Externalities, collective goods and the requirement of a state's intervention in pollution abatement

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Non Technical Summary

Does pollution reduction require the intervention of the state to force polluters via a tax or an emission standard to change their behaviour?

The tradition in economics is to say yes. Pollution is considered as a case where the invisible hand does not work, that is to say the individual interests of agents (e.g., the profit maximising by firms) diverge with the general interest (i.e., the maximising of wealth). The reason for such a market failure is that pollution is characterized with an externality feature. An externality occurs when a transaction between two parties does not take into account a benefit or a loss for a third party who is not in the market arena. For instance, the whale capture and trade benefit to fishermen and users but hurt people who care this animal and will its protection as an engendered specie. A correlated reason is that pollution abatement is often characterised with a collective good feature. It benefits to all even those who do not pay for it, and this discourages people to make efforts. In presence of a collective good, the invisible hand also fails : the collective interests of fishermen is not to over-capture but their individual interest is to free-ride, that is to say not to restrain the capture of whale while the others are expected to reduce this capture. In confrontation with externality and collective good issues the traditional recommendation of normative economics is to call for government intervention. In setting a tax or an emission standard, the government will remedy to the market failures. It will achieve what the market fails to do : the setting of an optimal price or quantity of environmental resources. In other terms, the government plays a role of a benevolent maximiser of welfare. According to this vision, a state's intervention is the single means to cope with hazardous emissions. Indeed, only two mechanisms of coordination between agents are envisaged : the competitive market and public planning. When the first fails, the other must be set.

This traditional vision is both misleading and wrong:

Nowadays, one encounters a new approach of environmental policy which puts emphasis on voluntary initiatives and actions. Instances are the setting of eco-label and environmental management schemes where firms may opt in or opt out for improvement programmes of their environmental performances, and the growing number of bilateral agreements between industry and government on long-term pollution abatement objectives. One also observes self-regulatory arrangements where industry associations commit in environmental programmes in the absence of public authority intervention. An interesting example is the responsible Care Programme undertaken by the International Council of Chemical Associations. It promotes the adoption of good environmental practices and the implementation of indicators of environmental performances. According to the traditional vision there is no economic rational for such a new approach. Above all voluntary initiatives and actions are denied to be an efficient alternative to the setting by the government of taxes or emission standards. They are marked with the stigma of being just cosmetics.

From a theoretical point of view, this traditional vision is also wrong. The technical aim of the paper is to demonstrate that the necessity of a state's intervention in presence of externality and collective good is not analytically founded. The demonstration is based on the market failures theory revisionism as initiated by R. Coase, a Nobel Price in economics, and developed in the law and economics literature. The demonstration is made in considering two states of nature: a world with zero-transaction costs, that is to say a world where agents can costlessly negotiate, elaborate and enforce a contract - and a world where these costs of using a mechanism of resource allocation - whatever it is a firm, a market, an industry association, or a government - are positive.

The micro-economic rationale for public intervention in case of externality is discussed and criticisised in a second section; that one of collective good in a third section.

Summary

The concepts of externality and collective good are often used by economists to infer that a state's intervention is strictly necessary to cope with the harmful effects of pollution on the environment. Such inference is wrong. It is also misleading. An example is provided by the current debate on voluntary approaches in pollution abatement. These are self-regulatory arrangements where a firm or an industry association, commits in an environmental programme vis-à-vis consumers or local communities. A well-known example is the Responsible Care Programme undertaken by the International Council of Chemical Associations. Based on the common belief that a state's intervention is the single means to achieve pollution abatement, such initiatives are judged as reflecting a pure communication strategy and are expected to inavoidably result in cosmetic effects on the environment. The aim of the paper is to remind that the nature of hazardous emissions as externalities and the nature of their abatement as collective goods do not logically imply that a state's intervention is necessary in ensuring pollution reduction. The exclusion of private arrangements as an alternative to public regulation is not theoretically founded. The paper surveys the market failures theory revisionism as initiated by Coase (1960) and developed in the law and economics literature. It concludes that whether private arrangements in pollution abatement may be an alternative to public regulation is an issue which can only be treated and solved at the empirical level. The micro-economic rationale for public intervention in case of externality is discussed and criticisized in section two, that one of collective good in section three.

