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Coasean versus Pigovian solutions to the problem of social cost: the role of common entitlements

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Abstract: This paper works towards drawing a proper relationship between the Coasean and Pigovian approaches that should be based on the distinction between individual/private and shared/common entitlements. Because of the specific goals of his work, Coase (1960) does not make an explicit distinction between the two types of property rights; however, there are basic differences in their management, so this distinction is essential. According to Coase, the definition of property rights facilitates the optimal allocation of private entitlements through Coasean bargaining and market transactions. This paper suggests that shared/common entitlements should also be taken into account. The shared/common entitlements alternative is so important that it should be explicitly outlined in Coase's entitlement optimisation assumption. When resources are shared among members of groups and communities, Coasean bargaining and market deals may be carried out only after co-owners organize and collective management is established in order to negotiate the reallocation of entitlements. For Coasean bargaining to take place in these situations, centralized (i.e. Pigovian) rules and regulations should first be adopted by the groups/communities. Hence, in cases of common property rights, the Coasean and Pigovian approaches are complementary to one another. In such cases, Coasean bargaining is not a rejection of centralized Pigovian regulation but is a means to its improvement. And vice versa: relevant Pigovian rules adopted by the co-owners of entitlements are necessary institutional arrangements enabling Coasean market solutions.

Keywords: Coasean bargaining, collective action, common property rights, entitlement optimisation assumption, Pigovian institutional arrangements, Pigovian taxation/regulation

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1. Introduction

Ronald Coase's "The Problem of Social Cost" is not only one of the most cited articles in economics, law and social science, but also one of the most debated works in these fields. Hardly any other paper has been subject to either the ardent support or the severe criticism Coase's piece has received in hundreds of studies. Researchers have identified and discussed multiple aspects and layers of the article's content, e.g. four theorems (Stigler 1966; Lai and Lorne 2015) and four corollaries (Hovenkamp 1990). Scholars have explored the impact of transaction costs on the assignment of property rights and the implications of the latter for institutional structures, natural resource management, pollution, and many other aspects of social life.

Along with all these issues, the key problem of the article as defined by Coase – his argument with Pigou about the proper treatment of externalities – has been the subject of the studies of Baumol (1972), Yandle (1997), Demsetz (1996, 2011), Aslanbeigui and Medema (1998), Webster (1998) and Hovenkamp (2009), as well as many other researchers. Some have argued that Coase overstates the opposition between his method and that of Pigou. This paper contributes to that discussion. Specifically, it focuses on the implications of the Coasean approach in contexts of common property rights, i.e. when an externality concerns multiple individuals/parties (Polinsky 1983, 12–14). Indeed, researchers have noted that in "The Problem of Social Cost" Coase is concerned only with cases of externalities between two parties (Schwab 1987; Major et al. 2016), but few have analysed the implications of collective negotiations and actions. Like some of these researchers, I support the view that "coordinating the desires of multiple parties" is actually the "largest impediment" to reaching an efficient Coasean solution (Calabresi 1968, 68; also Schwab 1987, 267). This impediment is caused by the high – often prohibitively high – transaction costs in such cases. Whereas the high transaction costs are no doubt a major consideration for the Coasean solution, this research puts an even bigger emphasis on the specific nature of the solution in situations with multiple parties and common/shared/collective entitlements. In fact, Coase (1960, 18) himself mentions in his article (but without going into much detail) the issue with multiple consumers of externalities. He notes that when "a large number of people are involved", arrangements made by central governance may be more efficient than those handled through the market. Whereas Coase acknowledges the *possible* role of the government in solving externality issues in such cases, in this paper I argue that when multiple co-owners of a common resource are involved, any Coasean solution *unavoidably* employs centralized interventions (although generally at levels lower than the government) that should be termed Pigovian. If, for instance, as a result of Coasean negotiations a collective company-polluter has to compensate a victim of pollution, then the only way for the company's management to raise the funds for the payment is by imposing a sort of "Pigovian tax" on all shareholders. Or if the victim to be compensated is a local community, the body governing this community will allocate the compen-

sation among the community's members through a sort of "Pigovian subsidy". As the paper shows, *in contexts of common/collective property rights*, the implementation of a Coasean solution *necessarily* employs centralized measures of the Pigovian type.

If not for the title of Coase's article, considering the multiple-parties option might seem unimportant. Yet the title is about social cost, because this is characteristic of externalities: they generally concern multiple parties. It is therefore strange that in his article Coase investigates only costs incurred by single third parties. In the Pigovian sense, "social cost" is a cost incurred by society, which clearly comprises multiple third parties (Major et al. 2016). As this research concludes, when several or numerous third parties are concerned, the Coasean and Pigovian approaches are neither totally different nor opposite to one another, but rather are complementary. After all, Pigovian regulation and taxes/subsidies are no doubt a form of institutional arrangement, and as such they should take their place among the alternative Coasean solutions.

