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Understanding Commons and Anticommons in different economic contexts¹

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Abstract

Many common resources are managed under private property rights-based systems. Privatizing these resources leads to fragmented property rights and scattered decisions. Gathering all these rights could lead to higher private and social costs. Heller has described this phenomenon as Anticommons Tragedy, with the resources underused and limited possibilities of innovation and development (Heller, 1998). The concept of Anticommons has been highlighted in the fields of intellectual property, media, and business. Nevertheless, few studies have attempted to shed light on Anticommons in the field of fisheries. The present article attempts to introduce the concepts of Commons and Anticommons, in light of previous studies focusing on the importance of property rights and access modes, for fishery resource management. Access rights management is the main problem that threatens the sustainability of fishery resources. The fisheries involve many interdependent economic stakeholders influencing the decisions of resource utilisation. In this context, the coordination failure leads to a chaotic situation where the fishery resources are underused.

Keywords: Commons, fishery resources, Anticommons, access modes, costs.

Introduction

Commons issues sparked interest of scientists and more particularly the overexploitation common resources. These problems have been widely discussed in the literature under the

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name of Tragedy of the Commons (Hardin, 1968). This is the result of the exploitation of scarce common resources under an open access regime. Negative externalities lead to a market failure thus inducing the overexploitation of resources. The depletion of stocks of fish, overexploitation of grazing lands, pollution of air and the depletion of groundwater illustrate this phenomenon of Tragedy of the Commons (Lametti, 2013, Libecap, 2009 and Ostrom, 2008).

Privatization would in fact make it possible to internalize the negative externalities linked to overexploitation and to ensure better use of common resources. Many resources are then managed by systems based on private property rights, examples of these systems are intellectual property rights (patents) and rights usage (licenses and quotas). The privatization resulted in the segmentation of the rights of ownership and the fragmentation of decisions. Assembly of these interrelated rights and decisions, may result in very high private and social costs. Heller (1998) has described these phenomena as the Tragedy of the Anticommons, characterized by underuse of common resources and blocking new development opportunities and innovation.

The new concept of Anticommons raises several scientific questions in the field of property law and economics. The Tragedy of Anticommons is defined as a mirror image of the Tragedy of the Commons (Buchanan and Yoon, 2000). It is a concept, unfamiliar within the community of scientists, likely to induce very high social costs (Kosnik, 2012 and Driouchi, 2011). It is also less used in scientific language because the dynamics of under-utilisation of resources is still unfamiliar (Heller, 2008).

The study of Anticommons has been widely discussed in theory, however little empirical evidence were undertaken on the relevance of their predictions, in particular through the analysis of cases in the field. The concept of the Anticommons has been well illustrated in the field of intellectual property rights, especially studies carried out on research in the biomedical industry and in other areas such as the media and business (Driouchi, 2016; Overwalle, 2016; Hazlett and Skorup, 2013 and Driouchi and Malki, 2011). While the Commons refer to the situation where several resource rights of use exist but no rights of exclusion, the Anticommons refer to the situation where there are, in addition to the rights of use, many rights of exclusion. The Tragedy of the Commons and the Tragedy of the Anticommons appear when the exclusion rights are separate from the rights of use (Buchanan and Yoon, 2000).

This study attempts to shed light on the concepts of Commons and Anticommons in the light of previous theoretical and empirical studies in different economic sectors. In the first part, I will present a definition of Commons and Anticommons while emphasizing the problems related to the emergence of two concepts, in relation to property rights and the efficient use of resources. Then I will review, in the second part, all the studies and publications relating to Commons and Anticommons as well as their implications. The third part will be dedicated to the examination of empirical case studies carried out so far in different economic contexts and the new areas where the Anticommons could be emerged. A discussion of the implications of Anticommons will be initiated, particularly in the case of developing countries, then a conclusion.

I- The concepts of Commons and Anticommons

I-1- The Commons and the distinction between resources and Properties

The Commons can be defined as institutional arrangements or governance systems in which resources are used jointly by Society as a whole, or by a limited number of people commonly-owned (Driouchi, 2013; Lametti, 2013; Coelho et al., 2009; Muzner, 2005). They are distinguished of the common resources themselves, which are part of the Commons. These include two main types of arrangement: free access and common property. The Open access is a regime where every user has the free right to use the resource but no one has the power to exclude others, nor the responsibility to limit its exploitation. The Tragedy of the Commons is much more related to this type of regime. For example, the case of the oceans, forests, air and irrigation water management.

Common ownership is a regime where a limited number of (communal) persons may exclude nonmembers from the use of resources, but could not mutually exclude each other. This type of regime does not always lead to a Tragedy, because communities can find arrangements to better manage resources, this is the case, for example, with co-management of the Lobster fishery in the Bay of Maine in the United States (Brewer, 2012 and Ostrom, 2008).

