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## **The Gift and Open Science**

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**Abstract:** This short note illustrates how social structures and behavior of scientists in the societal sub-system of open science resemble patterns analyzed in the *Gift*, an essay written by Marcel Mauss nearly 100 years ago. The presented analysis goes beyond existing interpretations of gift giving in science. The latter has mainly focused on the exchange of knowledge and citations. I argue that the *Gift* explains also identity, competition, co-opetition, rituals, and punishment. Mauss's *Gift* is seen as a complementary model to existing economic and sociological approaches regularly used to analyze structures and behavior in open science. By accentuating such an anthropological approach, I conclude that the *Gift* provides explanations of the stability and the expansion of the open science community.

**Keywords:** open science; scientific competition; gift; Marcel Mauss; reciprocity; anthropology of open science

**JEL Classification:** A12, A14, Z11, Z13

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## 1. Introduction

The question of how open science works is tackled by different scientific disciplines, most notably sociology and economics (e.g., Bourdieu 1975; Dasgupta and David, 1994; Hagstrom, 1965; Merton, 1973; Stephan, 1996; Walstad, 2002; Wible, 1998). Topics in this discussion are open science as a market of ideas, open science as a mechanism for providing information goods, and scientific competition. In all cases, open science is considered as a process that requires interactions of individuals and groups (Polanyi, 1962). Reciprocal behavior of actors is ubiquitous, it serves the production and exchange processes, and causes externalities.

The objective of this essay is to draw attention to open science as a gift system. More particularly, I refer to the very idea of the gift as outlined by Marcel Mauss in his article *The Gift* published in 1923. He describes a norm-governed system of generalized giving between individuals and groups in ancient societies and specific communities. According to him gift-giving is an universal feature, independent of time that exists in all societies.

The case at hand is contemporary open science. In open science endogenous and exogenous norms govern individuals and organizations. Marcel Mauss's ideas have been a point of departure only for a few contributions to address mechanisms in this field. These contributions mostly focus on one particular element of the *Gift*, i.e. reciprocal exchange or reciprocal gift-giving (e.g., Hagstrom, 1965). The point made in this note is that Mauss's anthropological approach allows for a far more complex analysis of how open science works. I show that the anthropological perspective (see also Hess, 2007) complements approaches in the other social sciences, such as competition within open science, the struggle for recognition and status, or mechanisms of social punishment. The aim of this note is to use patterns of the *Gift* and go beyond the traditional gift-giving aspect addressed in discourses about open science.

Closest to this idea are the papers of Bergquist and Ljungberg (2001), and of Zeitlyn (2003). Bergquist and Ljungberg (2001) illustrate the open source community as a case of repeated gift-exchange. With reference to Mauss they illustrate how gift-giving is related to the building of power relations within a society. From their point of view, the system of gift-exchange, prevalent in the open source community, also characterizes the academic society. They particularly emphasize that gift exchange contributes to the formation of social relations. This happens through imposing reciprocal returns (Bergquist and Ljungberg, 2001, p. 308). In

a similar argumentation, Zeitlyn (2003) refers to Mauss and reciprocal gift exchange to explain the production of open source software. Zeitlyn stresses that every gift bears a meaning and that a giver remains connected to the object provided as a gift (Malinowski 1922; Hagstrom, 1965). Provision and access to open source software is free but the software remains related to its originator and bears for the user the obligation of giving a return. In addition Zeitlyn (2003, p. 1290) explains how social interactions of gift exchange leads to ‘kinship amity’ with long-term moral relationships in the open source movement.

This note differs from both papers in two ways: Firstly, it does not address the open source movement but open science in general. Secondly, it discusses additional aspects to gift exchange, all immanent in the *Gift*, with respect to open science. The paper finds that the *Gift* constitutes a model that explains how social systems work and persist over time. The anthropological perspectives complements existing approaches in economics and sociology with respect to the societal sub-system of open science.

The second section summarizes arguments from the discourse on how open science and scientific competition works. The third section outlines in a stylized form Mauss’s core ideas on exchange. In the fourth section, I address identity, competition, rituals and punishment in open science through the lens of the *Gift*. The final section concludes.

## **2. Products, Motivations and Institutions in Open Science**

I start with the claim that open science resembles a market of ideas. Therein scientists compete for status. This economic approach is able to embed aspects of open science, which usually sociologists accentuate. The economic perspective (see recently Albert 2008, 2011) opens a path to address essential similarities between the structures of open science and those structures underlying the *Gift*. In order to do so this section addresses four aspects: output, motivation, institutional structure, and cooperation.