Because Coase himself opposes his own approach to the treatment of and solutions to externalities to that of Pigou, I follow Coase's article in juxtaposing the two. With only one exception, I consider Pigou's position *only as interpreted by Coase*. That is, I do not analyse in detail solutions to externalities proposed by Pigou in, e.g. "The Economics of Welfare" (1932), because my goal is to examine the implications of Coase's solution.

2. The Coasean versus the Pigovian approaches

As emphasized in the introduction, this paper adheres to Coase's main point – his indirect argument with Pigou regarding solutions to externalities. Coase criticises the Pigovian approach because it considers only one direction of the externality impact and fails to account for its reciprocal nature. Coase also opposes Pigou's proposal (the welfare economics solution) that a direct centralised (governmental) intervention (taxation/subsidies or regulations/bans) will correct the externality problem. Coase's solution is based on the understanding of the "reciprocal nature" of externality issues (1960, 2): an externality issue is actually about using a resource, and the party that uses it inevitably harms the other party. Coase therefore argues that market negotiations would be a better solution than Pigovian intervention. To prove this, however, he starts from a theoretical situation, in which "the operation of a pricing system is without cost" and shows that a rearrangement of property rights that "would lead to an increase in the value of production" "will always take place" (15), no matter how entitlements are allocated. This is known as the (first) Coase theorem: in a world of zero transaction costs, the allocation of resources will be efficient and invariant, regardless of the initial assignment of rights (Stigler 1966). However, Coase acknowledges that market transaction costs do exist in the real world; thus the rearrangement of the property rights is not costless, and the initial allocation of entitlements matters. In real-world situations, Coase identifies three basic institutional arrangements to solve

externality issues (16–18): through the market, the firm, and the government (i.e. the state or society). However, these are not three alternative solutions, but rather a two-step solution: in Step 1, the government defines and allocates entitlements, and in Step 2, entitlements *may be* reallocated, depending on associated costs, and externalities will either be compensated as a result of Coasean bargains or be internalized by a firm. Table 1 summarises Coase's argument regarding the essence of the problem of externality and its solution.

Table 1: Pigou's and Coase's solutions to externalities, as stated by Coase (1960).

Pigou's solution as seen by Coase	Coase's solution
The essence of the problem of externality:	
One person A in the course of rendering services to B incidentally renders services or disservices also to C. Hence, there is only one direction of the effect – from A to C.	The problem is reciprocal in nature: An externality issue is actually about the use of a resource – the party that uses the resource always harms the other party.
The solution to the problem of externality:	
The government (the central planner) should intervene directly through centralised instruments: – Quantity regulation (bans) – Monetary tools (taxes or subsidies)	The government (the central planner) should define and allocate entitlements and then, *if* reallocation is beneficial, net of associated costs, – Either the market will operate through Coasean bargains, – Or a firm (or another entity, e.g. an association) will internalise the externality.

2.1. The precise meaning of "externality" and "social cost" in Pigou's and Coase's analysis

This paper emphasizes the importance of the observation that in "The Problem of Social Cost" Coase examines cases of externalities only with single, not multiple victims (Major et al. 2016). However, in the literature this issue is somewhat overlooked. Therefore in this section I discuss it in some detail.

I argue that a factor of key importance in the indirect dispute between Coase and Pigou is the precise meaning of the terms 'social cost' and 'externality'. In "The Economics of Welfare", Pigou (1932) generally refers to externality costs as costs incurred by society, which implies multiple third parties. He uses plural forms and speaks of costs "thrown upon people not directly concerned" (134) and "services or disservices" rendered incidentally "to other persons" (183). Therefore, Pigou considers that in principle, externalities affect the general public and are normally 'consumed' by multiple 'consumers'. In contrast, immediately after the first paragraph of "The Problem of Social Cost", Coase "shifts from plural to singular" (Major et al. 2016, 245). What seems to be misleading is that economists typically assume that when they examine the cost incurred by one provisional third party, they actually consider costs incurred by any and virtually all third parties. This is the way that Coase refers to 'externality'.

In his article, Coase mentions or analyses more than a dozen examples. He examines nine actual cases from legal history and comments on one such case cited by Pigou (1932, 185) – the case of the overrunning rabbits, *Boulston v. Hardy*. Coase also examines two examples that might be termed 'theoretical', as they were not taken from actual court cases. Again, he cites Pigou (1932, 134) in referring to the damage done to the surrounding woods by sparks from railway engines. In the beginning of his article and in section VI (15), Coase only mentions a third "theoretical" case – the "standard example … of a factory the smoke from which has harmful effects on those occupying neighbouring properties". But in all examples Coase focuses on the relationship between a single producer of an externality and a single consumer. Indeed, six of the cited court cases involve only single third parties: the cases of *Sturges v. Bridgman* (Coase 1960, 8), *Cooke v. Forbes* (10), *Bryant v. Lejever* (11), *Bass v. Gregory* (14), *Webb v. Bird* (20), and *Andreae v. Selfridge and Company Ltd* (22). However, the *Bass v. Gregory* case concerning a well in the defendant's yard that had become the ventilation shaft of the cellar of a public house involves two plaintiffs: the owner and the tenant of the public house, who complained that "the defendant removed a grating from the mouth of the well…so as to stop or prevent the free passage of air from [the] cellar upwards through the well." Yet although there were two plaintiffs in this case (more on this in the next section), they acted as a single party in the litigation.