Authors such as Coelho (2009) and Ostrom (2008) considered the Commons as a specific form of property, common ownership with rules and norms for managing behaviour of rights holders. In this sense, the Commons can be characterized by three essential elements (Caffentzis, 2012; Aigrain, 2010 and Calame, 2010) :

- 1) A shared resource, highly subtractable (rival) and operated in open access by community members and whose exclusion is difficult;
- 2) A community of users who wish to exploit the resource continuously and over the long term;
- 3) Rules and procedures enabling users to manage the resource.

Commons are therefore situations or institutional arrangements combining both free access and common ownership of resources. The most famous example in the field of natural resources is that of collective pasture. Each breeder guided by maximizing profit, decides freely and separately to introduce more animals into the field. The introduction of an excessive number of animals leads to the overexploitation of resources until they are exhausted. This is the Tragedy of the Commons, where many persons separately control the production inputs. These users cannot exclude other people involved in the exploitation of this resource. The Tragedy of the Commons in this case is linked to open access and competition between users of the resource (rivalry).

Fenny (1990) and Coelho (2009) distinguish between the resource and ownership. Common ownership refers to the situation where the rights of use of the resource are controlled by a group of co-owners in regard to access rules, but the autonomy of decisions is limited in comparison with private ownership situation. In the case of common ownership, the Tragedy of the Commons reflects the situation of absence of coordination in the use of resources leading to their overexploitation (Kosnik, 2012).

I-2- Anticommons and exclusion rights

The Anticommons are a symmetrical image of the Commons where resources are under-exploited and exclusion rights are added to the rights of use. The Anticommons refer to the situation where several co-owners have a right of exclusion vis-à-vis each other in relation to the use of a scarce resource, but no one can actually use this resource. They also refer to all knowledge and expertise shared between several private and/or public decision-makers, scattered and poorly connected. This results in inefficient and suboptimal resources utilisation (Driouchi, 2013).

The Anticommons also correspond to an ownership regime where several owners hold effective exclusion rights vis-à-vis a scarce resource and no one has the privilege to use this resource without the permission of other users (Mitchell and Stratmann, 2015; Coelho 2009).

and Lam 2007). The problem of the Anticommons is not only linked to the incomplete definition of property rights or their fragmentation, but also it relates to the way in which these rights are distributed or created (Driouchi, 2013; Lametti, 2013 and Muzner, 2009). According to Major, King and Marian (2016), the Anticommons are defined in connection with necessary and complementary inputs controlled separately. Based on this definition, the authors explain how operators develop their strategies for creating and allocating potential positive externalities.

The Anticommons property can then be defined as part of a spectrum of property where private property is bounded by common ownership and Anticommons ownership. Private rights are also situated between open access rights (Commons) and exclusive rights (Anticommons) (Munzer, 2005; Heller, 2008 and Kosnik, 2012). In this context, excessive privatization of a commonly-owned resource can place it in an Anticommons ownership situation (Figure 1).

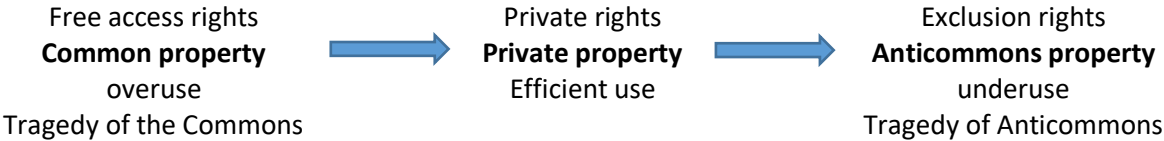


Figure 1: The property spectrum and its relationship to Commons and Anticommons (Heller, 2008)

In this diagram, we can see that private ownership is delimited on both sides by common property and Anticommons property. Kosnik (2012) and Heller (2008) have indicated that Anticommons property is located beyond private property, especially when there is too much protection for private property or when there is much more regulation than is needed. The Anticommons property therefore refers to the power of one or more people to exclude others from using or accessing a resource. Brede and Boschetti (2007) distinguished between pure Commons, Commons with regulation and Anticommons. According to these authors, pure Commons are Commons where there are no restrictions. Each user is free to use the resource without any constraint. The Commons with regulation are defined between pure Commons and Anticommons. The degree of regulations and their severity determine the distance from the situation of the Commons or from the situation of the Anticommons. In the case of the Anticommons situation, ownership is ill-defined, fragmented or overlapped and decisions are scattered, dispersed and disconnected.

Several empirical applications of Anticommons have been realized in the areas of intellectual property, including patents in biotechnological and biological research, taxation, business creation, telecommunications and aquaculture (Overwalle, 2016; Mitchell and Stratmann, 2015; Driouchi, 2013 and Coelho et al., 2009).

