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Clubs, Coase, and the Role of Government

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Abstract

As Ronald Coase and others have shown, deducing the appropriate role of government in the economy requires a *comparative institutions* approach. Trying to generalize from oversimplified specifications regarding transaction costs, according to whether exclusion is possible or not, is a futile exercise. An alternative to the *Ostrom matrix* is to distinguish private, club, and collective consumption goods according to their technical characteristics, specifically their degree of congestabiilty. The other box of the Ostrom matrix, "common pool" resources, can also be usefully analyzed from a club perspective. Spillover goods are spatial clubs. Lastly, a version of the Coase theorem is offered that provides the foundation of comparative institutional analysis

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Public goods and the Coase Theorem are two of the most confusing parts of any text or curriculum about public economics. At least some of the confusion can be resolved by applying the concept of the shrinking core and by more clearly separating first-best efficiency conditions from second-best matters of implementation. The resulting framework helps to clarify the role of government in an economy.

Public Goods

It is commonplace to define public goods by the characteristics of non-rivalry and non-excludability. This tradition was established by Musgrave (1939), who even Samuelson described as "undoubtedly *the* authority in the whole field of public finance" (Desmarais-Tremblay 2017). Yet non-excludability is not featured in Samuelson's "The Pure Theory of Public Expenditure" (1954). Musgrave eventually acceded to the primacy of non-rivalry (Musgrave 1969 and Desmarais-Tremblay 2017) but nonetheless helped to promulgate the now famous two-by-two taxonomy of goods according to rivalry in consumption and the feasibility of exclusion (Musgrave and Musgrave 1973, hereafter M&M).

In M&M's 2x2 diagram, the rows are labeled rival and non-rival and the columns according to whether exclusion is feasible or not. Ostrom and Ostrom (1977) named M&M's four categories as:

1. Rival/Excludable: *Private Good*
2. Rival/Non-excludable: *Common Pool Resource*
3. Non-rival/Excludable: *Toll Good* (changed to *Club Good* e.g. in Ostrom 1990)

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4. Non-rival/Non-excludable: *Public Good*

Similar diagrams appear in many textbooks,[2] in spite of Samuelson's objections. The problem with the names is that they conflate the characteristics of the good with organizational form. As Coase (e.g. 1937, 1960, and 2012) famously explained, however, different organizational forms are capable of achieving the same efficient solution absent transaction costs (see also Arrow 1969). Therefore, there is no unique mapping from good characteristics to the optimal mode of provision. Monitoring, enforcement, and other transaction costs must be considered in tandem with characteristics of the good to determine which organizational form is appropriate for which good in what transaction cost environment. For example, natural resources, whose stock is given by nature and may be depleted over time, can, under different transaction cost conditions, be efficiently organized as private property, central government management, common property (*res communes*), and even no property (*res nullius*).[3]

Samuelson (1954) found non-excludability unnecessary for his derivation of efficiency conditions and tried on multiple occasions to convince Musgrave to drop exclusion from his taxonomy.[4] His formalization of non-rivalry has the total quantity of the good produced as an argument in the utility function of all individuals, leading him to use the term "collective consumption good" instead of "public good," and rendering non-excludability redundant. This does not mean that excludability is irrelevant, but its relevance is manifested at a different level of analysis, one with transaction costs.[5] Excludability, a feature of property rights, is just one of many possible enforcement mechanisms.

Collective Consumption, Clubs, and Congestability

As an alternative to the Musgrave-Ostrom matrix,[6] we seek a classification of public, private and club goods that is independent of transaction cost issues such as excludability. To that end, we can subsume collective-consumption and private goods as special cases of club goods according to their degree of congestability. Club goods are characterized by congestion as new members are added to the club. Collective-consumption goods are the limiting case of club goods where congestion costs are zero. Private goods represent the other polar extreme of club goods, where congestion costs of one consumer are so high as to be strictly subtractive, i.e. another consumer's consumption of the good reduces mine to zero (Smith 2014).

In his original theory of clubs, Buchanan (1965) considered a club good of fixed size, e.g. a swimming pool, and defined optimal club membership as that number that minimizes the sum of long-

[2] See e.g. Hindriks and Myles (2013). Categories 2 and 3 are sometimes called "impure public goods".
[3] See the penultimate section, Common Property Resources.
[4] Desmarais-Tremblay (2017) details the intellectual history of public goods, including discussions and correspondence between Musgrave and Samuelson. Musgrave (1969) accepted the primacy of Samuelson's jointness in consumption over non-excludability on the grounds that even if tolling is possibly on an uncrowded bridge, exclusion would be inefficient, i.e. the optimal toll would be zero. Musgrave and Musgrave (1973) also qualify their two-by-two diagram, noting: "It is customary, however to reserve the term for case 3 and 4, i.e., situations of nonrival consumption" (as quoted in Desmarais-Tremblay 2017). See also Samuelson (1969) for an elaboration of his earlier views.
[5] See e.g. Roumasset (1978) and Dixit (1999) on the 1st, 2nd, and 3rd-best levels of analysis.
[6] See de Dios (2015) for an extension of the Ostrom two-by-two table to a two-by-three table including externalities.

run capital and operating costs plus congestion costs (lost benefits), both per member. The number of competing clubs is then given by the number of potential members (e.g. population) divided by the optimal membership size. While not using the same terminology, Tiebout (1956) asserted that consumer mobility and competition between clubs would then lead to an efficient solution with homogenous membership in each club. This led him to conclude that decentralized pricing is hypothetically capable of achieving efficiency, despite Samuelson's (1954) assertion to the contrary.