Before proceeding to the remaining court cases analysed by Coase, we should examine two of the 'theoretical' cases in "The Problem of Social Cost": the case of the straying cattle and the case of uncompensated damage done to surrounding woods by sparks from railway engines. In these two cases it is not likely that the externality issue would concern only single third parties. The cattle-raiser would hardly have only one neighbouring farmer – much more likely she would have two or more neighbours. Thus, building a fence between the cattle-raiser and Farmer A may not solve the externality problem, because the cattle may still stray and enter Farmer A's property through the lot owned by Farmer B or the one owned by Farmer C. This may pose serious impediments to Coasean bargaining between the cattle-raiser and Farmer A. Similarly, fire caused by sparks from railway engines may move from forests owned by Owner X to forests owned by Owners Y and Z. If this happened, it should be a major consideration both for the court's decision and for Coasean bargains between the railway company and Owner X.

Furthermore, in the three remaining legal cases cited by Coase, the consumers of externalities were, in reality, multiple. They include "persons residing near" airports and railroad terminals and suffering "dust, noises and low flying of airplanes", as well as "injuries and inconveniences […] from noises of locomotives, rumbling of cars, vibrations produced thereby, and smoke, cinders, soot and the like" (25). The cases of *Delta Air Corporation v. Kersey* and *Kersey v. City of Atlanta* involved the complaints of Mr. Kersey, who had bought land and built a house on it; "some years later the City of Atlanta constructed an airport on land immediately adjoining that of Mr. Kersey". Similar problems were at stake in *Smith v. New England Aircraft Co* (26). Another case, *Georgia Railroad and*

Banking Co. v. Maddox (25), concerned properties in close proximity to a railroad terminal. It is obvious that in all such cases, airports and railroad terminals generate externalities 'consumed' by many landowners in the area. Yet even in these cases, courts most often deal with issues between a single 'producer' and a single 'consumer' of an externality. This is reasonable, because it is, in principle, a single plaintiff who takes the case to the court. Still, this is not because the plaintiff is the only victim of "dust, noises", "injuries and inconveniences", but because it is often too costly and therefore problematic for multiple victims to organize and act collectively. So it is clear why in these cases Coase is not forced to investigate the implications concerning the relationships between one polluter and multiple victims of pollution. As a result, he also neglects to analyse issues related to co-ownership of resources and the cooperation necessary to defend common property rights and bargain collectively. But the issues of collective consumption of externalities should be emphasized, because of the growing importance of problems of ecological damage such as pollution, microclimate change and loss of biodiversity, which always concern multiple third parties.

3. Coase's theory, individual/private property rights, and shared/common property rights

3.1. Introducing shared/collective property rights in Coase's entitlement optimization assumption

An essential concept in Coase's theory is the entitlement optimization assumption. According to this assumption (Coase 1960, 15–16), if "the increase in the value of production consequent upon the rearrangement [of the property rights] is greater than the costs which would be involved in bringing it about", then property rights will be established or rearranged. If, alternatively, the costs are prohibitively high, entitlements will not be established or rearranged. Yet this assumption tends to mislead researchers, who consider only two options – either 'full' entitlements (i.e. only private property rights), or no entitlements at all. They thus miss the third alternative – that establishing property rights may lead to shared, collective or common entitlements.

Obviously, the major differences between the management of individual/private and shared/collective property rights are due to the differences in the powers of the owners and co-owners. The owner of individual/private property rights is entitled to exclusive disposition of the resource or its attribute/s. The key point is that she may take decisions on her own. That is how a person arranges and uses her own house or manages her individual company. She must comply with social rules and regulations, but she can sell the property or decide on her own when and how to redevelop or reorganise it. In contrast, the owner of shared/partial or collective property rights is not entitled to exclusive disposition of the co-owned resource/s – he may manage or use the resource/s only if all co-owners agree (Alchian and Demsetz 1972; Barzel 1997). Collective decisions by all co-owners

are needed to manage the common parts of a condominium, as well as to enlarge a collective company or to change the methods and the structure of its management.

It is clear how bargaining works in cases of individual ownership – the owner will weigh different options, make his choice, and enter the deal. But for co-owners to enter a market deal, they first must come to an agreement about what their common interests are, how they value alternative solutions, what their precise goal is, and so on (Alchian and Demsetz 1972; Barzel 1997). Exercising shared property rights requires collective management, and collective action is needed for any form of bargaining to be carried out and for the market to operate. Coasean bargaining is not any different.