The best example, which illustrates the problem of Anticommons is that of parking spaces. Imagine a parking space for vehicles in a municipality. At first, this public space is open to all. People will park their vehicles one after the other until the last available space. Therefore, no more vehicles can be parked there. This is the case corresponding to the Tragedy of the Commons, characterized by the depletion of resources. Then, under certain conditions, the municipality decides to delegate the management of the park to a private agency that requires users to pay a price against an access ticket. In this case, it is a monopoly, the result of which is not socially desirable. If now there are two agencies controlling access to the park. The two agencies will behave like two separate monopolies that will each simultaneously impose a price for access to the park. Users will therefore be obliged to pay the two prices imposed by the two agencies to access the park. The sum of the two prices is therefore higher than that of the monopoly. Due to this high cost of access, the number of parked vehicles will decrease. It can be demonstrated that if the number of agencies is too high, the cost of access will be exacerbated and the number of parked vehicles would tend towards zero. This is the Tragedy situation of the Anticommons where the resource (spaces to park) would be under-utilised.

Table 1 below shows the specificities of property rights in the case of Commons and Anticommons. It also shows three characteristics of Anticommons property.

I-3- Tragedy of the Anticommons

The situation of the Anticommons can induce a Tragedy of the Anticommons when collective management leads to the sub-optimal use of resources. In the long term, access to these resources would be completely blocked leading to the non-use of resources. The Tragedy of the Anticommons is the consequence of the Anticommons situation characterized by the prevalence of exclusion rights and economic agents acting rationally and individually. It is a symmetrical image of the Tragedy of the Commons insofar as in both Tragedies the agents impose inefficiencies on each other through the externalities they generate: the Tragedy of

the Commons leads to the exhaustion of common resources and the Tragedy of Anticommons leads to under-utilisation of resources.

Table 1: Specificities of property rights in the case of Commons and anti-commons

Common resources	Commons property	Regime where a limited number of people (commoners) can exclude non-members from using the resource, but cannot mutually exclude each other and where there are rules and procedures allowing user-members to manage the resource.	
	Anticommons property	blurry	Refers to the vagueness and uncertainty producing the overlapping of rights. This would imply a large number of property rights necessary for the use of resources.
		superimposed	Several rights on the same complementary and necessary resource
		Fragmented	Several rights on several parts of a necessary and complementary resource, which cannot be used alone.

II- Literature review

Commons goods are scarce common resources with problems related to overexploitation. In the case of Commons, users are free to use these resources without any possibility to exclude other members. The problems of the Commons were first described by Hardin (1968) as the Tragedy of the Commons. This is the result of exploiting scarce common resources under the open access regime. The study of open-access grazing systems allowed Hardin to conclude that the Tragedy of the Commons is inevitable when a scarce common resource is exploited by a large number of users, each holding a right of access to the resource. Farmers in a collective pasture, for example, behaving in an individual and selfish manner and not having internalized the externalities produced by their farm, are encouraged to introduce more animals to maximize their profit, until resources are exhausted.

Long before Hardin, Gordon (1954) studied fisheries and the causes of overexploitation of fisheries resources from an economic perspective. These authors showed that the regime of free access to common resources and the absence of private property were the main causes

of the dissipation of economic rent. Indeed, the sub-optimal management of fishing effort has led to over-investment in fisheries and subsequently to overexploitation of fish resources. This situation corresponds to the point of equality of average income and average cost that can occur in the case of fisheries and grazing lands. Fishermen continue to extract more and more fish until stocks are depleted in the long term.

Nevertheless, Individuals in a community can organise themselves and find institutional arrangements to manage their common resources efficiently (Agrawal, 2003 and Ostrom, 1990, 2008; Copes, 1986; Copes and Charles, 2004). The institutional solution also makes it possible to avoid the problems of privatisation by integrating the interests and needs of small fishing communities, through the allocation of community rights. The relationship between the Commons and private property has also been developed by highlighting certain possibilities of exclusion (Schlager and Ostrom, 1992).

The excessive privatisation of these common resources may also manifest problems related to the Tragedy of the Anticommons (Heller, 1998). The biotechnology and information technology, media, music, etc., are examples of common resources that manifest the effects of Anticommons. The latter imply the inefficiency of exploitation of these resources and the failure of their development.

The origins of the Anticommons date back to Roman times when several barons, installed on the banks of the Rhine River, forced merchant ships to pay some kind of tax during each passage. The large number of taxes and their high cost have paralyzed the trade activity of ships. Michelman and Heller described this phenomenon as Anticommons. Heller has thus studied the Anticommons through the analysis of the rapid development of kiosks next to stores, during the period of transition from the social to the capitalist regime in Russia (Heller, 1998).