Extending Buchanan's (1965) theory to the case of endogenous production, the club model can be derived as follows. The utility of an individual member is given by U(Y,S,n), where Y is consumption of the numeraire good, S, is production and consumption of the club/social good, and n is number of members in the club. The consumer spends her endowment, Y_0, on Y and her contribution to S, C(S)/n. The necessary condition for optimality with respect to the quantity of the social good in each club is that the aggregate marginal benefit of the club's membership is equal to the marginal cost of producing the good, i.e. $nU_S/U_Y = MC_s$, the well-known *Samuelson condition*. The condition for the optimal number of members in a club is that the marginal benefit of adding an additional member is equal to its marginal cost. The marginal benefit to a representative member is the marginal cost reduction per person. The marginal cost is the increased congestion cost, i.e. $C(S)/n^2 = -U_n/U_Y$.[7]

The greater the marginal disutility of congestion, the smaller is optimal club size. If $C(S^*) \leq -U_n/U_Y$ for any $n \geq 1$, then we have a corner solution with one member per club, i.e. a private good.[8] If there is no congestion such that the marginal disutility of an additional member is zero, the efficiency conditions call for the opposite polar extreme: one club optimally serving the entire population. We can therefore classify goods entirely based on congestion costs. Private and collective-consumption goods represent the two polar extremes of prohibitive congestion and no congestion. While these extremes are formally special cases of club goods, it is convenient to think of club goods as the intermediate category where there is an internal solution and the optimal number of clubs is between one and the number of consumers.

Only in turning to questions of implementation do we find a role for exclusion. If clubs are able to enforce payment by the mechanism of exclusion, then they can compete for membership. As the population divided by the number of consumer types increases, the set of undominated solutions (the core of the economy) shrinks to the Lindahl equilibrium with homogeneous membership in each of the clubs. With constant returns to scale this is achieved with members of each club paying an equal share of the costs, thereby proving the Tiebout hypothesis (Wooders 1980 and 1989, Conley and Wooders 2010). Clubs are typically conceived as voluntary associations, although the Tiebout proposition was

[7] Note that the derivative (with respect to n) of the cost per member, C(S)/n, is $-C(S)/n^2$. Since the additional cost is negative, the cost reduction (benefit) is positive, i.e. without the minus sign. See Hindriks and Myles (2013) and Cornes and Sandler (1996) for more conventional derivations.

[8] For rival goods bilateral contracting between suppliers and consumers leads to the usual competitive result, which, absent externalities, is efficient. Formally, the core (which is a subset of Pareto optimal points) shrinks to the competitive equilibrium as the number of traders goes to infinity. Note that if we define competitive equilibrium as what the core shrinks to, thus rendering the fiction of a Walrasian auctioneer unnecessary, the First Fundamental Theorem of welfare economics is true by definition. In his Principles text Nobel Laureate Edmund Phelps (1985) argues that this is a more natural approach to the study of markets. Coase (1960, 1990) essentially takes this result for granted in referring to a *competitive contractual equilibrium* as a *market*.

originally intended and has subsequently been used as the basis of a theory of local government expenditures.[9]

For Samuelson's (1954) collective consumption goods, the cost of adding an additional member to a club is zero, and the optimal number of clubs is one. Even if exclusion were feasible, there is a natural monopoly. If multiple clubs tried to compete for membership, the largest club (with the lowest average cost) could sell at the lowest price, drive out competition, and then raise the cost of membership, thus inefficiently limiting consumption. While private enterprise can produce and sell the good, regulation is needed to lower price and increase quantity. And if exclusion is not possible, the state needs a different enforcement mechanism, namely taxation authority and penalties for tax evasion in order to provide for the public welfare. Either way the government contracts with the private sector on behalf of its citizens. Regulation and other aspect of extra-market government provision are thus aptly described as "administered contracts" (Goldberg 1976).

In general, first-best regulation of a natural monopoly can be achieved by a two-part tariff: Charge the marginal cost of increasing service and make up the revenue loss with lump-sum finance. For a pure collective-consumption good, the marginal cost of serving an additional customer is zero so the two-part tariff collapses to one part, the lump-sum charge. The personized prices of Lindahl's benefit taxation scheme (Lindahl 1958) are but one form of lump sum charges inasmuch as the individual does not choose the quantity of the good to be consumed and the personized prices (taxes) are non-voluntary.[10]

The intermediate case between many clubs and a single club for a collective-consumption good is that of low congestion costs and the consequent small number of clubs. Here some central regulation may be appropriate inasmuch as some larger clubs may be able to recruit potential members away from rival clubs, thus raising average member cost of rivals, and then extracting some amount of monopoly profits thru higher fees.