(1) The *outputs* in open science are written and oral records of newly developed theories, new ideas, results, and so forth. They have the form of journal articles, books or oral presentations. The outputs of the scientific process resemble information goods. Usually, they are non-rival in consumption and non-excludability exists (Dasgupta und David, 1987). Furthermore, marginal costs are zero, and storage and distributional costs are close to zero (for digitalized goods). These goods may cause positive (or negative) externalities outside science. With

respect to input factors, scientists require apart from their own work, effort and ideas, the output of their fellow scientists. These inputs are again published ideas. In choosing ideas from others, scientists look like customers on a market for ideas. Given the sovereignty of the scientist to decide on the time and type of inputs that they use, i.e. consume, open science can be considered as a world-wide decentralized customers' market (Albert, 2008).

Behavioral norms prevalent within the community regulate the conditions for using inputs (Polanyi, 1962). The central endogenously developed norm in open science is 'giving tribute'. Tribute receive those who have initially published an idea. Merton (1957) describes this norm as the 'rule of priority' (cf. additionally Merton 1942 on norms in science). It implies that a person who publishes an idea first obtains the moral right of 'being cited' by others who later refer to this idea (Albert 2008, p. 1). Since the outputs in open science are mostly information and, as such, public goods (Nelson 1959, Arrow 1962), the pricing mechanism for private goods fails and leads to inefficient output levels. This explains why the priority rule is not only a property right norm (Dasgupta and David 1987, p. 531; Stephan 1996, p. 1200), but also implies a specific 'pricing' mechanism for this type of public goods. Receiving citations may provide incentives for scientists to participate in open science and to produce public goods. However, it is largely a voluntary contribution mechanism.

Leonard (2002, p. 159) discusses the dichotomous structure of cooperation/competition. According to him, scientists working in a specific field are rivals in the sense that they compete for priority. Rivalry and competition may increase the quality of the output. However, scientists are often in a need to cooperate with their rivals. They have at least to use the output of competitors as an input for the production of new knowledge. Nalebuff and Brandenburger (1996) coined the concept of co-opetition, which applies well to describe the simultaneous appearance of cooperation and competition within open science (see also Hippel, 1987).

Walstad accentuates an Austrian perspective. He stresses the entrepreneurial character of a scientist's work (Walstad, 2002, pp. 18-21). Scientists, similar to entrepreneurs, specialize on outputs and have to decide on the type of product, time of production, or market they intend to use. Despite these similarities with entrepreneurial activities, Walstad also hints that scientists are not often exposed to the risk of failure in case of zero demand for their outputs. This is true for tenured scientists whose participation in the production of new science is largely

voluntary, and who receive a salary independent from publishing activities (Dasgupta and David, 1994).

(2) The *motivation* for scientists to be active in the production of output is manifold. From a traditional economic perspective (cf. Leonard, 2002), scientists are rational individuals with given preferences who maximize utility in a specific institutional setting. The latter are rules or constraints such as the priority rule. It can provide incentives for scientists to produce and publish new knowledge *if* they consider ‘being cited’ from their fellows as a reward they would like to receive. Then a citation received is simulating a payment that an author gets if others use her output, i.e. the payment for using the public good produced by this scientist. The relative number of citations an author’s idea receives is a signal within the scientific community for the demand of her idea. Thus, authors may be able to build reputation through receiving citations. Other mechanisms and norms complement this reward mechanism.

In a figurative sense, the more citations a scientist receives, the richer she becomes. Her reputation resembles her ‘wealth’ within the community. When the priority rule is in place, publishing becomes a contest and can have a winner-takes-all form (Stephan, 1996, p. 1204). For scientists who are concerned about status, competition for status and recognition among peers may be a driving force for producing output (Hull, 1988; Merton, 1957, 1973; Walstad, 2002). However, this does not have to be the case. Taking part in this form of competition can also satisfy intrinsic motivation such as curiosity (see the interviews reported by Hagstrom, 1965). ‘Wealth’ in a more mundane sense can occur if status positions within the scientific community can be transferred into more and higher research grants, higher professional positions, higher financial benefits or more research resources (Albert, 2008, p. 2).