According to Heller, the Tragedy of the Anticommons is defined, in analogy to the Tragedy of the Commons, as a situation where several users hold the right to exclude other members from the use of a scarce resource and none of the users has the effective power to exploit that resource. The result is a situation of under-utilisation of resources. The management failure of common resources generates very high private and social costs, especially when property rights and the process of regulation and control are excessively fragmented. The failure of

cooperation between different stakeholders in decision-making can then lead to the blocking of new investment opportunities and limit economic and social development (Heller, 2013).

In order to understand the situation of the Anticommons and their implications, we take here in detail the example of car parking spaces in an urban area. These spaces can either be used by all citizens in open access or appropriated under a regime of private ownership. In the first situation, scarce common resources suffer the negative consequences of the Tragedy of the Commons. In the second situation, the owner imposes a fixed price (right of access) that each user will have to pay to access the resource. The owner of the resource then behaves like a monopoly. A third situation also arises when parking spaces are the property of the State. State authorities may, as a result of political considerations, for example, or simply for personal interests, distribute the rights to exploit parking spaces for the benefit of several users. After a certain period of time, the number of rights holders increases so that several users share limited parking spaces. Congestion problems lead to high management costs, requiring negotiations between co-users to be able to use the park. The difficulty of these negotiations and their exacerbating costs can lead to the failure of the use of parking spaces. Thus, for the State to exploit new parking spaces, in order to promote new investments, it will have to be able to bring together all the spaces or rights of use on these spaces. Transaction costs (weak coordination and opportunism) can be prohibitive and lead to the failure of authorities to consolidate rights. As a result, parking spaces would be exploited inefficiently and new opportunities for economic development would be blocked. These are the consequences of the Anticommons corresponding to the Tragedy of the Anticommons.

Buchanan and Yoon (2000) elucidated the symmetric aspects between the Tragedy of the Commons and the Tragedy of the Anticommons, in particular in terms of economic inefficiency in the use of the resource and the consequent social costs. In the case of the Anticommons, the resources are under-utilised while they are over-exploited in the case of the Commons. The number of user rights are high in the Commons and exclusion rights prevail in the Anticommons. Inefficiency in both situations results from separate decisions where each right holder exercises negative externalities over the other right holders. All these aspects are, according to the authors, of great importance for the understanding of the problems related to the governance of the Commons. They also point out that the loss of profits, due to the under-utilisation of common resources, is proportional to the number of exclusion right

holders. The authors developed an economic model illustrating the aspects of symmetry between the two Tragedies (Buchanan and Yoon, 2000).

Parisi, Depoorter and Schulz (2005) pointed out that the problems associated with the Tragedies of the Commons and Anticommons are the consequence of the lack of conformity between rights of use and exclusion rights, in case of confused boundaries between the two properties. Both situations are associated with asymmetric transaction costs. The two Tragedies represent two extreme limits resulting from deviations in two symmetrical directions from unified traditional property. In the Commons, rights of use predominate the rights of exclusion, while in the Anticommons the rights of exclusion prevail. The situation of the Anticommons is also characterized by the fragmentation of property rights, defined at two levels: horizontal or simultaneous fragmentation and vertical or sequential fragmentation. Horizontal fragmentation corresponds to the situation where several right holders independently and simultaneously exercise exclusion rights. Whereas, vertical fragmentation corresponds to the situation where right holders exercise exclusion rights at different hierarchical levels and sequentially. The higher the level of fragmentation, synergy and complementarity between fragmented rights, the greater the underuse of resources (Depoorter and Parisi, 2003). Fennell (2004) also indicated that the use and management of common resources might correspond to an intermediate situation between the two situations of Commons and Anticommons.

The cumulative effects of fisheries regulations induce governance institutions to manifest a situation of enclosure, characterized by low flexibility and high costs. This enclosure phenomenon is often observed in the fisheries management regime based on the limitation of resource access rights, such as licenses and fishing quotas (Murray et al., 2010). The governance of common resources also depends on the level of decision-making, political subjectivity and the reinforcement of interests and human rights. This ensures the security and stability of members of the fishing community and allows their participation in the choice of appropriate collective actions (Brewer, 2012 and Allison, 2012). In addition, the inadequate and inefficient management of territorial access rights can lead to access conflicts leading to the failure to use these rights, which would lead to the Tragedy of the Anticommons (Gallardo et al. al., 2011, McCarter et al., 2012).

Based on all these considerations highlighted by the above studies, fisheries offer a framework where complex interdependencies exist between several economic operators and which can also be under the effects of the Tragedy of the Anticommons. In this case, coordination is considered as an appropriate framework for analysing multiple complex relationships between various potential actors. However, few studies addressing issues related to the Tragedy of the Anticommons in the fisheries sector have been referenced. Filipe, Ferreira, Coelho and Pedro (2012) studied the cases of Halibut and Crab fisheries in Alaska and aquaculture in Portugal. Brede and Boschetti (2007) analysed the strategy of cooperation and non-cooperation between economic operators in fishing in Australia. These authors underlined the difficulty in terms of the outcome of the decision-making process when several stakeholders are involved in this process, which led to the blocking of development projects in the fisheries sector. The concept of Anticommons has also been used to assess the impact of the system of regulation of the use of water resources within the framework of the management of river basins in the United States of America (Kosnik, 2012).