While Musgrave was attempting to identify conditions of market failure and the need for public intervention, it is now understood that articulating the "first-best" theory in the absence of transactions costs is only a first step in designing the role of government. Alternative institutions can then be chosen according to their comparative agency costs, the sum of information and enforcement expenditures and the residual losses, measured according to the departure from the first-best solution.[11] Trying to categorize goods according to an oversimplified characterization of transaction costs, e.g. whether exclusion is possible or not, is likely to give a misleading portrayal of government's role. This perspective is elaborated in more detail in the subsequent section on the Coasean equivalence theorem.

[9] Local public goods are spatial clubs, where the marginal benefits of membership decline spatially, moving away from the center of provision (e.g. a firehouse) and typically falling to zero outside of jurisdictional boundaries (e.g. Hochman 2011).

[10] Lindahl's scheme assesses taxes according to marginal benefit. Another candidate, sometimes attributed to Wicksell (1896), would be to tax in proportion to total benefit (consumer surplus).

[11] This definition of agency costs is due to Jensen and Meckling (1976). For a formal demonstration showing that minimizing agency costs is equivalent to maximizing second-best welfare, see Roumasset (1995).

Common Pool Resources

The juxtaposition of "common" along with "pool resources" also runs the risk of confounding organizational form with characteristics of the good in question. But this time we can imagine a resource pool (literally a pool of oil or an aquifer) that is common to many overlying users such that the name can be taken to refer to the characteristics of the good and the locations of potential extractors. In that sense common pool resources are naturally associated with the *commons dilemma*, the incentive for many extractors to excessively deplete the resource absent property rights, central government, or community regulation. First-best management requires extraction up to the point where the marginal benefit (price) is equal to the full marginal cost (including marginal user cost). The commonality between Ostrom's (1965, 1990) groundwater and Libecap's (1998) oil is that there are multiple extractors. The difference is that Ostrom's extractors have their own demands whereas Libecap's extractors are selling to the same oil market. For the latter, club/community management determines how much to extract and allocates shares (e.g. in proportion to each owner's land area above the pool). Ostrom's community managers have the more difficult task of aggregating demands, deciding how much to extract each period, and then dividing up responsibilities and extraction allowances. This is greatly simplified for homogenous extractors (roughly equal allocation of tasks and extraction rights).

Ostrom's insight was that private property and "Leviathan" (central government) are "not the only ways" to govern common pool resources and their tendency towards resource depletion. Rather a "hybrid" form, a club, may sometimes be more efficient (Sandler 2010). The many examples provided by Ostrom and colleagues (e.g. Ostrom 1990) suggest that local governance, being accountable to the people, is often more successful at sustaining the resource than private property or central government, but this is not assured. Local governance, e.g. by cooperatives, is also susceptible to rent-seeking (Hart and Moore 1996 and Banerjee et al. 2001). Whether private, local, or central governance is second-best optimal is a matter of comparative institutions. For each form, optimal governance occurs where marginal agency cost equals the marginal reduction in the "externality" cost of departing from the first-best solution, given by P=c + MUC (where P is the resource price or marginal benefit, c is extraction cost, and MUC is the marginal user cost).[12] A global comparison can then be made across the different institutions, each with its own optimal governance (Roumasset and Tarui 2010). Borrowing Ostrom's (1990) rhetorical device, common property "is not the only way."

As with other club goods, the appropriate role of government may increase with the size of the pool. Most of the pool resources discussed in "commons" literature (e.g. Ostrom 1990) are small relative to the economies of which they are a part. Exceptions such as the High Plains Aquifer in the U.S. (from Texas to Wyoming and South Dakota) are less suitable for management by many competing clubs.[13]

Spillover goods

The term "externality" also confounds the nature of the good with economic organization. Distinguishing between *spillover goods* and *externalities* provides a clarification. Spillover goods occur as

[12] See e.g. Roumasset and Wada 2015. In the case of a non-renewable resource such as oil, MUC is given by the expected price increase divided by the discount rate.

[13] See Salant (2009) for a novel discussion of how an equal sharing rule within each club combined with competition between clubs for members can result in efficient incentives for extraction, thereby curbing the tragedy of the commons.

a byproduct of production and consumption. The prototypical case involves pollution emissions from the production of one good entering into the production function of another good (e.g. Montgomery 1972) or into the utility function of one or more consumers. Where these are external to markets, they are called "externalities." As Arrow (1969) emphasized, a spillover may be an externality or not, depending on the costs of alternative forms of economic organization.

Spillovers can be *internalized*, by creating a market (e.g. the market for SO2 emission permits) or by emission taxes that face producers with the added social cost imposed by their pollution. Whether it is efficient to do so and by what means is primarily a matter of transaction costs (Coase 1960, 1990). If the costs of monitoring emissions and administering a taxation or permit scheme are too high, it is possible that indirect regulations (e.g. the U.S. CAFÉ standards for the improvement of vehicle fuel economy) are more efficient.