Because individual or shared property rights are exercised in very different ways and they are a key factor in the way that market negotiations are conducted and market mechanisms operate, this issue deserves special attention with regard to Coase's entitlement optimisation assumption (1960, 15–16). When the existence of collective/common entitlements is taken into account, the optimization assumption should be restated as follows (Slaev 2016c):

> At any phase of development, either *individual/private* or *shared/common* or *no entitlements* will be established over a resource, depending on the balance between the value of the benefits and the value of the costs associated with the establishment of entitlements.

Admittedly, Coase does acknowledge and sometimes even discusses issues of common or collective ownership and issues of centralized planning and government interventions (Coase 1960, 15–19, 27–28). Nevertheless, important aspects of Coase's theory concerning collective and common entitlements are still under-investigated – namely, when and under what conditions shared entitlements are established, and how they function. This paper works to fill this gap.

3.2. Management of private and collective property rights

Private property rights are exclusive, but never complete. That means that the owner – an individual or an entity – has exclusive powers of control over an object (a resource) or (some of) its attributes and can take key management decisions individually, though she always has to comply with the norms of society – following nuisance law and other social rules. The private owner can either use the resource individually (e.g. by processing or consuming it) or exchange it through market transactions. Because of her exclusive powers, she is able to manage the use of the resource most strictly and with detailed direct provisions. This type of management is termed 'teleocratic' (drawing on Hayek 1982; Moroni 2007, 2010). The key feature of individual/private entitlements is that there is an inherent and indispensable connection between all aspects and components of property rights – i.e. consumption, management and access rights and responsibilities for provision of resources and for negative outcomes (see, e.g. Ostrom and Schlager 1996, 133). Thus the management of individual/private property is characterised

by two major advantages. The first advantage is efficiency, because a single owner is well aware of her own precise interests and abilities and is able to take well-informed decisions. Responsibility is the second advantage, because of the strong link between rights of use and consumption of the positive results and unavoidable responsibilities for all associated costs and for all negative results. Both advantages are of particular importance to the Coasean approach to solving externalities through the market mechanism – private property rights facilitate efficient market exchange and simultaneously establish respective responsibilities.

In contrast, shared property rights are owned by a number of co-owners. Thus there is no indispensable connection between different aspects and components of property rights – one co-owner can be responsible for management, another may provide the resources needed, and allocation of consumption rights may follow different schemes among co-owners, if they all agree. Therefore, shared ownership requires that entitlements be allocated among co-owners. Adopting and enforcing rules and regulations allocating shared entitlements is a key feature of shared/common entitlements. To manage "common resource/s, the owners will have to employ rules that should define who may use the property and under what conditions they may use it, who can make decisions and what procedures they must follow, etc." (Slaev 2016a,b). This type of management, which is based on rules rather than strict and detailed direct provisions, is termed 'nomocratic' (Moroni 2007, 2010). Regulation is at the core of nomocracy. Hence, the management of shared/common entitlements is necessarily linked to the Pigovian approach; partnerships, collective and stock companies, communities and societies need centralised Pigovian rules and regulation. The Pigovian taxes of which Coase is so highly critical are just such a set of monetary rules.

But the management of shared/collective/common property rights faces many major issues and difficulties, which stem mainly from two basic factors. First is the outlined absence of an indispensable connection between entitlements to benefits and obligations to provide necessary resources and to bear eventual negative consequences. Because of this, problems of free-riding (Olson 1965; Ostrom 1990), shirking (Alchian and Demsetz 1972) and the tragedy of the commons (Hardin 1968) emerge. Furthermore, these issues develop into issues of collective management, particularly when there are more than a few co-owners, and delegation of property rights is required. Because it is practically impossible for a large number of co-owners to take part in each management decision, they have to delegate some of their management rights to "a small management group [who become] *de facto* owners" (Demsetz 1967, 355). Common ownership thus faces the threat of corruption, misuse of coercive central powers, and problems of public choice and agency management (Buchanan and Tullock 1962; Ross 1973; Mitnick 1975; Jensen and Meckling 1976).

However, a key advantage of common entitlements is that they help individuals, entities and firms economise on investment, production, organizational and transaction costs by allocating these costs. Companies share and thus save on investment, supplies and administration costs; societies share costs of infrastruc-

ture, national defence, and social and police services. Most of these goods and services would be too costly – and indeed would be unlikely to exist – if costs were borne by individuals. Furthermore, the gradual improvement to the systems of rules, norms and regulations can neutralize many deficiencies of central/common management (Ostrom 1990). Whereas rules and regulations can never be perfect, they can evolve and improve. As Ostrom persistently emphasizes, "individuals learn from their mistakes" (1999, 496), and self-governing communities of users can improve the systems of rules and thus overcome many of the inherent difficulties of collective action (Ostrom 1999; Ostrom and Hess 2007). If systems of rules are improved, communities can reduce the costs, and this is what Pigovian rules can do in organizations. Actually, in the spirit of Coase, Pigovian rules and taxes should be viewed as an alternative institutional arrangement, which, depending on the associated costs, may be the optimal solution in contexts of common ownership. The following paragraphs examine how this is done in the case of externalities.