(3) The effectiveness of the scientific subsystem depends on its *institutional structures*. These influence scientists’ decisions. As stated in new institutional economics, institutions may emerge endogenously, i.e. from within the community, or, alternatively, are imposed from outside, for instance by organizations. An example for an endogenous institution is the priority rule. Albert (2006) develops a model and shows how norms about product quality can evolve in scientific competition (see also Popper 1959, who stresses that methodological norms are a consequence of rules within a society; also Jarvie 2001). Vanberg (2010, pp. 30-31), as well as Leonard (2002), addresses the relevance of the institutional setting apart from the invisible hand of self-coordinating scientists (Hull, 1988). This setting is the rules and the rule-enforcing institutions that constrain open science. Vanberg argues that institutional-

constitutional constraints influence the way science is produced. Consequently, the institutional setting affects the ‘game of science’ (Zamora Bonilla, 2008; also Popper 1959, Albert 2011) and its effectiveness. From such a perspective a multitude of endogenous and exogenous institutional constraints influence open science. Multiple equilibria are possible to occur and these are not necessarily stable, especially when science is understood as an evolutionary process (Vanberg, 2010; Wible, 1998).

(4) Finally, *cooperation* among scientists occurs and affects individual and social outcome. Researchers are not only free to decide which inputs they use but they are also free to cooperate with fellows. For individual scientists it is rational to form cooperation and networks when the expected gains from cooperation are higher than expected costs. Positive results of co-operation and networks can be the faster production of new knowledge, quantitatively and qualitatively better options to publish in a shorter period of time, and better chances for receiving citations (Dasgupta and David, 1994, p. 504; Stephan, 1996, p. 1220). This is likely if the abilities and resources of cooperating scientists are complementary to each other. Melin (2000, 34), for instance, asks for the reasons of collaboration among scientists. He finds that collaboration is motivated, besides social reasons, mainly by access to resources of collaborators (also Beaver, 2001, p. 373). Indeed, networks may also have negative effects on output, for instance if time has to be spent on network formation (Walstad, 2002, p. 5; cf. also the co-author model by Jackson and Wolinsky, 1996).

Network formation and the need to write co-authored papers can become endogenous rules of self-organization within specific fields of open science (Adams et al., 2005; Hicks and Katz, 1996; Wagner and Leydesdorff, 2005), if scientist can gain new knowledge only through co-operation. However, network formations can also be an exogenously implemented rule imposed by organizations as a precondition for providing research funds. Such rules may indeed hamper the effectiveness of the scientific system and inefficient equilibria are likely to evolve (Egbert, 2008).

Since rules largely govern scientific competition and since goods are non-private, the comparison of open science with traditional market models lacks in substance. Models that account for institutional settings and address public goods seem to be better suited to cover some of the peculiarities in open science (Albert, 2010). Examples are models that relate to market structure, networks, principal-agent structures, or path dependency. Such a turn

towards an institutional perspective allows a supplementary interpretation as provided in Marcel Mauss' work.

### **3. The Mauss'ian System of Giving**

Marcel Mauss' essay *The Gift* (1923/1924, 1990) popularized the behavioral pattern of reciprocity in anthropology. He develops an evolutionary model and draws on extended ethnographic studies, particularly from Oceania and North America, and on numerous historical examples from Europe and Asia. His model starts from a societal stage described as a 'total system of giving' (Douglas, 1990). Exchange is ubiquitous in this stage. Groups and individuals exchange nearly everything. At later points in development processes reciprocity remains a pattern of interaction, however without its former universality. Reciprocity remains an exchange system even in modern societies with prevalent market exchange.

Mauss stresses that the giving and accepting of gifts is relevant for the existence of a society as such. As a universal behavioral pattern, gift-giving shapes and stabilizes societies. What is remarkable is that Mauss (1990, p. 70) addresses two influences on individual decisions: the interest of the person and the interest of the society from which the individual is part of. Unlike his uncle, Durkheim, Mauss did not claim in the *Gift* that society overwhelmingly determines behavior; and also unlike the utilitarian school, which stresses individual rationality, Mauss considers individuals as part of the society. Karl Polanyi frames this observation years later as 'embedded in social contexts'.