In the typical case of pollution where there are multiple victims, the mechanism of competition across pairs of bilateral contractors does not apply since pollution is typically a collective-consumption bad. Government can act on behalf of the victims, however, by requiring polluters to have permits for emissions beyond the established baseline, thus creating a potential (one-sided) market for emission permits. Alternatively, they can impose a fee (emission tax) for pollution damages. These alternatives along with more indirect alternatives can then be subjected to comparative institutional analysis.[14]

Pollution can also be analyzed as a spatial club. One can imagine treating municipalities (or counties) as spatial clubs competing for members, thus incentivizing pollution control and inducing sorting according to preferences for clean air and water (e.g. Huang and Hua 2018). Greenhouse gases are global public bads, i.e. the optimal number of clubs is one, bringing us back to the natural monopoly problem. Absent a world government, however, we are now in the area of fostering international cooperation, which may take the form of a club of countries sanctioning non-members (Nordhaus 2015, Mason et al. 2017). Where spillovers are bilateral, clubs consist of one supplier and victim (or beneficiary) each.

An Equivalence Version of the Coase Theorem

The controversies and confusion surrounding the Coase Theorem have been widely detailed (e.g. Medema and Zerbe 2000). Two versions of the theorem are popularly described—the *invariance* and the *efficiency* versions. The invariance version asserts that if property rights are well-defined and transaction costs are zero, the same efficient solution will obtain regardless of liability placement. This version has been recognized as incorrect inasmuch as liability rules affect income, spending, and prices such that a different allocation is possible (e.g. Usher 1998).

The invariance version can be rescued, however, by stating more fundamental restrictions that will rule income effects out, in particular that shareholders of the polluting and victim firms have quasi-linear utility functions such that prices of the outputs of the two firms will not be affected by demand effects of liability placement (Hurwitz 1995).[15]

[14] Private supply of permits would not fare well in an institutional comparison due to the underprovision problem.
[15] Bergstrom (2017) subsequently generalized the Hurwitz result to a somewhat broader class of utility functions, but the invariance version still requires highly restrictive assumptions.

The highly restrictive requirements of the invariance version can be viewed as motivation for an alternative version. The *efficiency version* of the Coase theorem says only that costless bargaining will result in an efficient solution. To prove this, we need a solution concept for cooperative games, the most general of which is the *core of an economy*. But to say that the core of an economy is efficient is true by definition, since the core is a subset of Pareto efficient points. Accordingly, the efficiency version is a trivial tautology (e.g. Usher 1998).

The key to identifying a viable theorem consistent with Coase's mission is to recognize the role of competition. Recall that in the case of club goods, efficiency only obtains (at least approximately) with many clubs in competition with one another. Examining the court cases that he described, we see that Coase (1960) was clearly focused on bilateral spillovers. In each example, there is one agent imposing costs on another single agent: Cattle trample a farmer's field; a building blocks sunlight to a neighbor's swimming pool; a confectioner's machinery interferes with the work of a neighboring dentist.[16] Coase argued that for these cases, if liability were clear, the parties involved would have been able to bargain with each other to reach an efficient contractual solution. Since the contracts are bilateral, competition is possible ex ante before the parties established businesses in specific locations.

According to Harold Demsetz, who attended Coase's famous 1959 University of Chicago seminar, Coase stressed the importance of *ex ante* competition for reaching his value-maximizing solution, even though his 1960 paper analyzes *ex-post*, two-party court cases.[17] Nobel Laureate George Stigler, who named the Coase Theorem in his microeconomics text (Stigler 1966), explicitly asserts "perfect competition" as a requirement for its domain.[18]

Just as ordinary markets emerge in a competitive contracting environment, the same is possible for the case where spillovers are bilateral. Coase's point was not that contracts will always save the day, but that government intervention, e.g. in the form of Pigouvian taxes, may not be the only or even the best way to internalize the spillover and that designing the best organizational form requires a comparative institutions approach (see also Demsetz 1969). Each institution can be compared according to its governance/agency costs and how close it comes to the first-best ideal.[19]

Cheung's (1973) documentation of apple-orchard owners contracting with beekeepers for pollination of apple blossoms provides a perfect example of *ex ante* competition. Inasmuch as there were many beekeepers and apple orchards in Washington State, this case illustrates both bilateral contracting and competition for favorable contractual terms. Cheung's (1968) case of share tenancy in Taiwan provides another excellent example. The Cheungian version of the Coase Theorem is that competition for bilateral contracts results in an equivalency with the competitive equilibrium. Cheung did not do so, but the proposition can be proved using the core of an economy, since the core shrinks to the competitive equilibrium as the number of contractual pairs approaches infinity (Johansson and

[16] Even the Coase's case of railroad sparks starting fires on adjacent farmers' fields can be considered bilateral in the sense that each farmer is afflicted by a separate unit of spark emissions.
[17] See Stigler (1985) for an account of Coase's seminar and subsequent dinner discussion and Roumasset (1979) for Demsetz's recollection of the importance of *ex ante* competition in Coase's presentation.
[18] In lieu of a proof, Stigler diagramed the Coasean equilibrium as the intersection between the marginal benefits of cattle being able to enter a farmer's field and the marginal damage costs to the farmer.
[19] See e.g. Roumasset (1995) for a formalization of the comparative institutions approach.

Roumasset 2002).[20,21] That is, competition for the best contractual terms produces prices and quantities, as if there were a competitive labor or land rental market in the case of share tenancy and a market for pollination services for the apple-honey economy. While Coase eschewed formalization, he clearly understood this intuition and frequently described the competitive contracting solution as a market.