III- Empirical case studies of Anticommons

The situation of the Anticommons and its implications are empirically difficult to detect and highlight. Several studies have developed the theoretical aspects of the Anticommons much more in comparison with the empirical aspects, especially in areas where the effects of the Anticommons are easy to elucidate. Heller (2008) points out that the Tragedy of the Anticommons is difficult to spot, but it is only by becoming familiar with the concept of Anticommons, and developing more empirical studies that we can push the reflection towards a better understanding of the importance of the Anticommons in terms of economic policies. Taking into consideration the effects of Anticommons would overcome the problems of market failure and would avoid social losses and enhance collective well-being.

The most obvious empirical studies are those in biotechnology, scientific research, and information and communications technology (ICT). The business, media and fisheries sectors, where common resources are subject to strong privatization, could also constitute a vast field where the effects of the Anticommons can be observed.

III-1- Biotechnology and biology

The field of biotechnologies conceals several examples where the situation of the Anticommons can prevail. The most developed cases in the literature are the patents in biomedical research (Cancer, human embryonic cells) and biological research (tomato that consumes less water and contains anti-cancer broccoli) and in agricultural biotechnology (Case of the molecular crossing of Golden Rice). Especially when biotechnology products are ill-defined and their ownership rights are unclear or overlapping, with reference to intellectual property rights (Lam, 2007 and Munzer, 2009).

Overwalle (2016) and Contreras (2016) revealed the prevalence of Anticommons in connection with the stifling of patents in the human genetics sector and the multiplicity of stakeholders in the decision-making process. Thus, the difficulty of bringing together these multiple patents would risk blocking possible opportunities for innovation in the field of genetics. In addition, the problems in the biopharmaceutical industry and in biomedicine are due to multiplicity of patents leading to aggressive competition between the companies holding these patents. This competition thus led to the Tragedy of Anticommons (Zatorski, 2011; Biddle, 2012 and Cho et al., 2003). Technological progress in agriculture has enabled powerful companies forming an oligopoly to obtain patents on the processes and information contained in the DNA sequences incorporated into corn or rice seeds. This situation has created an obstacle to any opportunity for innovation and seed development in agriculture (Thomas, 2015). The production of Golden Rice, for example, requires obtaining 32 permissions from companies holding 70 patents on this species (Moran, 2014).

III-2- Media and the electromagnetic spectrum

The underuse of electromagnetic spectra, defined as an artificial scarcity in the field of telecommunications (Hazlett, 2012), limits the promotion of new investment opportunities because of the free granting of rights and the misallocation resources (Dibadj, 2003). This is due to heavy use of certain frequencies while others are not. This is a problem that is much more related to telecommunications management and operation policy than to technical progress (Heller, 2008). The failure to develop the 4G network by the operator LightSquared in the United States of America, for example, can elucidate the effects of the Anticommons.

The reasons for this failure are related to exorbitant transaction costs (Hazlett and Skorup, 2013).

In the same perspective, Akhiate (2014) highlighted the relevance of Anticommons for analysing the efficiency of spectral resource management. The study carried out by Akhiate revealed that the Moroccan Media sector is stuck in an Anticommons situation without resulting in an Anticommons Tragedy. The analysis of the regulatory framework and the performance of Media operators has made it possible to test the existence of an Anticommons situation (Akhiate, 2014). Mitchell and Stratmann (2015) also tested the prevalence of Anticommons in the communication services taxation system in the United States of America. Under-utilisation here is associated with over taxation and results in high tax rates and low beneficiary rates. The lack of coordination between the different tax authorities has therefore created a market failure.

III-3- Investment development

The implications of the Anticommons were also explained in the field of business and more particularly the process of creating enterprises. The work carried out by Driouchi and Malki (2011) illustrates these aspects. The effects of the Anticommons have been analysed in the case of business creation in developing countries. The authors tested the existence and prevalence of high costs associated with fragmented and separate decisions along the business creation process. The results obtained confirm the predictions of the Anticommons and show their impact on the development of new businesses in developing countries in comparison with developed countries. This greatly reduces the chances of creating new investment opportunities. The significant effect of the number of procedures and the execution time on the increase in the costs of starting a business has been elucidated (Driouchi, 2013).