"It is a capital mistake to theorize before one has data"
(Conan Doyle, Scandal in Bohemia)

1. Introduction

The concepts of externality and collective good are often used by economists to infer that a state's intervention is strictly necessary to cope with the harmful effects of pollution on the environment. Such inference is wrong. It is also misleading. An example is provided by the current debate on voluntary approaches in pollution abatement. These are self-regulatory arrangements where a firm or an industry association, commits in an environmental programme vis-à-vis consumers or local communities. A well-known example is the Responsible Care Programme[1] undertaken by the International Council of Chemical Associations. Based on the common belief that a state's intervention is the single means to achieve pollution abatement, such initiatives are judged as reflecting a pure communication strategy and are expected to inavoidably result in cosmetic effects on the environment. The aim of the paper is to remind that the nature of hazardous emissions as externalities and the nature of their abatement as collective goods do not logically imply that a state's intervention is necessary in ensuring pollution reduction. The exclusion of private arrangements as an alternative to public regulation is not theoretically founded. The paper surveys the market failures theory revisionism as initiated by Coase (1960) and developed in the law and economics literature. It concludes that whether private arrangements in pollution abatement may be an alternative to public regulation is an issue which can only be treated and solved at the empirical level. The micro-economic rationale for public intervention in case of externality is discussed and criticisized in section two, that one of collective good in section three.

2. The revision of the argument of a state's intervention in presence of externalities

Since Pigou (1932), externalities are associated with market failures and state intervention is the natural means to remedy to it. The argument goes along the following lines. In presence of an externality, the welfare theorem does not hold: the competitive market diverges from a Pareto equilibrium. It follows immediately that the state must do something since there is simply no other alternative and planification is a perfect mechanism of resource allocation. It will solve the market misallocation by interfering on price or quantity. This view of the state as a natural and efficient alternative to the market is conform with the first mid twentieth century vision when neo-classical economics envisaged central planning as a perfect substitute of market in resource allocation. One reminds that this period has been marqued with an intense debate on the socialist calculation. From a Walrasian point of view, there is a formal similarity between the allocation problem in a private enterprise economy and a socialist economy. However, in absence of price mechanism the collect of information on preferences, technology, and endowments, the calculation of Walrasian equations have to be made by public authorities. Against the Austrian school (Van Mises and Hayek), it was argued by neo-classical advocates of socialist economy (Lange and Lerner) that central planning is perfectly able to cope with such an informational problem. Puzzlingly, one may notice that in this theoretical realm limited to only two possible mechanisms of resource allocation, they are said to be perfect substitutes but an advantage remains to planning for it is able to remedy to externality whereas market is not. However, this theoretical advantage holds only because of a set of heroic hypotheses: the state as a Pigouvian authority is omnipotent; is a benevolent maximiser of welfare; is able to collect information free of charge.

A state’s intervention as an efficient means to allocate resources has been challenged by the economic theory of regulation (Stigler, 1971) and the public choice theory (Tullock, 1967). However, within the normative economics perspective the disbalance in favour of state intervention has been corrected much later by so-called new economics of regulation (Laffont and Tirole, 1991) through the analysis of

[1] A comprehensive description of this self-regulatory arrangement is provided by Gunningham, 1995.

regulatory failures. According to their causes, they are customarily classified as follows: the lack of information of the regulator who is then confronted with an informational asymmetry which benefits to the regulated industry; the specific interest of the regulator (e.g., to obtain a future position in the regulated industry) who therefore may fail in acting in accordance with public interest goal; the lack of credibility of the regulator in its future commitment which leads industry not to take irreversible decision of compliance even if they are socially efficient. Owing to these regulatory failures, public intervention can only achieve second best equilibria.