As usual, the proof clarifies the restrictive assumptions needed for the proposition to be strictly true, in particular the requirement for competition among pairs of bilateral contractors. Of course, the number of pairs never reaches infinity, but under plausible conditions the core shrinks quite rapidly. [22,23]

Since the core of a bilateral contracting economy shrinks to a competitive equilibrium with universal markets, these solutions are equivalent allocations. As is well-known, the Pigouvian tax/subsidy solution in a world of zero transaction costs is also equivalent. This result provides an *equivalence version* of the Coase Theorem. Since contracts, the market, and the Pigouvian solution under competition and absent transaction costs all achieve the same efficient solution, the upshot of the Equivalence Version is that any meaningful comparisons between the different policy designs can only be made through a consideration of transaction costs, i.e. in a *comparative institutions* framework (Demsetz 1969).[24]

The equivalence version satisfies a Coasean agenda: First, it effectively undermines the proposition that Pigouvian taxes are the only or even the best way to restore efficiency in an economy with externalities, clearly an important part of Coase's (1960) motivation. Second, the equivalence proposition serves as a starting point for Law and Economics and serves as a pillar of the New Institutional Economics. The equivalent solution, which Coase refers to as the value-maximum, becomes the benchmark by which other institutions can be measured. Third, the equivalency result undergirds

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[20] Bees are a joint input to the production of both honey and apples, analogous to the formulation of Montgomery (1972) who puts emissions into the production function of a consumable good. Absent non-convexities, the core shrinks as competition increases and the equivalence between competitive contracting and a Walrasian equilibrium is established.

[21] Johansson and Roumasset 2002 prove that the core of a apple-honey economy shrinks to the competitive equilibrium with a market for pollination. Johansson 1996 also proves that the core of an economy with negative bilateral spillovers shrinks to the competitive equilibrium with an emissions market as the number of bilateral pairs goes to infinity.

[22] In Roumasset (1979), I noted the applicability of the Debreu-Scarf Theorem to simple share tenancy and production externality economies. The application to a share tenancy economy shows that the core shrinks rapidly. For example, with only three landlords and three tenants, the core does not contain any shares that are more than 10% away from the competitive equilibrium equivalent. In an apple-honey economy, the core with 10 pairs of traders is within plus or minus 3% of the competitive equilibrium (Johansson and Roumasset 2002). Accordingly, the core can be used to show the limits of market power. On the other hand, if there were only a few landlords or orchard owners, they could potentially agree to offer only exploitative contracts.

[23]Foley (1967) and Aivazian and Callen (1981) have provided examples where the core of a production spillover economy is empty, but these were not bilateral contracting economies. They also implicitly involved inconsistent definitions of property rights. As shown in Bergstrom (1975), where there is jointness in the consumption of a negative spillover, the core still contains the Lindahl solution. The problem is that the core does not shrink. As members are added to the coalition, benefits increase but costs do not. Since *agreers' surplus* increases as new members are added, it becomes ever more difficult to block the many ways of sharing the surplus. That is, the core *grows* instead of shrinking, admitting more and more solutions besides the Lindahl equilibrium (Pauly 1967).

[24] The comparative institutions approach should also be extended to include imperfect competition. To my knowledge this has not been achieved.

Coase's (1937) proposition that the boundaries of the firm are chosen to minimize transaction costs, if we take transaction costs to be a general category that includes the contracting costs of dealing with an outside supplier and the agency costs of internal firm governance. Aside from these costs, locating a supplier such as Fisher Body outside of General Motors or vertically integrated inside of GM would be equivalent.[25]

Coase (1960) also introduced the notion of reciprocal causation of harm. While the railroad sparks may destroy some crops, the damages were only possible because the farmer planted close to the tracks. As Baumol (1972) details in his classic paper on taxation and externalities, both Coase and more forcefully Buchanan and Stubblebine argued that taxation of the emitter should therefore be accompanied by taxation of the victim, such that "all marginal externalities are eliminated." As Baumol showed in the same paper, this turns out to be a red herring. It is not necessary to determine who "caused" the externality, only to know who is the generator/emitter and who is the recipient victim. (His demonstration illustrates that *blackboard economics* is useful after all, even in clarifying the essence of Coasean economics.)

Baumol (1972) adds the proviso that a Pigouvian tax should be administered "without payment or compensation" to the victims, lest victims are motivated to shirk on avoidance expenditures. This requirement has proved to be an additional source of confusion however. We return to the equivalence proposition for clarification. Consider the classic Spence-Zeckhauser (1974) case of Upton Paper Mills and Downley Baths albeit with many upstream effluent producers, who once their locations are fixed, are matched one-to-one with downstream victims of pollution. To implement a market for emission permits, the government can grant victim rights by issuing pollution permits to downstream recipients and requiring upstream polluters to obtain emission permits according to the quantity of emissions that they impose on their bilateral victim. To obtain the equivalent Pigouvian solution to a competitive permit market, the government must pay the victims compensation as if they were sellers of permits. The reason that this compensation does not distort the victim decisions is that said payment is lump sum. It is not paid according to actual damages but according to their (least) marginal damage function, which is identical to their supply of permits.[26] Similarly, if the government imposes a victim-rights liability rule, the competitive contracting equilibrium (what the core shrinks to) is equivalent to the permit-market solution with victim rights.