An extreme example of a 'total system of giving' which includes 'total services' and 'total counter-services' is the *potlatch*. Mauss (1990, pp. 39-43) refers to potlatches in order to illustrate three obligations that determine behavior. The first is the 'obligation to give': within a social order individuals and groups follow this obligation in order to maintain their social position. 'Giving' signals individual or group wealth, being blessed by spirits and gods, other individual or group achievements, or power. The giver must provide invitations to gift-giving occasions. It is her undeniable task to spread information to potential receivers of gifts, for instance invitations to a feast such as a rite of passage. The second is the 'obligation to accept': the invited must accept an offer. Mauss mentions only a few possibilities to turn down an invitation. The acceptance of an invitation has, however, a consequence for the

invited. The consequence is the third ‘obligation to reciprocate’: the obligation to accept an invitation constitutes a ‘burden’ (Mauss, 1990, p. 41) for the invited because she has to reciprocate a received gift in the future. Indeed, in the potlatch cultures the value of the reciprocation should be higher than the value of the gift received. Disobeying an obligation has social consequences for the offending individual or the offending group. They can lose status, power, social esteem, valuables, individual freedom, or even life (for a structural analysis of the potlatch see Rosman and Rubel 1972).

A pillar in Mauss’s (1923/1924) argumentation is the path-breaking fieldwork of Malinowski (1922). In *Crime and Custom in Savage Society*, a book published shortly after the *Gift*, Malinowski (1926) describes in detail complex rules of exchange on the Trobriand Islands. Corner stones in the exchange of services and goods on the islands are mutual obligations of payments and repayments, which are complex arrangements on a multitude of social layers, such as among individuals, kinship groups, villages and districts. Furthermore, economic exchange is closely related to formal ceremonial rituals of exchange (Malinowski, 1926, pp. 22-29). Indeed, the individuals involved in exchange scrutinize the behavior of their exchange partner in all relevant aspects. Malinowski also refers to the psychological side in the complex context of giving and receiving since the process entails the implementation of power in social relations. He states with respect to the inhabitants of the Trobriand islands:

“Now nothing has a greater sway over the Melanesian’s mind than ambition and vanity associated with a display of food and wealth. In the giving of gifts, in the distribution of their surplus, they feel a manifestation of power, and an enhancement of personality. [...] Generosity is the highest virtue to him [the Trobriander; HE], and wealth the essential element of influence and rank. The association of a semi-commercial transaction with definite public ceremonies supplies another binding force of fulfilment through a specific psychological mechanism: the desire for display, the ambition to appear munificent, the extreme esteem for wealth and for the accumulation of food.” (Malinowski 1926, p. 29)

The passage will keep its meaning if the ‘Melanesians/Trobriander’ is replaced by ‘scientists’ and ‘food’ by ‘outputs’ produced in open science.

Malinowski’s fieldwork and Mauss’ theoretical work have become the corner stones for work on reciprocity in anthropology, e.g. in the work of Polanyi (1944), Lévi-Strauss (1949), and Sahlins (1972) (cf. Gudeman, 2001, pp. 84-86; Parry, 1986). Mauss himself notes that such an exchange system as in a potlatch is not the form of exchange in modern societies but that

essential *patterns* of this system exist everywhere in modern societies (for a critical discussion compare Parry, 1986). Indeed, nearly 100 years after the publication of the essay this view can be confirmed. Gift-giving has remained a universal pattern (see Hann, 2006, p. 208; Liebersohn, 2011, pp. 139-163; Mauss, 1990, pp. 71-83) and it can be found also in modern market-driven societies (Hart, 2007; also Kranton 1996).

Before relating the model outlined in the *Gift* to the organization of contemporary open science, a noteworthy analysis of Liebersohn (2011) deserves attention. Liebersohn (2011, p. 147) has analyzed Mauss's essay *The Gift*. He finds that Mauss, the scientist, considered his essay as a return gift to his fellow scientists in the sense of his own model. Mauss systematically pays tribute to his French scientific community, as well as to his fellows in Britain and the US by citing their works. Liebersohn (2011, p. 147) summarizes that Mauss "[...] wrote with a potlatch zest for counterdisplay, recognizing the scholarly riches received and reciprocating with an essay that could match and perhaps surpass his predecessors' offerings." That is to say, it is Mauss himself who addresses the topic dealt with in this note.

