharmaceutical research are very modest, as well as the incentives for habitat conservation.

Barbier and Aylward (1996) emphasize that the high costs of development of any drugs derived from biological and genetic materials might affect the low price and valuation attached to the resource, when negotiated.

On a similar line, Polski (2005) reports that in the U.S., an average of 10 years is needed to bring a new drug to market at a cost of about 800 million U.S. dollars.

Frinn (2003) points out that any material found naturally has a low chance of having useful biological activity and that random synthetic chemicals are much easier to work with and one has an equal chance of finding a chemical that has a specific activity as a natural product.

Markandya and Nunes (2011) attempt to understand how the value of the genetic and biological resource is determined. Starting from the remark that "*there is a feeling that the price being paid under there arrangement is too low*" (page 85), the authors make the use of a microeconomic model and explain the low valuation of genetic and biological resources as a consequences of the market organization. By decreasing the number of firms that have access to the material, one can increase the exchange price.

Onofri and Ding (2011) micro-economically model bioprospecting contracts. The authors attempt to explain a "low exchange price", expressed in monetary terms, as a consequence of a richer contractual structure that aims at sharing both monetary and non-monetary benefits, including human capital formation, research sharing and moral satisfaction from contributing to an important research project. A low monetary price, therefore, is counter-balanced by different types of (mostly non-monetary) compensations for the exchange.

The present study follows the surveyed stream of literature and attempts to empirically explain the formation of ES price in material transfer agreements and understand the drivers that ex ante spur parties to stipulate a material transfer agreement, in the absence of a monetary incentive. In particular, the main research question aims at investigating how the price for the ecosystem services in material transfer contracts is negotiated and defined. Following the cited literature, this study uses a sample of material access agreements, in order to perform an econometric, exploratory analysis that looks at the contract parties' objective functions and attempts to understand the mechanisms that determine the payment for the selected ES.

The work is organized as follows: Introduction discusses the economics of contracts, Section 2 describes the general characteristics of material transfer agreements and performs an economic analysis of the main provisions, Section 3 contains a description of selected data and variables, Section 4 presented the econometric analysis and results, and Section 5 concludes.

2. Material Transfer Agreements

Material transfer agreements regulate the exchange, between a provider and a recipient, of (mostly) genetic and biological materials for broad sake of purposes, including research, education and scientific exploration. The provider is most frequently a governmental or research institution from a country that is rich in ecosystem services (ES)/natural capital.[1] The recipient is usually a research institution/laboratory from a country that is rich in technology and skilled human capital. When a payment is accorded, for the sake of privacy protection, in the selected model contracts, the exchange price/value is not specified, only the payment modalities (annual, lump-sum, trust fund).

The provider's main obligation is delivering the required material. The recipient main obligation varies across contracts. Sometimes, as expected in exchange contracts, the recipient has to pay a price for the material. In other scenarios, the price is not requested, but the payment scheme is non-monetary, often aiming at activities that strengthen capacity of human capital in the provider institution and/or country (e.g. building a laboratory; purchasing selected research instruments; providing technical expertise; lecturing and so on).

Material transfer agreements are usually long-term. The exchange of the material is repeated during the period, within which the contract is in force. The agreements temporal duration is determined by the parties on a case-by-case criterion.[2]

In the selected sample, the issue of other monetary and non-monetary benefits sharing, central to the CBD spirit, is not always contractually regulated. In addition, the transfer of property rights on the material (including intellectual property rights) from provider to recipient does not always occur with the exchange of the material itself. The transfer of property rights legally qualifies the exchange: a transfer of property rights legally implies that the contract is a sale. If property rights are not transferred, the material is not sold, and therefore, it is coherent that an exchange price is not paid. However, the sample does not present a coherent empirical regularity on the issue. Some contracts prescribe for a payment, without at a transfer of property rights; others transfer property rights on the material from provider to recipient, but do not require a payment.

The contractual transaction-costs-minimizing basic structure is enriched by different obligations, spanning from reporting obligations to traceability of the material along the research and production chain; from confidentiality to definition of performing standards. These provisions[3] set different incentives and disincentives to the parties' behavior. The reporting provision, for instance, prescribes the recipient obligation to regularly report the provider on research activities, and might generate a disincentive to behave opportunistically, in Williamson lexicon, and misreport or cheat on the outcome of scientific exploitation. The traceability obligation is designed with a cost-minimizing purpose, since it allows tracking back information on the material uses and allocations.

Finally, the agreements include a transaction costs-minimizing clause that refers to the stipulation of a separate agreement or to subsequent renegotiation, which will both enable for adaptation and regulation of future events (like discovery, patenting and/or commercialization and so on).

The issue is very complex for several reasons. The peculiarity of material transfer contracts is that they are instrumental to generating a set of expected events that have scientific, economic and legal impacts.

[1] As highlighted by one referee, the word "provider" as it is used in the paper is not a "provider country" as envisioned under the Convention on Biological Diversity (CBD) and its Nagoya Protocol (NP). Indeed, under CBD, the provider that approves the mutually agreed terms of the contract is the national authority in the country of origin. For example, for the contracts in Appendix II, none of the contracts explicitly concern such a national authority (except, partially and potentially number 3).

[2] Such contractual characteristic of long-term duration is very well explained by transaction cost economics (Williamson, 1979). Contracting and achieving an agreement upon an exchange is a costly activity that neoclassical theory of markets fails to explain in a satisfactory way because there are "costs of using the price mechanism," including "costs of negotiating and concluding a separate contract for each exchange and transaction, which takes place" (Coase, 1937, p. 3). There is a cost in using a market mechanism and the more complex the transaction the higher the price of the market mechanism. Neoclassical theory implies that transactions are spot, simple (not complex), numerous, homogeneous. Coase and Williamson show that asset specificity2 increases the uncertainty and complexity of the transaction, and therefore transaction costs. The higher asset specificity, the higher the uncertainty and complexity of the transactions, the lower the reliance on the (neoclassical) market mechanism, that does not guarantee the minimization of transaction costs2, the higher the reliance on long-term contracts. The exchanges of genetic and biological material present different degrees of asset specificity, spanning from human, to site and dedicated asset specificity.

[3] See Section 3 for a detailed description of the provisions.