4. Comparing the Coasean and the Pigovian approaches in the context of common entitlements

The goal in this section is to analyse the differences and the commonalities between Coase's and Pigou's approaches and show that the former is not a rejection of the latter, but rather an improvement upon it. For this purpose, as stressed in the introduction, I adhere to Coase's interpretation of the Pigovian solution and his statement of the Coasean solution, outlined in pages 16–18 of Coase's work. That is, I compare the Pigovian approach, which involves direct interventions through taxes/subsidies and bans (quantity regulation), and the two-step Coasean approach, which comprises Step 1 – the initial definition and allocation of entitlements, and Step 2 – the eventual reallocation of entitlements through the market or the firm.

4.1. The Coasean approach to the role of government, the market and the firm

With regard to the first step, it is easy to show that Coase overstates the opposition between the two approaches. To start with, Coase does not reject the role of the government (the state), but he maintains that its purpose should be to establish property rights and provide for efficient institutional arrangements, instead of direct Pigovian interventions. However, two objections can be raised to show that the two approaches to the role of the government actually have a lot in common:

- Legal and administrative rules (recommended by Pigou) that impose bans or taxes or provide subsidies actually establish rights of management, obligations, and rights of use, i.e. property rights.
- The establishment of property rights (as recommended by Coase) is realized by enacting legal and administrative rules.

Clearly, Pigovian rules do create Coasean property rights and, conversely, the establishment of Coasean property rights is a form of direct government intervention through Pigovian rules. This is not to say that the Pigovian and the Coasean solutions that require involvement by the government are one and the same, but they do have substantial commonalities. In fact, Pigovian rules are also institutions, and as such they can be used to reduce transaction costs.

As noted, Coase identifies two options for the second step. The first option is through the market – Coasean bargaining, which denotes market negotiations over externalities and respective exchanges. The second option is through the internal organization of a firm, and it leads to internalization of externalities. However, to realize this second option, "the firm would acquire [all] legal rights" (16) over all resources involved in its activities. Yet for the firm to acquire those resources, Coasean bargains and market exchange would again be needed. Thus any second-step Coasean solution to externalities involves bargains and market exchange and can therefore be termed a Coasean market solution. Clearly, this solution is fundamentally different from the Pigovian approach. Coasean market solutions are the subject of analysis of the remainder of this section. Table 2 presents some of the key methodological differences between Pigovian and Coasean market solutions involving Coasean bargaining.

The precise distinction between Pigovian and Coasean measures is essential for this paper. In many cases it is difficult to determine whether specific monetary tools, such as charges, fees, dues and contributions, should be grouped with taxes or regarded as market instruments. For instance, in "The Lighthouse in Economics", Coase (1974) considers light dues ("payments from owners of

Table 2: Methodological differences between Pigovian solutions and Coasean market solutions to externalities, as interpreted by Coase (1960).

Pigovian solutions	Coasean market solutions (Coasean bargaining)
Main feature: aimed at establishing centralized rules and monetary (fiscal) instruments (e.g. taxes and fees)	Main feature: aimed at defining property rights that should be (re)allocated by the market by means of Coasean bargaining
A. The solution to the externality problem is defined by the central body.	A. The solution to the externality problem is defined by decentralized agents.
B. Who should provide compensation and who should be compensated are defined in advance – before the specific problem has emerged.	B. Who should provide compensation and who should be compensated are defined by Coasean bargaining in the course of the negotiations.
C. The parties concerned cannot choose between alternative uses of resources.	C. The parties concerned can choose between alternative uses of resources.
D. There is no competition between agents and alternative uses of resources.	D. Agents and alternative uses compete to acquire entitlements over resources.
E. The connection between benefits and responsibilities exists only as defined by rules and regulations.	E. There is a direct and indispensable connection between benefits and responsibilities due to private entitlements.

ships" for lighthouse services), a market instrument that represents an alternative to taxes. Obviously, Coase adopts that position because the light dues are not determined by the government. Trinity House, which collects the light dues, is indeed a private corporation, but it is governed under a Royal Charter, i.e. it can be considered authorized by the Crown. As the official General Lighthouse Authority for England, Wales, the Channel Islands and Gibraltar, it is much more a governmental body than a free market player (see "Main feature" and point A in Table 2). In addition, consumers of lighthouse services cannot choose among different providers in the areas they have to sail through, if they want to get to a specific port (points B, C and D in Table 2). Thus, individual consumers are not in a position to bargain about the price of the service (see "Main feature" in Table 2). Therefore, I argue that the light dues collected by Trinity House are in fact a Pigovian measure, not an example of Coasean bargaining.