Astonishingly, the inclusion of regulatory failures in normative economics does not result to question the decision of state intervention and the unique alternative option to public regulation rests on *laissez-faire*. Once both regulatory and market failures are taken into consideration, one would have expected a balanced analysis of the two types. Intuitively, one might say that public intervention must not be recommended when regulatory failures overweigh the market failures that the regulator is supposed to solve. Such a balance is not made possible by the modern economic theory of regulation because the concept of regulatory failure is not symmetrical to the concept of market failure. The latter is independent from the idea of imperfections one encounters in the real world as errors in calculation, uncertainties or inconsistent expectations which also violate the welfare theorem. As pointed out by Bator (1958), externalities - or market failures[2] - would occur in a pure theoretical world of a stationary context of perfect information where agents maximise their utility without any calculation error. This is different matter for regulatory failures for they are associated with some "bad" attributes of the real world such as the capture of the regulatory agency by industry. Conceptually, the terminology of failures is very confusing for market failures are unrelated to any strategic behaviour of agents whereas regulatory failures are originated from it[3]. As a result it is not possible to compare welfare losses due to market and regulatory failures. If one wants to compare the relative failures of market and public intervention one cannot logically compare perfect market with imperfect regulation (or *vice-versa*).

This is why economists which depart from a perfect regulator scheme and which analyse the welfare loss owing to the informational asymmetries between the environmental regulator and the polluting industry continue to take as granted that public intervention is necessary. They implicitly assume that the market failure is higher than the regulatory failure related to the public intervention in pollution abatement.

Coase (1960) is the first economist to envisage the treatment of externalities without state intervention such as via direct bargaining between polluter and polluted and the integration of the emitor and recipient of externality within the same firm. He proposes a new analytical background to compare the ability of different institutional arrangements to realign private and social costs. The line of reasoning of the now so-called transaction costs approach is as follows: the use of a mechanism of resource allocation whatever it is the market, the firm, or the administration is not free of charge. The choice between the several possible arrangements of organising resource allocation depends on the relative cost of each one. If, for instance, the transaction administrative cost to abate pollution is lower than the transaction cost through direct bargaining then the preferred option relatively to the other is obviously public intervention. There is no *a priori* preference for, nor exclusion of, a particular institutional arrangement; in particular there is no general superiority of private ones over public ones or *vice-versa*. Moreover, *laissez-faire* is only a solution when transaction costs of all the possible allocation mechanisms are higher than the benefits that pollution abatement entails. A reasonable statement since in this case any change in the *status quo* results in a decrease in the social welfare.

The transaction cost approach to the choice of allocation mechanism radically departs from welfare economics and puts in evidence its analytical failure. As the key of concept externality is substituted with

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[2] The concept of externality as used by Bator (1958) is very large. Indeed, it includes all types of market failures (those due to non-appropriability of resources, non-convexity of production function, and publicness of goods).

[3] Both cases are measured in the same unit (in variation in producers' and consumers' surplus) but the benchmark differs. The welfare loss due to a market failure relates to a difference between two perfect worlds whereas as far as regulatory failure is concerned the variation of surplus results from the passage from one imperfect world to a perfect one (the welfare loss is the amount of the rent that the regulator is obliged to leave to firms as a counterpart of the revelation of their abatement cost). In the case of market failures, the additional welfare loss owing to market imperfections like informational asymmetries and uncertainties are not accounted for. This plays in favour of public intervention for market failures are higher when one considers the additional problem of market imperfections. However, the point here is to discuss whether public intervention is analytically founded not if it is pragmatically and empirically founded.

transaction cost - and, a zero-transaction world - as the point of reference to assess the improvement of resource allocation is remplaced by a world of positive transaction costs. As pointed by Calabresi (1968), in absence of transaction cost, externality could not even occur much less persist. If we could eliminate transaction costs, *de facto* externalities would be of no consequence. In other terms, in absence of transaction costs, there cannot have deviation from an optimal allocation of resource. The reason is simple: if there were no costs of transacting, then the potential Pareto improvement could be realised by costless bargaining between self-interested agents. Therefore, in a zero-transaction world, there is no possible improvement of resource allocation. To assess an improvement one have to take a positive transaction costs world in reference and examine the different option which may reduce them. Therefore, externalities are not what is the matter. "It is a very strange feature of modern welfare policy prescriptions that they proposed to do away with externalities, which are only one of the symptoms of an imperfect world, rather than with transaction costs, which are at the heart of the matter of what prevents Pareto optimal bliss from ruling sublime" (Dalhman, 1979). It is important to notice that the transaction costs approach eliminates the frontier between market failures as defined in reference to a perfect world and market imperfections originated from imperfect information and strategic behaviour.