Kosnik (2012) presented a case study of the effects of Anticommons on the efficiency of the management of river water, used for irrigation purposes. The use of this resource for small-scale energy production requires approval by a multitude of dispersed and interconnected agencies with the power to regulate the use of this water. Individual behaviour and insufficient coordination between control agencies caused the failure of the management system of the irrigation water use. Therefore, the development of renewable energy generation by the SSH

method has been limited (Kosnik, 2012). The federal state has over-regulated the resource exploitation activity by trying to develop the production of renewable energy using the SSH system. Thus, several legal texts have been decreed giving the agencies management and control powers. Bretsen and Hill (2009) also studied cases illustrating the prevalence of Anticommons in the management of water transfer to agriculture in the United States of America. They showed that this transfer of use was blocked because of the existence of a multitude of exclusion rights (Bretsen and Hill, 2009).

III-4- Fisheries and aquaculture

The fisheries sector is also among the economic sectors where Anticommons can emerge. Flipé studied the effects of Anticommons through the analysis of aquaculture bureaucracy in Portugal (Flipé et al., 2007, 2012). Aquaculture investment projects are significantly delayed and sometimes cancelled because of the difficulty of obtaining the necessary authorisations. These difficulties are related to the complex and lengthy rules and procedures required by the authorities. Leal (2004) drew attention to the risk of the emergence of Anticommons in relation to the excessive fragmentation of fishing quotas so that they are very low and unprofitable and therefore unused. Fisheries are characterized by the complexity of their ecological system and by the risk of stock collapse, which subjects them to the risk of a chaotic situation (Filipé et al., 2012). This fragility of fisheries systems leads to a situation of Anticommons.

Brede and Boschetti (2007) also studied the influence of economic agents on the decision-making process in relation to the regulation of fisheries resources. They highlighted the 'obstructive' effect of agents by pointing out that the Anticommons and the Commons are considered to be two extreme situations in terms of degrees of obstruction.

IV- Quantitative methods and hypothesis testing

Studies undertaken on the Anticommons situation have used quantitative methods to test the effects of Anticommons on the functioning of the market and on the promotion of innovations. The hypothesis tests focused, on the one hand, on the identification of property rights and their fragmentation in relation to the blocking of innovations, such as the intellectual property rights of human genes, and on the other hand, the testing of predictions

of the Anticommons on the market in the field of development of communication and business creation services. Other tests were also carried out to highlight the market power exercised by actors holding property rights. Collusion and oligopoly are two main causes of market power. The quantitative methods used in this context are essentially based on comparison tests, regression analyses and econometric estimations referring to theories of costs and profit. The empirical estimation of regression equations has been used, for example, to elucidate the costs of fragmented decisions, the rates of overlapping taxes and the quantification of the effects of Anticommons in the case of scientific research. Based on game theory, the 'Pre-Litigation Decisions' model was used to assess the motivations of the behaviour of the actors in dispute. Price structure analysis and Euler index estimation were also used to empirically estimate market power. For this purpose, the econometric estimation of the input demand and dif-in-dif regression equations was used.

V- Discussion

The various examples discussed above elucidate the crucial role of the Anticommons and their implications for the governance of common resources and economic development. They also provide information on the need to understand the Anticommons and to be aware of the effects they generate, especially in developing countries, before implementing institutional reforms and proposing solutions to the negative effects of policies.

The Anticommons present themselves as a symmetrical image of the Commons and lead to the Tragedy of the Anticommons. This is characterised by the existence of a multitude of exclusion rights vis-à-vis a scarce common resource, while the Tragedy of Commons is characterised by free access and a scarce common resource. Anticommons also refer to the situation where several separate rights exist on necessary and complementary inputs (King, Major and Marian, 2016). The characteristics of Commons and Anticommons are summarised in Table 2.

It is true that empirical studies on the Anticommons and their implications are still limited to certain more tangible areas, but the Anticommons are of great interest for the study of negative externalities in association with the under-utilisation of resources. The empirical examples presented in the literature show that Anticommons exist and can develop into

Tragedy when decisions are separated and economic agents exercise rights of exclusion vis-à-vis each other. Major et al. (2016) theoretically indicated that as long as there are several people with complementary rights to a scarce resource, the results will always be inefficient even in the absence of transaction costs. Coordination would be the best solution to this inefficiency, especially in the face of separate and fragmented decisions. The private and social costs associated with this fragmentation would be exorbitant (Driouchi, 2013).

Table 2: Summary of the characteristics of Commons and Anticommons and their characteristics in terms of common resource management.

Types	Commons	Anticommons
Regime of property	Common ownership (ownership and management of resources are carried out by members. Non-members are excluded)	Anticommons ownership (poorly defined, fragmented or overlapping ownership). The rights of some members can block the rights of others on the same resource.
Types of rights	Several predominant rights of use and difficulties of exclusion	Rights of use and predominance of several rights of exclusion
Access Mode	Free access to resources	Limited or regulated access
Decisions	Separated and limited (some decisions are shared between members)	Separated, fragmented and disconnected (interdependent decisions and weak or absent of coordination)
Regulations	Few regulations	Too many regulations
Tragedy	Tragedy of the Commons (High number of use rights and resources are overused)	Anticommons Tragedy (High number of exclusion rights and resources are underused)
Examples	Collective routes, fisheries, forests, irrigated areas, atmosphere, knowledge, generic heritage, electromagnetic spectrum, etc.	Parking management, biological gene patents (medicine, pharmaceutical and agricultural industry), business creation, taxation and spectrum management system, etc.