4.2. Coasean market solutions in the context of common entitlements

Taking part in market transactions is where common ownership turns out to be "the largest impediment". For multiple parties, co-owners of resources, to enter a market deal, they should first agree on the value of their resources, the value of each share, whether the exchange is worthwhile, and numerous further details. Consent is a major issue not only for communities and informal associations, but also for collective and stock companies, partnerships and any other collective entities.

In his paper, Coase refers several times to the standard example of a factory with a smoky chimney, but only twice mentions that it affects "a vast number of people engaged in a wide variety of activities" (1 and 16). These seem to be the only occasions when he refers specifically to situations in which multiple victims are affected by an externality, and he does not go into detail. But these situations are so prevalent in reality that the implications of the Coasean approach in such circumstances merit in-depth investigation.

The starting point of this study is very much the same as that of Major et al. (2016), who focus on the divergence between single and multiple victims. However, Major et al. assume the non-cooperative behaviour of victims and show that "the Nash equilibrium result proves to be neither efficient nor invariant" (246). Conversely, this paper explores the possibility of cooperation between victims of externalities or users of resources (Ostrom 1990; Searle 2002).

I begin by analysing the activities involved in a Coasean solution to externalities that affect multiple victims by elaborating on *Bass v. Gregory* (14), in which there were two plaintiffs – the owner and the tenant of a public house. They acted as a single party in the court case, because they both had a common interest in preserving "the free passage of air from [the] cellar upwards through the well". Still, obviously, the interest of the owner was greater than the interest of the tenant, because if they lost the case, the tenant could move to another public house, whereas the owner would still have a cellar with no ventilation. Hence, the differ-

ence in their interests is a reason for them to define in advance how the solicitor's honoraria and the court expenses, as well as the eventual gains or losses, would be allocated between them. This agreement is by nature a Pigovian measure, if only because it is made before the litigation (point B in Table 2). Yet the Pigovian nature of the agreement between multiple third parties is much more evident when the number of third parties is larger. Consider the case of the straying cattle. As noted in the second section, Coase investigates in detail the options for allocating the costs of erecting a fence between a single cattle-raiser and a single neighbouring farmer; however, the situation he envisions seems improbable – it is more likely that the cattle-raiser would be surrounded by several farms. In that case, there would be no point in erecting a fence only between the cattle-raiser and one of the neighbouring farmers, and if there were several neighbours, the calculation of the costs would be overly complicated. Whether this complicated allocation of costs will be feasible depends on the existing legal system. The fencing issue is widely recognized by the legal systems of the United States, for instance. Because Pigovian and Step 1 Coasean solutions are connected (see the previous subsection), there are no purely Pigovian or purely Coasean legal provisions. Still, some laws may be considered more Pigovian (i.e. liabilities are more strictly defined by legal rules), and some are more Coasean (i.e. liabilities are to some extent negotiable). If specific fencing duties are not strictly defined or detailed, but owners bear general civil or criminal liability, Coasean negotiations are a likely solution, especially when the law recognises the costs and benefits of fencing (e.g. freedom from intrusion by livestock and trespassing neighbours, increased land value by virtue of fostering agriculture, and diminution of lawsuits; Tidgren 2016). However, when multiple farmers bargain with a cattle-raiser about the costs of fencing or take the case to court, collective action has key advantages but is also quite expensive. To reduce the cost of negotiating, collective action would benefit from centralised Pigovian rules, as discussed further in this paper.

All these relationships are most evident in the "standard example" (as Coase terms it) of a factory polluting the air in an area. Assume that 30 farms are located within the affected area. According to most economists, the Coasean bargaining principle suggests that the owner of the factory will negotiate with each farmer individually (e.g. Holcombe 2013). But this is possible only on one key condition – that the farmer is the exclusive/private owner of the air above her farm. Otherwise, she may not negotiate on her own. This is obviously a wrong assumption, because the air over different farms is constantly moving and intermingling. Ignoring this problem and pursuing a Coasean approach results in a 'market' process with obvious deficiencies. Assume that negotiations with the first farmer result in an agreement that the victim of pollution should be compensated X dollars per hectare with polluted air. For the two parties, X dollars per hectare is the fair price, but the second farmer would probably value air differently and demand Y dollars per hectare with polluted air. And the third farmer may demand Z dollars per hectare. Still, in reality the factory owner might come to agreement with many farmers and might buy the rights to pollute the air over their lots, even

though the price accepted by each farmer would differ from the price accepted by the neighbours. The market price of pollution would, therefore, remain unknown; hence, such one-by-one negotiations can hardly qualify as a genuine market process. But there is an even greater problem. Suppose the polluter has paid 16 of the 30 farmers (more than 50% of them). Has he really bought their polluting rights? Can he pollute the air if he has bought the rights of two-thirds or three-quarters of the farms? Obviously, even if he has paid 29 farms for the rights to pollute the air above their land, the polluter still is not entitled to pollute the air of the area, because volumes of air are constantly exchanging and he is also polluting the air of the 30th farm, which he has not paid for. Clearly, for the Coasean solution to work – for the market mechanism to function – the polluter must pay *all* co-owners of the air in the area. Thus to carry out 'genuine' Coasean bargaining over a common resource, the polluter must bargain with all co-owners together.