#### **4. Open Science as a Gift**

This section outlines how patterns pertinent to the *Gift* resemble patterns prevailing in open science. The main point made in this section is that the model developed in the *Gift* provides a complex view on open science. This goes beyond the aspect of gift exchange. In this section I address firstly previous applications of Mauss's gift-exchange to science (Hagstrom, 1965; Bergquist and Ljungberg, 2001). Secondly, I identify in Mauss's work further patterns, which have not been discussed in the context of open science. They include identity, competition, obligation, ritual and punishment.

In order to understand open science as a gift-exchange system in its fullest sense, it is helpful to recall Mauss's approach. He points out that an individual follows her own interest *and* acts in the interest of her society. Let us assume for the following that the individual is a scientist who participates in open science and belongs to an open science community. Hagstrom (1965) is the first who addresses gift-giving in science and who explicitly refers to Mauss and Malinowski. In Hagstrom's terminology, 'recognition' is central for scientists. He illustrates this with a scientist who submits a manuscript to an editor (a journal). Handing-in a manuscript resembles the giving of a gift, in this case information or knowledge provided by the author. The acceptance of the manuscript by the editor resembles a counter-gift. As

Hagstrom notes, receiving this counter-gift from an editor is a way for an author to acquire recognition as a scientist in her community. Bergquist and Ljungberg (2001) and Zeitlyn (2003) follow this argument with respect to the provision of open source software, which allows an initial software developer to gain status.

A closely related aspect pointed out by Hagstrom (1965) is the findings of Mauss and Malinowski that outputs or results cannot be alienated from their producers. While products bought on markets do not need to bear the identity of the producer or seller, products exchanged in science require a marker of their producer's identity, such as authors' names or funding institutions. As outlined above, for the motivation of scientists it is often essential that the output they produce is related to their name. If this is not the case, the competitive element in the production process – the application of the priority rule – loses its incentive for producing quality and quantity. The non-alienation of a giver from the things she gives is described by 'keeping-while-giving' (Weiner 1992) in other anthropological contexts. Giving away implies a likely return to the giver, in the discussed case the receiving of citations for a paper given to the community and to the public.

Hagstrom (1965) states that the act of giving creates obligations. Since scientists often do not immediately distribute output via markets but initially use screening processes by other scientists, the latter are obliged to participate in this process by controlling and reciprocating the initial giver. Obligations are institutions in the production and evaluation process of open science products. Institutions provide social structure because they determine social relationship between the involved individuals, and foster the cohesiveness within the scientific community (see Bergquist and Ljungberg 2001, p. 308, as originally pointed out by Mauss 1990). While the link between the *Gift* and the structures in open science and the open source movement has been documented, the following four aspects have not found particular attention yet.

(1) *Identity in exchange*: Mauss describes potlatch exchange as exchange between non-anonymous individuals or non-anonymous collective entities, such as families, clans, or villages. Identity in repeated gift-exchange is important. It guarantees that exchange does not have a generalized form but a rather dyadic structure in which actors provide gifts and receive counter-gifts.

In open science, double blind reviewing has become a benchmark for many journals. Double blind reviewing may ensure anonymity between an author and a reviewer. On the one hand, keeping anonymity can serve to achieve a higher quality of output. This is the case if anonymity lowers entry barriers for unknown or young authors to open science, since reviewers may have a positive bias for established authors. Bourdieu (1975, p. 20) brings up the problem. He argues that scholars' identity determines judgments in science about these scholars and their capacities, or, as he puts it, judgements become 'contaminated' by identity. The judgment of scientists over another scientist (or her work) can depend on the latter academic position, her position in the hierarchy of science, her research affiliation, and so forth. On the other hand, anonymity of the reviewer may also lead to a higher quality of reviewer reports because the reviewer does not have to fear retaliations. One may argue that less information is better in evaluating processes because it allows more competition among authors as well as better reviews.

In fact, often the reviewing process is not anonymous. An author and a journal editor do know each other's names. Many journals submission guidelines demand from authors to suggest potential reviewers when submitting a paper and sometimes submissions even require the naming of potential reviewers. Thus an author, a giver, can predict with a certain probability the reviewer of the paper. Often the referee report reveals hints to the identity of the reviewer. The reviewer can identify the author of a paper to a certain extent. Indeed, we can argue that it may be in the interest of a reviewer to reveal her identity if her judgement is positive such as an 'accept' or a 'resubmit'. The review is a counter-gift given by the reviewer and the editor to the author. It is in the interest of the reviewer to reveal her identity if she expects that the author reciprocates in the future. For a negative evaluation, it may be reasonable for the reviewer to try to keep anonymity but this is not necessarily the case. Since referee reports are in many cases helpful to an author in order to improve her paper, a negative decision is also a counter-gift for her. Perceived as such, a reviewer may also consider revealing their identity. To sum up, despite possible problems for the scientific process that may derive from the identity of authors and reviewers, both may have an interest in revealing identity in order to participate in a gift-exchange game.