While the Coase solution emphasizes bargaining, i.e. is correctly analyzed via cooperative games, clear liability rules may result in an equivalent solution without bargaining. Victim rights in tort law incentivize polluters to reduce pollution up to the point where their marginal benefit of emissions equals the marginal damage cost to victims, while incentivizing victims to invest in optimal avoidance such as water filtration (Brown 1973, Shavell 1987).[27] That is, the equivalency of permit markets, Pigouvian incentives, Coasean bargaining can be extended to include liability rules (including negligence provisions).

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[25] For an extensive discussion of the controversy and a proposed resolution of why, in a world of transaction costs, Fisher Body was vertically integrated into GM in 1926, see Rolder (2006).

[26] See Holtermann (1976) on compensating victims according to their marginal damage cost function and the lump-sum nature thereof.

[27] Pollution needn't be portrayed as accidental in order for the non-cooperative equilibrium to be equivalent to the other solutions (e.g. Michelman 1971).

Another set of equivalencies exists under polluter rights, i.e. the victim is liable for pollution damages, the polluter is endowed with emission permits in the permit market, and the polluter is subsidized for reducing pollution in the Pigouvian solution. The Pigouvian subsidy, however, is a tax in disguise, because the subsidy equals a lump-sum grant equal to the profit-maximizing amount of pollution times the market equilibrium permit price minus a Pigouvian tax on emissions. This solution is equivalent to the market solution with polluter endowment of rights and the Coasean contract solution with polluter rights.[28] In this sense, it may be misleading to speak of a Pigouvian subsidy not to pollute. What incentivizes pollution control is the explicit or implicit tax on emissions. What varies is only the baseline above which excess emissions are taxed and below which emissions are reckoned as negative (resulting in a negative tax liability).

Where there are multiple victims, there is no equilibrium contractual equivalent to the Pigouvian solution because the core does not shrink (Bergstrom 1975, 1976). The government can effect a market equivalent of the Pigouvian tax solution however by requiring polluters to purchase permits for their emission quantities. (Allocating permits to victims would run afoul of the free rider problem.) Similarly, under accident law, it would be difficult for many victims of a single polluter to form a coalition to sue the polluter. Long before the first Clean Air Act in the U.S., a small number of victims successfully sued for damages from industrial pollution. But once the victims became more diffuse, this mechanism was no longer effective.[29]

Conclusion

Absent transaction costs, different organizational forms are capable of achieving the same efficient solution. The role of transaction costs in determining optimal institutional structure depends on characteristics of the good in question, available mechanisms of governance, and the transaction cost environment. Simple generalizations, e.g. about whether the good is "excludable" or not, are unlikely to be fruitful. Rather goods can be classified according to their technical characteristics and the first-best solution used as a foundation for comparative institutions. Simply put, levels of analysis should be kept distinct, but the first-best analysis can facilitate analysis at the second-best level.

The (first-best) theory of clubs can be used as a unifying principle for public economics, environmental economics, and resource economics. A collective consumption good is a club good for which the optimal number of clubs is one. Private goods represent the other polar extreme, where the optimal number of clubs is the same as the total number of consumers. The reason that government intervention is called for in the case of pure collective-consumption goods is due to the natural monopoly problem, i.e. the provision of public goods can be viewed as an extension of the theory of regulation, and the role of government increases as the number of clubs decreases.

Potential extractors of pool resources can also be viewed as a club. Where resources such as trees, oil, and fish are sold into a larger market, market competition avoids the natural monopoly problem. For resources that are consumed directly such as drinking water, competition between clubs may require Tiebout mobility of consumers to effect competition. For very large pools, such as the

[28] See Roumasset (1979) and Johansson and Roumasset (2002) for further discussion of the victim and polluter-rights sets of equivalencies.

[29] Shafer (2000) argues that before the Clean Air Act, factories installed smokestacks to diffuse pollution thereby increasing coalition costs for a viable lawsuit.

Ogallala Aquifer, a greater role of government may be indicated. There is scant research on the interaction of multiple resource clubs, and this may prove to be a fruitful avenue to advance the Ostrom agenda.[30]

Spillovers can be analyzed as spatial clubs, where the optimal number of clubs again ranges from one to the number of consumers. For global public goods, such as mitigation of climate change, the optimal number of clubs is one.

Much of the confusion surrounding the Coase theorem can be resolved with the equivalence version. The equivalence version of the Coase theorem applies to bilateral spillovers such that the optimal number of clubs is equal to the number of emitter and victim pairs. It states that under victim rights and absent transaction costs, bilateral production spillovers can be equivalently internalized by markets, contracting, and Pigouvian taxes with lump-sum victim compensation. There is an analogous set of equivalencies under polluter rights. This proposition serves to promote the Coasean agenda:

1) Pigouvian taxes are not the only way to internalize spillovers (Coase 1960).
2) Since alternative solutions are capable of the same solution absent transaction costs, they can only be meaningfully compared through (second-best) comparative institutional analysis (Coase 1937 and 1960).
3) Whether or not a supplier of intermediate goods should be vertically integrated into the firm is an application of principle 2) (Coase 1937).
4) The first-best equivalency provides a benchmark by which institutions can be compared.[31]

The import of the Coasean equivalency, at the first-best level of abstraction, is enhanced by stripping away the red herrings of reciprocal harm and alleged moral hazard of victim compensation. The mechanism for internalizing spillovers is an emission fee, whether it takes the form of a tax, a permit price, or is built into the contract. Compensation can be made to polluters (such the net payment becomes an abatement subsidy) or to victims, but either way the compensation is lump sum. The difficultly of knowing the marginal damage cost of pollution and the marginal benefit of emissions are issues that arise at the second-best level, in doing comparative institutional analysis.