Negotiations generally incur high transaction costs; collective negotiations are much more expensive, and so are collective Coasean bargains. Alternative institutional arrangements may be used to reduce transaction costs as examined in the following paragraphs; however, certain general considerations apply. First, although collective bargaining with 30 co-owners is expensive, 30 individual bargains no doubt incur much higher costs. Hence, organization saves transaction costs, *especially if one takes into account the cost of risk* to negotiate successfully with 29 farmers and fail with the 30th. Second, even if farmers are organized, negotiating with all 30 of them may still be prohibitively costly. Electing "a small management group" (Demsetz 1967, 355) to conduct the negotiations will reduce the costs substantially, despite all the drawbacks of collective management. Thirdly, establishing a system of centralized (actually Pigovian) rules is in fact a basic mechanism for cost reduction in organizations.

The following paragraphs examine four possible arrangements that allow the farmers to negotiate over air pollution. Two of these arrangements involve individual entitlements, and two involve shared/common entitlements. The latter two unavoidably employ Pigovian measures.

The first solution involves organising either a formal or informal association of farmers. As already shown, the farmers need to bargain with the factory owner collectively, but it is too expensive for all 30 of them to take part in the negotiations, so, as explained, they should organise and elect "a small management group" to bargain with the polluter. Any form of collective management of property rights is associated with difficulties, such as organisation problems, possible misuse of central powers, etc., yet this is the least expensive way for the farmers to defend their common air. What is particularly important for this research is that organisation necessarily involves Pigovian measures. First of all, the management group should acquire powers and a central position. To establish a mandate for the management group to bargain, the farmers should organise a meeting and define their main terms of the negotiations. Thus some aspects of the negotiations' results are defined before the bargain (see point B in Table 2), and the bargaining

parties may choose only between the limited alternative options of the mandate (see points C and D in Table 2). Some smaller details will be determined in the course of the bargain, and then the management group will exercise its central powers (point A in Table 2). However, all expenses associated with the bargain should be covered by all farmers. For that purpose each one should pay his or her contribution, which is similar to taxing. Hence, if an association is a party involved in solving an externality problem, it employs Pigovian measures to carry out Coasean bargaining.

I next examine the second alternative solution, establishing a private company. There are two options for this company – it can be an individual property if one person buys up all "adjoining properties", or it can be in collective ownership. The first option has two sub-options: the person who buys up all properties in the area may be the owner of the factory, or it may be one of the farmers. If the factory owner buys all properties in the area, this is the solution defined by Coase as the "firm" solution that internalises the externalities. Alternatively, if one of the farmers buys the properties of her neighbours, then this will facilitate Coasean bargaining between one buyer and one seller. Thus both outlined options result in 'pure' Coasean solutions – either through internalisation of the externalities or through Coasean bargaining. However, the solution depends on the costs incurred by each party, and it is not likely that the owner of the factory would buy all 30 farms for the sole purpose of becoming the only owner of the air he is polluting. Nor is it likely that one of the farmers would buy all farms with polluted air, unless she perceives some extra profit in the bargain. Therefore, Coase's proposed company will most likely be a collective one founded by the owners of "adjoining properties in [that] area". This is the fourth solution, which is examined below.

Establishing a collective company will solve the externality issues, but only insofar as the producer of the negative externality will have one legal entity to bargain with and negotiations will be facilitated. To the factory owner the new company will be a private entity, but to the farmers it will be a collective body. In fact, as in the first case of an association, many of the externality issues will be transformed into issues of collective management with all associated organizing costs and drawbacks, such as possible misuse of management powers and corruption, public choice problems and agency problems. Yet, because the organisation of the company is based on its own private statutes, as well as on private contracts between the shareholders and the management, and between the management and the employees, many of the problems will be solved, but others will remain. As in the case with the association, to handle the negotiations with the factory owner, the 30 farmers/company co-owners will have to elect a "small management group". They will have to hold a meeting of the shareholders, agree on the general terms of the bargain, and delegate authority to the management. Thus the negotiations will be based on the rules and regulations adopted before the bargain (point B in Table 2). Furthermore, to economize on organizing costs, the entire organization of the firm will be based on rules. The central body is responsible for their enforcement (point A in Table 2). To meet any expenses for any activity of

the collective company, the shareholders will have to provide contributions (in a process similar to taxation), and part of the money raised will be used to fund certain common activities (in a process similar to subsidising). One might debate to what extent these payments qualify as Pigovian taxes or subsidies, but one thing is certain – they all are defined within the company and not by the market mechanism (Coase 1937), and the entire process will be executed by the management in a centralized manner. Hence, referring to Table 2, I argue that when a collective firm is involved in Coasean bargaining, then, as in the case of the association, the firm also resorts to Pigovian solutions.