(2) *Competition*: Mauss explicitly makes it clear that the giving of gifts among individuals or groups is a sequential process of competition for social status, for instance in a potlatch. In this process the participants, individuals or groups try to outperform their competitors. Competition does not occur for material wealth but rather for status, i.e. for achieving a

superiority position in giving, which signals wealth, being blessed by the gods, having luck, or being skillful. Those who give the most by quantity or by value obtain the highest status. Subsequently, the need to provide a counter-gift that should be (normatively determined by the participants) of even higher value than the gift received, may provide a persistent incentive for the competitors to continue competing. If the goods given also serve third parties, the goods (i.e. gifts) create positive externalities and can resemble public goods.

This process is very similar to processes in the production and distribution in open science. One researcher or a research group struggles to outperform a competitor in the timely production and publication of high-scale new knowledge. This output is not solely a gift to the scientific community, but it is also a public good for third parties. The priority rule being in place is a precondition for generating status within the scientific community but sometimes also within the general public. This is so because the competitors within the scientific community have to quote the original contribution. The competition for status in open science is very similar to what Mauss analyzes for potlatch cultures: the more valuable things an individual (or a group) gives, the higher their status is within the community, and, the higher the challenge is for the competitor to outperform the giver in the future by providing a counter-gift.

Competitors in this iterated game may provide a higher quality and new discoveries in the future, so that also status can shift to a competitor. Again, Bourdieu (1975) makes an important point. He opens his article with the words that "... the scientific field is the locus of competitive struggle, in which the *specific* issue at stake is the monopoly of *scientific authority*." (Bourdieu 1975, p. 19). From an economic perspective, this reads as though scientists are in a situation of monopolistic competition in which they try to obtain temporary monopolies via status. In Bourdieu's sociological terminology, scientific authority is a form of social capital that individuals can acquire. It is worth noting that Mauss's much earlier developed concept of the *Gift* is fully compatible with such ideas developed in sociology (Bourdieu 1975), but also with the early models of non-competitive markets in economics (Robinson 1933).

(3) *Obligations, rituals and punishment*: In Mauss's argumentation it is apparent that participants in the exchange obey the central norms, i.e. the three obligations. The first one implies that individuals must give. The subsequent obligations come into existence with the first act of giving. With these norms in place, an exchange process of gift-giving and

receiving counter-gifts does not stop after it has started. Norms and consequences are harsh so that free-riding, i.e. non-giving, becomes related to comparatively high social costs if detected. The situation resembles a centipede game (Egbert, 2017).

Obligations are ubiquitous in open science. With submitting a paper an author signals that she is willing to follow the existing rules of the reviewing processes in particular and of open science in general. These rules include the obligations to follow citing rules, to react to referee reports, to act herself as a referee for the journal at a later point of time, and so forth. This may also include paying tribute to the journal or its editor by providing citations. In some cases, journal editors even demand gifts from authors in the form of quoting papers from ‘their’ journal. Mauss’s third obligation allows considering citations as counter-gifts. Particularly, if the author’s identity is given, citation networks are likely to occur as stable systems and to lead to the reciprocal increase of the member’s status in the citation network while discriminating non-members.

As one can notice, all types of exchange are bound to rituals. Rituals are imminent in the original context of the *Gift* (cf. Malinowski 1926). On the one hand, rituals are institutional constraints for those who take part in the exchange. They may exclude parties from participation. Thus they determine rules of who, what, in which quantities, when, and where can be exchanged. On the other hand, rituals provide structures that facilitate exchange, allow observations of the exchange process and reduce monitoring costs. This is the case in market exchange as much as in gift exchange.

Open science is also largely governed by rituals. They provide structure to the exchange process. They are visible in the rules of communication between an author and an editor, e.g. submission letters, in the communication between authors and reviewers, e.g. referee reports and comments on these, in the communication between the editors of journals and the publisher. Rituals are abundant at scientific conferences and at meetings, at rites of passage, such as obtaining a PhD, at inaugural lectures, and so forth. These rituals are useful in order to ensure norm enforcement, i.e. to make obligations and disobedience to rules visible.