In all of the cases examined here (clubs, spillovers, and pool resources), the optimal form of governance depends on which form can minimize agency costs by balancing the departure from the first-best equivalency solution with the economizing of agency costs. Nonetheless, some generalizations are possible. For private goods the minimal role of government is providing Adam Smith *night-watchman* functions including the contractual infrastructure for bilateral contracting. For club goods, the contractual infrastructure must include the ability of associations to contract with the public and regulatory functions where competition is inadequate. In that sense, the role of government increases as congestion costs (and therefore competition) decline. The central government's regulatory authority

[30] Salant (2009) provides a potentially useful starting point.

[31] Coase did not express this himself, concerned that "blackboard economics" often abstracts away from fundamental determinants of institutions and may obscure the ability of cooperation to internalize apparent "market failures." Nonetheless, the benchmark approach offers a method of operationalizing comparative institutional analysis including the analysis of comparative public policies (Roumasset 1995) and is therefore complementary with the rest of the agenda. It also offers a bridge to mathematical economists who are often dismissive of the Coase Theorem, e.g. Starrett's (1988, p. 24) declaration that the Coase Theorem is a "piece of folklore".

for clubs naturally extends to contracting for the provision of collective consumption goods on behalf of the citizenry.

There is perhaps no such thing as a purely private good inasmuch as all goods generate some kind of spillover in their production or consumption. The decision not to regulate negligible and small spillover effects presumably reflects an implicit judgment that the increased costs of regulation are not worth the benefits.

The concept of spatial clubs can be used as the basis of an economic theory of multiple jurisdictions and of fiscal federalism. In a first-best setting, the jurisdiction for a particular spillover should be extended to internalize the spillover. This tendency should be balanced against lost *Tiebout sorting*, benefits of club competition, and the ability of local jurisdictions to be more responsive to local demands.

References

Aivazian, V., H. Callen. 1981. The Coase theorem and the empty core. Journal of Law and Economics, 24(1): 175-181.

Banerjee, A., D. Mookherjee, D. Ray, and K. Munshi. 2001. Inequality, Control Rights, and Rent Seeking: Sugar Cooperatives in Maharashtra. Journal of Political Economy, 109(1): 138-190.

Bergstrom, T. 1975. The Core when Strategies are Restricted by Law. Review of Economic Studies, 42(2): 249-257.

Bergstrom, T. 1976. Regulation of Externalities. Journal of Public Economics. 5(1-2): 131-138.

Bergstrom, T. 2017. When was Coase right? UC Santa Barbara Economics Dept. Working Paper.

Brown, J. 1973. Toward an Economic Theory of Liability. Journal of Legal Studies, 2(2): 323-350.

Buchanan, J. 1965. An Economic Theory of Clubs. Economica, 32(125): 1-14.

Buchanan, J. and Stubblebine. 1962. Externality. Economica, 28(116): 371-384.

Cheung, S. 1968. Private Property Rights and Sharecropping. Journal of Political Economy, 76(6): 1107-1122 .

Cheung, S. 1973. The Fable of the Bees: An Economic Investigation. The Journal of Law & Economics, 16(1): 11-33

Coase, Ronald H. 1937. The Nature of the Firm. Economica, 4(16): 386–405.

Coase. R. 1960. The Problem of Social Cost. Journal of Law and Economics, 3(Oct.): 1–44.

Coase, R. 1990. The Firm, the Market, and the Law. University of Chicago Press.

Conley, J. and M. Wooders. 2010. Anonymous pricing in Tiebout economies and economies with Clubs. In D. Pines, E. Sadka, and I Zilcha, Topics in Public Economics: Theoretical and Applied Analysis. Cambridge: Cambridge University Press.

Cornes, R. and T. Sandler. 1996. The Theory of Externalities, Public Goods, and Club Goods. Cambridge: Cambridge University Press.

Demsetz, H. 1969. Information Efficiency: Another Viewpoint. *Journal of Law and Economics*, 12(1): 1-22

Desmarais-Tremblay, Maxine. 2017. On the Definition of Public Good. History of Political Economy. 49(1): 59-92.

De Dios, E. 2015. Completing Ostrom's Table: A Note on the Taxonomy of Goods. University of the Philippines School of Economics Discussion Papers 201503.

Dixit, A. 1999. The Making of Economic Policy. A Political Transaction-Cost Perspective. Cambridge: MIT Press.