To sum up, the attention to transaction costs reveals that the preference of welfare economics for public intervention is an implicit value judgement. Welfare economics says that the intervention of the state is necessary to efficiently remedy to market failures. According to transaction costs approach, this is consistent if and only if: (i) transaction costs are positive, (ii) administrative transaction costs (that is the costs of the use of public intervention as a mechanism of resource allocation) are lower than transaction costs of market mechanism, (iii) administrative transaction costs are lower than the benefits that pollution abatement entails. The superior ability of the state in the Pigouvian tradition to cope with externality remains an assertion, to be taken on faith; it is not based on any analytical proof.

3. The hurdles for private supply of collective goods

Another analytical argument about the natural necessity of a state's intervention to abate pollution is provided by the theory of public goods (Samuelson, 1954). Environmental damages are often featured by the attributes of non-excludability and non-rivalry that characterise collective goods. (The latter term is used hereafter instead of public goods to merely underline that the provision of these goods is not necessarily public). Take the example of a local emission in the atmosphere. Once it is produced by the operating industrial plant, people in the neighbourhood cannot avoid to consume this good, i.e., to breath. Moreover, the breath of polluted air does not affect the bad quality of air inhaled by other individuals in the vicinity. At first glance, as far as pollution is concerned, it seems more convenient to speak about bads rather than goods. However, the terms are perfectly substituable for the non-provision of a desired collective good is a collective bad (Brubaker, 1975) and the remission of a collective bad is a collective good[4]. For instance, one cannot exclude people from benefiting the green house effect reduction provided by an emission abatement, say of a power generation plant. Besides, the consumption of this cleaner quality of air by an individual is not diminished by allowing additional individuals to consume it. The whole actual and future population of the earth is supposed to benefit from CO2 pollution abatement. Because of this symmetry, the term of collective good is maintained hereafter to describe non-excludable and non-rival pollution. This kind of pollution raises the problem of the commons (Hardin, 1968; Dasgupta, 1990), a problem associated with a joint use in natural resources. The academic example is that of common pasture and its reciprocal nature: if I bring an additional cow into the meadow, I harm you and all other cattle people; there will be just that much less grass for your cattle and for those of others; if you bring an additional cow into the pasture you harm me and all other people.

A straightforward critic of the collective good argument may be addressed. Collective goods are just a special case of externalities. The example of common pasture gives an intuitive demonstration: it may be posed as a problem of reciprocal externalities where any farmer is both a polluter and a pollutee in case of over-grazing. Formal demonstration are proposed by Evans (1970) and Cornes and Sandler (1986). Therefore what has been said in section two on externalities can be extended to collective goods. However, the theory of collective goods gives rise to new issues such as free-riding which are of interest in the

[4] Public goods and bads have the same nature as well as negative and positive externalities have the same nature. The change in the sign does not affect the problem except when one considers that the individual behaviour is differently sensitive to a loss and a gain. However, the hypothesis of loss aversion as proposed by Kahneman (1991) is not considered here.

problem of private supply of pollution abatement. That is why here the longer demonstration is proposed as the more interesting route to follow.

The rationale for public intervention in case of pure collective goods seems especially strong. It is twice required because non-excludability and non-rivalry call each one independently to the other for public action. We first examine non-excludability and then we turn on to non-rivalry.

For all tenants of the theory of public goods, non-excludability make the market unable to efficiently provide collective goods. However, different rationales are argued and are comprehensively discussed below. According to a classical view, the market is unable to provide any amount of collective good. Whereas in more recent theoretical developments, private provision of non-excludable goods is envisaged but it is inefficient: market would undersupply collective goods relatively to the socially optimal amount.