At the institutional level, Mitchell (2015) tested the negative effects of Anticommons in the case of the policy of taxation of communication services. This example illustrates the case of sequential Anticommons, in which several property rights are superimposed, held by entities located at several hierarchical levels and exercised over the same good or service. This can lead to increased private and social costs. In this case, an institutional solution is possible. Another problem related to the Anticommons is related to the blockage in the innovation

process, insofar as the proliferation of intellectual property rights creates a phenomenon of piling up patents, the main cause of reducing opportunities for innovation and development of scientific research (Biddle, 2012).

The involvement in the managerial process of public institutions and private economic operators, with divergent and often conflicting interests, raises problems in the design and implementation of the economic development policies, particularly in developing countries. This corresponds to the situation where interconnected decisions are fragmented and economic agents act individually and separately, without taking into account the externalities of their decisions. This situation refers to the Anticommons where decisions are inefficient and private and social costs are very high. More coordination would be needed in such situations (Driouchi, 2013; Driouchi and Malki, 2011).

Many studies have been carried out on the methods of managing common resources and the importance of communities exploiting these resources directly. Brewer (2012) highlighted the important role of social groups as well as their institutions in preserving common resources. He also stressed the importance of taking into account the interests of members of the fishing community in the choice of appropriate collective actions.

In addition, poor fisheries governance negatively affects the well-being of communities. In the case of fisheries, for example, Murray has shown that the cumulative effects of fisheries regulations induce governance institutions to be in the situation of enclosures, characterized by low flexibility and high costs. This phenomenon of institutional enclosures is often observed in fishery management regimes based on limiting access rights to resources, such as fishing licences and quotas (Murray et al., 2010; Heinmiller, 2009).

In this light, the level of decision-making, political subjectivity and the strengthening of interests and human rights could ensure the security and stability of members of the fishing community as well as their participation in the choice of appropriate collective actions (Brewer, 2012; Allison, 2012). For this reason, many authors have recommended the privatisation of common resources and the adequate and appropriate definition of private property rights. The solution to the Tragedy of the Commons therefore lies in the redefinition of private property: individual transferable quotas, ITQ, for example (Grafton et al., 2006; Libecap 2007, 2009; Arnason, 2007, 2012).

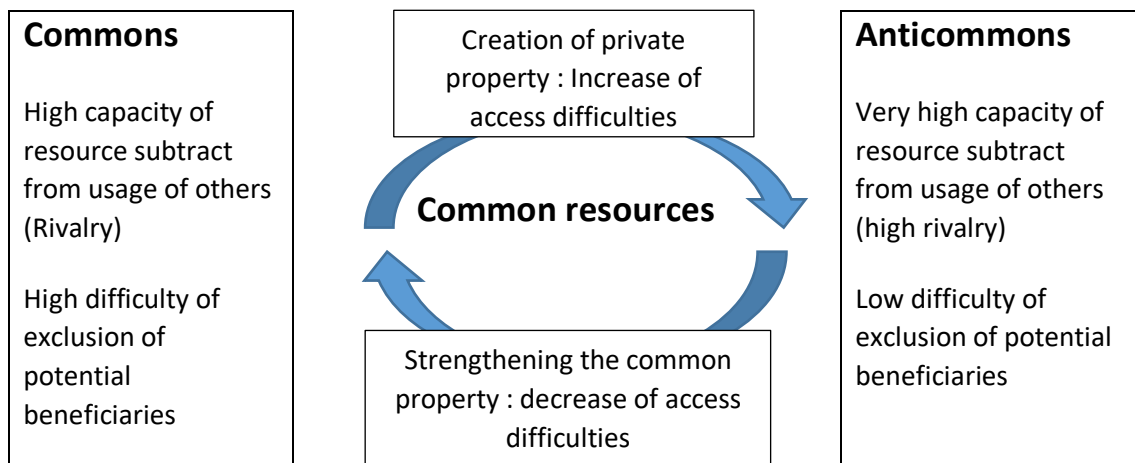
Table 3 presents the main advantages and disadvantages of solutions to the Tragedy of the Commons.