Disobedience may lead to punishment of the offender. As Mauss argues, gifts shape and stabilize society. A precondition for gifts to function as a stabilizer, punishment mechanisms for norm violation must exist. Mauss (1990) addresses cases in which punishment of norm violations can occur, for instance when a gift that should be given is not given, if potential

recipients of gifts are not invited to the gift giving occasion, or if gifts are rejected by receivers. In open science mechanisms of punishment also exist. A prominent form of norm violation is plagiarizing, i.e. using ideas of fellow scientists by not providing adequate references (see Necker 2014 on attitudes to norm violation; also Wible 1998, pp. 43-56). Punishment occurs at different levels. Examples are not publishing a plagiarized paper, not quoting a paper, making plagiarism of an author public in order to ostracize the plagiarizer, exclusion from funding, loss of academic position, etc. Obligations, rituals and punishment are ubiquitous in open sciences. As an institutional arrangement, they help to shape and stabilize this societal sub-system.

In spite of these striking similarities between the *Gift* and the way open science works, some patterns in open science do not fit neatly in the model developed in the *Gift*. I briefly outline three aspects but leave their tackling to future work. Firstly, the Mauss'sian gift-system is deterministic and leaves little choice to an individual or group. Obligations are exogenous, set in place by social structures and individuals have to follow these obligations. However, in contrast, open science is a voluntary process. As Albert (2008, p. 2) outlines, the voluntary contribution mechanism constitutes the demand and the supply side of open science contributions. The decision not to participate in this process exists, at least for established scientists. Thus, one may argue that the model outlined in the *Gift* is more relevant for scientists at the beginning of their career. These have to follow established rules, respectively obligations, for instance submissions to journals in order to acquire recognition within the community (Hagstrom, 1965). Secondly, gift giving and counter-gift receiving is a sequential system with repeated interaction, for instance in a potlatch. This does not necessarily cover all structures in open science where giving and receiving is neither an iteration of sequential moves, nor is it symmetric in nature. Thus, power relations, which occur among scientists through obtained status and reputation in the course of time, require detailed analysis (Bourdieu, 1975).

## **5. Conclusions and Implications**

My argument is that the mechanism of how open science works can be depicted well by the patterns formulated by Mauss in the *Gift*. He provides an anthropological model applicable to open science as complementary to existing approaches from the neighboring social sciences. The *Gift* is useful to explain features such as repeated reciprocal exchange, networks and competition, co-opetition among scientists, identity and an abundance of institutional settings,

such as rituals or punishment. This anthropological perspective allows also formulating further implications with respect to the social function of these structures. In order to address three of these functions I regard the aspect of gift giving and its implications for societies in general.

The economic anthropologist Gudeman argues that reciprocity in the form of sharing allows the *creation of persistent communities*. As Gudeman (2001, 86) formulates: “Sharing is an act of making and maintaining community.” This statement does not only apply to ethnic communities but also to communities based on other membership criteria, in the case discussed here, to the community of scientists in open science. The sharing of knowledge through writing, reviewing and publishing is an act of “making and maintaining” this societal sub-system. The chance for a scientist to become a member of this sub-system by providing an initial gift and following institutionalized obligations does stabilize the system as such and accounts for its persistency over time with different players. This does not exclude the emergence of hierarchies and dependencies within open science as network or market structures. Mauss articulated this position, namely that exchange stabilizes society.

Gudeman provides also a good starting point for the second implication, the *extension of community*. Providing an initial gift does not only allow entrance to a community, but allows the community to grow through new members. Gudeman (2001, 86) argues that “[T]he gift extends the commons to someone outside the community, offering temporary participation or even permanent inclusion.” An initial gift signals the willingness of the giver to participate in the complex system and allows her entry into the community. At the same time, the community grows in size. What is applicable to other communities also holds for the community of open science with comparatively low entry barriers. Access is open in the sense that voluntary contributions of “commons” are possible. The increase of the share of individuals working in science and the increase of knowledge exchange since the Enlightenment are a demonstration of extending community through sharing. This aspect is particularly important because open science allows producing and consuming public goods (Nelson, 1959; Arrow, 1962; Dasgupta and David, 1987). In this sense gift-exchange increases the number of public goods and enhances social welfare – particularly if positive externalities are related to the scientific output.

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