The argument for the zero-supplying of non-excludable goods by market rests on the inability of private producer to charge a price from users. This is the academic example of lighthouse where the owner cannot secure payment from the ships which use it. As a result, the building of such a facility is unprofitable for a private firm and the collective good will not be supplied. The usual line of reasoning advocated by welfare economists applies: the invisible hand of the market fails to achieve a socially optimal equilibrium; so government should intervene for it is the unique envisaged alternative mechanism of resource allocation. As regards the type of market failure, non-excludability can be ranked as a "failure by incentives" à la Bator (1958). This reasoning entails the same contradiction than in the case of remedying to externalities. In absence of transaction costs there is no problem of excludability. A potential private supplier (e.g., a lighthouse-builder firm) sets a pre-contractual arrangement with potential users (shippers) of the collective good and decide to produce it depending on the pre-payments and commitments of its future clients. In a zero-transaction world, bargaining, contracting and enforcement are costless and therefore such a pre-contractual agreement between parties will result in an optimal production of the non-excludable good. If now we consider a more realistic world where transaction costs and imperfect information prevail, once more the necessity of a state's intervention is not analytically founded. The feasibility of provision of non-excludable goods by private means depends on the cost to ensure exclusion. There are two means. One consists in setting technical devices as scramblers or club gates, or setting tie-ins with an excludable good as the access to harbours for lighthouse users. The second means is provided by contracting: in absence of physical excludability the owner must be able to monitor usage and enforce claims against users (Borcherding, 1978). The cost of a technical device is obviously a pure empiric variable and this does not provide an analytical argument in favour of zero-supplying. The enforcement costs are also contingent to the empiric context. However, it is implicitly assumed by tenants of zero-supplying to be infinite. Indeed, zero-supplying is traditionally associated with the strongest version of the free-riding hypothesis: each individual expects that the others will contribute to the provision of the good. Consequently, if a potential private supplier proposes a contractual scheme to potential users, everybody will express his absence of interest and nobody will sign in the hope that a sufficient number will. Such a behaviour entails a disutility for each potential user for each one knows that the other know that he will not sign and therefore the collective good will not be produced. However, it is still rational not to commit in the pre-contractual arrangement because the owner is assumed not to be able to monitor usage and enforce claims against users. Zero-supplying is stylised as a prisoner's dilemma from which one cannot escape for contract between parties are not enforceable. The state should then allocate public expenditures to produce the non-excludable good. In this case, the state intervention is founded but it is based on a pure *ad hoc* hypothesis: the power to enforce is the monopoly of the state.[5] We will see now that the other rationales for a state's intervention in the presence of non-excludable goods are also linked with specific versions of the free-riding hypothesis.

Nowadays, the private supply of non-excludable goods is not rejected by public goods' theorists. This view is indeed more adequate with the growing in number empirical studies which document such a private provision. One may quote the Coase (1974) historical study on the lighthouse finance and administration which demonstrated that the private sector in Britain had been supplying lighthouses since the 17 th. Century..."The early history shows, that contrary to the belief of many economists, a lighthouse service can be provided by private enterprise [...] The lighthouse were built, operated, financed and owned by private individuals [...] The role of the government was limited to the establishment and enforcement of property rights in the lighthouse". However, within a normative economics perspective

[5] This is a very different hypothesis from the common statement that the state is equipped with the monopoly of legitimate violence, which undoubtedly provide the state with a stronger coercive power of enforcement than the one of private arrangements but does not preclude private coercion and enforcement.

such empirical consideration does not undermine state intervention. The necessity of public action enters now through the window of market underprovision of collective goods. It is backed on another famous academic[6] example: bee services of honey production and apple tree pollination. The two productions are tied. The market of honey (or the market of apples) may make profitable the installation of hives by beekeepers (or apple tree growers) without regards to the absence of an exclusion or charge system between the parties. In that case, bee services although a non-excludable good[7] are provided without public intervention. But, an externality problem arises: bee owners (whatever they are beekeepers or apple tree growers) provide a free of charge service (pollinating fruit trees or honey making, respectively) to the other party. Consequently, an insufficient and non-optimal number of hives will be installed by beekeepers for the positive externality they produce is not compensated by apple growers. We go back to the argument of state intervention in presence of externalities as presented and criticised in the second section. The now familiar to the reader two cases have to be considered. In a zero-transaction costs world, there is no externalities to correct since costless mutual contracting between parties has achieved a Pareto-optimum. In a positive transaction costs world, the respective ability of different arrangements is given by their relative transaction costs, in particular here those involved in the solving of the problem of revelation of preferences.