Table 3: Advantages and disadvantages of solutions to the Tragedy of the commons

		Solutions based on		
		Markets	State	Institutional arrangements
Advantages		Optimal means for the production and exchange of private goods (align private costs with social costs)	Imposes rules and restrictions in order to procure the necessary resources and limit selfish behaviour (align private costs with the social costs of resource use)	Understand the wide variety of institutional arrangements that humans construct to govern, provide and manage public goods and common resources
	Disadvantages	Concentration of resources in the hands of a few people	<ul style="list-style-type: none"> • High monitoring and enforcement costs, • Private agents do not receive all the social benefits, • Lack of flexibility and low efficiency 	<ul style="list-style-type: none"> • Difficulty in meeting the conditions required to have a stable institution in the sense of Ostrom, • Valid solution for small-scale resources

The above examples relate to tangible resources and illustrate the problems associated with the Tragedy of Commons. The literature is rich in similar ample examples, namely forests, air pollution, motorways, parking spaces, genetic heritage and biodiversity, etc. There are also other intangible common resources that have been studied by economists, in particular knowledge, communication and information technologies (internet) and the electromagnetic spectrum. Among these resources, knowledge, information and culture have the characteristic to multiply by sharing (Calame, 2010; Aigrain, 2010).

Commons are defined in relation to their strong capacity to remove the resource from the use of others (equivalent to rivalry), on the one hand, and with more difficulties in excluding potential beneficiaries (Ostrom, 2011). These two characteristics can help to understand the relationship between Commons and Anticommons (Figure 2).



Source : Author

Figure 2: Dynamic Relations between the situation of Commons and the situation of Anticommons and the role of property rights

The dynamic relationships between the Commons and the Anticommons can be understood in terms of the level of creation of private property that determines the level of difficulty in accessing common resources. The transition from the situation of the Commons to the situation of the Anticommons is induced by a strong privatization resulting in the great difficulty of access to common resources. The shift from Anticommons to Commons is, by contrast, induced by the strengthening of common ownership resulting in easy access to resources.

On the other hand, the convergence between the economy of ownership and the economy of decision-making can help to understand how the Tragedy of the Anticommons appears in the presence of fragmented and dispersed decisions and in the absence of coordination. The benefits of a balance between coordination and fragmentation in the decision-making process are therefore significant, in relation to the governance of common resources. Problems linked to the Tragedy of the Anticommons might hinder economic development and restrict the creation of new investment opportunities, thus limiting the development of markets (Driouchi and Malki, 2011). In the same perspective, Major, King and Marian, (2016) have shown that the failure of cooperation in the case of the existence of several actors is not the only consequence of market failure, but it is a systematic result of an Anticommons situation. As soon as there are a multitude of owners of complementary rights, each behaving in such a way as to maximize its own profit vis-à-vis a scarce resource, the likelihood of success diminish and the use of the resource is systematically inefficient.

In the case of fisheries, the problems associated with the failure of the governance of fishery resources and their implications, in relation to the Commons, have been studied by several authors. Crosson, Yandle and Stoffle (2013) highlighted the importance of transaction costs relative to institutional arrangements in fisheries, in this case the property rights. Transaction costs (especially coordination costs) are likely to block decision-making processes and thus hinder the creation of new opportunities for investment and economic development in fisheries. Also, the value of taking into account social arrangements and institutions, involved in the development of resource conservation policies, has been elucidated in line with the scale and level of information available (Wilson, 2007; Acheson, 2010).

Conclusion

The Commons and Anticommons are two important phenomena characterizing scarce common resources, which have been much debated in recent years economically, legally and politically. These are two symmetrical situations linked to the existence of multiple rights of use in the case of Commons and multiple rights of exclusion in the case of Anticommons. In analogy with the Tragedy of the Commons, the Anticommons can induce a Tragedy of the Anticommons when the rights of exclusion are held by many actors. The empirical examples analysed in the literature highlight the prevalence of the Anticommons, particularly in the cases of intellectual property rights, investment development and the media. The recognition of Anticommons by the various stakeholders and the consideration of their implications can avoid market failure and promote economic and social development.

The Commons refer to the situation where multiple users have free access rights to a scarce common resource without being able to exclude each other mutually. While the Anticommons can be defined as a property regime where multiple users hold effective rights of exclusion vis-à-vis the resource and no one has the privilege of using this resource without the permission of the other users. The problems of Commons and Anticommons are the result of the excessive fragmentation of rights over a scarce resource, which are held by many economic agents.

The Tragedy of the Anticommons is characterised by higher transaction costs and the under-employment of resources, which generates too much loss in social well-being. In some cases, the effects of Anticommons can be chaotic and result in complete inhibition of resource use. Developing countries present conditions that can lead to the Tragedy of the Anticommons, including bureaucracy and lack of transparency, rigid institutions, and insufficient coordination and knowledge. Ignoring the effects of Anticommons increases the risk of market failure and thus reduces investment and development opportunities. The integration of the Anticommons in the decisions of economic agents can guide and improve the economic policies of emerging economies.

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