Thus far I have analysed arrangements available to the victims of pollution, but the options available to the polluter(s) should also be examined. It is reasonable to suggest that according to Coase there should be no principal difference between the behaviour of the polluter and the victim of pollution, because he sees the externality problem as reciprocal. Still, reciprocal does not necessarily mean symmetrical. Market negotiations are rarely perfectly symmetrical; Coasean bargains are even less so. In cases of pollution this is obvious, and therefore the implications of collective ownership for the polluter must be examined as well. Coasean bargains generally refer to resources with poorly established property rights or common resources, and very often property rights are poorly established precisely because resources are common. All this is typical for air pollution: the victims are co-owners of the resource, but because their entitlements are imperfectly defined they need to organize in order to establish well-defined co-ownership. Thus the purpose of organization and associated Pigovian rules is to enable Coasean bargaining.

Individual polluters, on the other hand, do not need to organize in order to enter a Coasean bargain. Hardly any resource subject to pollution is so valuable to the potential polluters as to make them establish a union for the sole purpose of acquiring property rights over this resource. However, if an already established collective or stock company plans to construct a factory that may pollute the air in an area, this is a typical situation involving collective property rights on the part of the polluter. The operation of such a company is unavoidably based on administrative regulations and financial rules defining who is paid for what and who should be charged for the use of the company's resources or for failing to provide other resources or benefits. Depending on its profile, a company is equipped with the administrative and financial rules necessary for its market activities. If a collective/stock company needs to conduct Coasean bargaining to pay for air pollution and the company is not equipped with the relevant rules, then obviously such rules must be developed and adopted *before* the bargain (point B of Table 2). Just like the collective company of farmers who are victims of pollution, a collective polluting company will seek alternatives to reduce the high transaction costs of negotiations by improving its internal organization and enforcing relevant regulations and financial rules. These rules are of the Pigovian type, because they are centralized (point A of Table 2), defined before the bargain takes place (point B), and defined by the assembly of the company's co-owners so that the negotiator

is not free to choose solutions outside her mandate (point C); thus competition between uses is constrained (point D), and the negotiator bears responsibility for losses and benefits only within her mandate as defined by the rules (point E). If, finally, the polluting collective/stock company and the victims come to an agreement, then clearly the company's shareholders will have to allocate the negotiated costs among themselves and raise the funds to pay for the polluting rights by employing a mechanism similar to Pigovian centralized taxing.

5. Conclusion

In this paper, I have supported the view that the Coasean and Pigovian approaches are not totally opposite, but rather can be complementary. Other authors have also argued this point; however, this paper employs a specific argument based on the existence of shared and common property rights. Because shared and common property rights are pervasive in the economy and in social life, they must be considered in the formulation of the entitlement optimization assumption, which Coase defined in "The Problem of Social Cost". Therefore, the entitlement optimization assumption should identify three possible options concerning the establishment of property rights over a resource – individual/private entitlements, shared/common entitlements, or no entitlements. In his article, Coase does not distinguish between individual/private entitlements and shared/common entitlements, so he does not consider the specific implications of the latter option. But actually, in contexts of shared or common entitlements, Coasean bargaining and market deals may be carried out only after co-owners organize and collective management is functioning. In organizations, however, centralized rules of the Pigovian type (administrative or financial) are an appropriate institutional arrangement. Thus they are a relevant Coasean solution for reducing organizational costs – indeed, organizations cannot exist without such rules. Ultimately, for Coasean bargaining to take place in contexts of common entitlements, Pigovian measures are needed. In such situations the Coasean approach is not a rejection of the Pigovian, but is rather a means to its improvement.

If this conclusion is valid, it raises an important question: Precisely how does the Coasean approach develop and eventually improve upon the Pigovian? One suggestion is that the centralized rules created in conjunction with Coasean bargains differ in their scope from what is traditionally meant by Pigovian rules. The classical Pigovian solutions are associated with state interventions; however, by analysing the specifics of Coasean and Pigovian solutions outlined in Table 2, this paper has shown that Pigovian measures characterise not only state interventions, but also those of any centralized organization. Because the Pigovian rules established in conjunction with Coasean bargains are generally not state interventions, it is reasonable to suggest that a Coasean solution is associated with a reduction in the scope of Pigovian rules – that is, state interventions are replaced by centralized measures within stock or collective companies, associations, clubs and smaller communities. This suggests a parallel to Ostrom's theory and has important implications concerning the theory of multi-level governance. At the very

least, such options are worth investigating, as are all other possibilities involving the management of shared/collective/common property rights.

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