Because of the absence of price mechanism, the information on preferences have to be collected by public authorities to identify the optimal amount of provision of collective goods. But here intervenes a second version of the free-riding hypothesis: it is in the selfish interest of each individual to give false signals, namely to pretend to have less preference in a collective good that he really as. To overcome this typical asymmetry of information problem, public authorities have to set a specific incentives system. As a result, only second best solutions can be achieved by public action. As far as the case of private provision of collective good is concerned the effect of the above assumption on free-riding, is strictly the same. An individual which sets a pre-contractual scheme with potential users of a collective good (e.g., a lighthouse-builder firm which contracts with shippers before providing the facility) is confronted with an identical problem of preference revelation. Here, the hypothesis of free-riding does not introduce *per se* a difference between the respective ability of private and public arrangement to treat non-excludable goods problem. The better arrangement is the one which sets the less costly system to overcome free-riding. Depending on contingent circumstances such as the number of parties, this might be state intervention or self-regulation.

We then arrive to a last argument for public intervention in presence of non-excludable goods: large coalition of private interests are unstable. The assumption is that individual members of large coalition may easily defect (not contributing to the costs) but continue to benefit from the collective good. This third version of the free-riding hypothesis is inherited from Olson's theory of collective action (1965)[8]. It considers that the propensity to contribute to collective goods diminishes with the size of the group. The underlying idea is that the larger the group, the easier for individual to cheat for the lower the probability of non-compliance to be noticed and sanctioned. This is usually considered as a disadvantage for private supply of collective goods versus state supply. In other terms, private systems of monitoring compliance and sanctioning are implicitly assumed weaker than state enforcement capacities. This might be generally true at the empirical level[9] ,but in any case this is not an analytically founded reason.

The argument of non-rivalry of benefits to state that public intervention is necessary is shorter to discuss. The line of reasoning of public goods theorists is simple and there is only one rationale, that one as initially formulated by Samuelson (1954). Owing to non-rivalry of benefits, the marginal cost of serving additional persons is zero. Therefore, it is socially optimal to offer the non-rival good to anyone who will to consume it (i.e., not to restrain its use even if the good is also excludable). But this conflicts with the profit-maximising price that a private supplier will offer. Charging a profit-maximising price inefficiently

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[6] Like lighthouse, the case of bee services is used for an academic purpose rather than to explain empirical observations. Like lighthouse, the case of bee services is not adequate to illustrate non-excludability for as pointed out by Cheung (1973), beekeepers generally do not provide bee services freely to fruit growers. In United States bees are in fact transported to orchards and rented to growers who need pollination service.

[7] Bee services between a beekeeper and an apple grower is considered as a polar case of public good for the specified group which benefit from it is only limited to a two person neighbourhood.

[8] Even if the term of free riding is not used in the Olson's book.

[9] As far the environment is concerned, the lack of enforcement of adopted policies is frequent in some countries like Italy. It seems that in this country, private enforcement of pollution abatement programmes at the local level is more powerful than national public enforcement (Brusco et alii, 1996).

excludes some users whereas the setting of the price at the level of the lowest willingness to pay induces a deficit for the producer. For those which are more familiar with the natural monopoly problem, one would recognise the marginal and average costs divergence and the social welfare loss as represented by the deadweigh cost when the price is set at the average cost. The implication is the same: non-rival goods have to be priced at marginal cost and financed by the state through taxation. However, as argued by Demsetz (1970), and similarly to externalities, non-rivalrous consumption may give rise to price inefficiencies only if transaction costs are positive. The argument is that in absence of transaction cost, the producer may charge each consumer a separate price slightly below his marginal valuation and ensures a complete price discrimination. The anthem of the market failure revisionist theory sounds back again: if transaction costs are zero, then there is no inefficiency to remedy by public intervention and if transaction costs are positive there is no *a priori* advantage for public arrangements over private ones, or vice versa.[10]

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To sum up, it is very important to distinguish the concepts of externality and collective goods, and the theory of action which is derived from them. The two concepts have a strong power of explanation of pervasive actual phenomena. The theory of action to be taken in the presence of such goods is less worthwhile. As far as the implication of a state's intervention is concerned, its validity is ultimately founded on contingent hypotheses regarding variables like bargaining and enforcement costs. Whether self-regulatory arrangements may be an alternative to public regulation is a pure empiric question.

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[10] One particular reason which underlies the latter statement is that there is a trade-off between some uneconomic exclusion that a charge on non-rival goods entails and the loss of information concerning the valuation of the collective good when free access is ensured and production is paid by public expenditures.

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