Foley, D. 1967. Lindahl's Solution and the Core of an Economy with Public Goods. Econometrica, 38(1): 66–72
Goldberg, V. 1976. Regulation and Administered Contracts. The Bell Journal of Economics, 7(2): 426-448.
Guzzini E, Palestrini A (2009) The empty core in the Coase theorem: a critical assessment. Economic Bulletin, 29(4):3095–3103.
Hart, Oliver D., and Moore, John. 1996. The Governance of Exchanges: Members' Cooperatives versus Outside Ownership. Oxford Review of Economic Policy 12 (Winter): 53–69.
Hidriks, J. and G. Myles. 2013. Intermediate Public Economics, second edition. Cambridge: MIT Press.
Hochman, O. 2011. Efficient Agglomeration of Spatial Clubs. Journal of Urban Economics, 69(1):118-135.
Holterman, S. 1976. Alternative Tax Systems to Correct for Externalities and the Efficiency of Paying Compensation. Economica, 43(1): 1-16.
Huang, J. and Y. Hua. 2018. Eco-efficiency Convergence and Green Urban Growth in China. International Journal of Regional Science, 41(4): 1-28.
Hurwitz, L. 1995. What is the Coase Theorem? Japan and the World Economy, 7:60-74.
Johansson, P. and J. Roumasset, Apples, Bees and Contracts: A Coase-Cheung Theorem for Positive Spillover Effects. World Economic Forum, Shanghai: Dec. 2002. https://www.researchgate.net/publication/313699570_Apples_bees_and_contracts_a_Coase-Cheung_theorem_for_positive_spillover_effects
Johansson, P. 1996. Coase, Contracts, And Cocaine: The Foundations of a Comparative Institutions Approach to Externality Theory. Ph.D. dissertation. University of Hawaii.
Libecap, Gary D., Unitization. 1998. New Palgrave Dictionary of Economics and the Law. Available at SSRN: https://ssrn.com/abstract=81573 or http://dx.doi.org/10.2139/ssrn.81573
Libecap, G and J. Smith. 2002. The Economic Evolution of Petroleum Property Rights in the United States. *The Journal of Legal Studies*, 31(S2).
Lindahl, E. 1958 (1919). Just taxation—A positive solution. In Musgrave, R. and A. Peacock (eds.), Classics in the Theory of Public Finance, London: Macmillan.
Mason, C., S. Polasky, N. Tarui. 2017. Cooperation on Climate-Change Mitigation. European Economic Review, 99(Oct.): 43-55.
Medema, S. and R. Zerbe. The Coase Theorem. In Bouckaert and DeGeest (eds.). 2000. The Encyclopedia of Law and Economics, Aldershot: Edward Elgar Publishing, Inc., vol. 1, pp. 836-892.
Michelman, F. 1971. Pollution as a Tort: A Non-Accidental Perspective on Calebresi's Costs. Yale Law Journal 80(3) 647-686.
Montgomery, W. 1972. Markets in licenses and efficient pollution control programs. Journal of Economic Theory, 5(3) 395-418.
Musgrave, R. 1939. The Voluntary Exchange Theory of Public Economy. The Quarterly Journal of Economics,53(2): 213–237.
Musgrave. 1969. Provision for Social Goods. In J. Margolis and H. Guitton. Public Economics: An Analysis of Public Production and Consumption and Their Relations to the Private Sectors. London: Macmillan.
Musgrave, R. and P. Musgrave. 1973. Public Finance in Theory and Practice. New York: McGraw-Hill.
Nordhaus, W. 2015. Climate Clubs: Overcoming Free-riding in International Climate Policy. American Economic Review, 105(4): 1339–1370.
Ostrom, E. 1956. Public Enterpreneurship: A Case Study in Ground Water Management. Ph.D. dissertation, University of California at Los Angeles.
Ostrom, E. 1990. Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge: Cambridge University Press.
Ostrom, Vincent, and Elinor Ostrom. 1977. Public Goods and Public Choices: The Emergence of Public Economies and Industry Structures. In E. S. Savas (ed.), Alternatives for Delivering Public

Services: Toward Improved Performance, 7-49. Boulder, CO: Westview Press.
Pauly, M. 1967. Clubs, Commonality, and the Core: An Integration of Game Theory and the Theory Of Public Goods. Economica, 34(135): 314-324.
Phelps, E. 1985. Political Economy: An Introductory Text. New York: W. W. Norton & Company.
Rolder, A. 2006. Fisher Body Revisited: Supply Contracts and Vertical Integration. European Journal of Law and Economics. 22(2): 181-196.
Roumasset, J. 1978. The New Institutional Economics and Agricultural Organization. Philippine Economic Journal, 17(3): 331-348.
Roumasset, J. 1979. Sharecropping, Production Externalities, and the Theory of Contracts. American Journal of Agricultural Economics, 61(4): 640–647.
Roumasset, J. 1995. The Nature of the Agricultural Firm. Journal of Behavior and Organization, 26(2): 161-177.
Roumasset, J. and N. Tarui. 2010. Governing the Resource. Economics Working Paper 10-15, University of Hawaii.
Salant, S. 2009. Putting free-riding to work: A Partnership Solution to the common-property problem. Journal of Environmental Economics and Management, 57(3): 309–320.
Samuelson, P. 1954. The Pure Theory of Public Expenditure. Review of Economics and Statistics, 36(4): 387–389.
Samuelson, P. 1969. Pure Theory of Public Expenditure and Taxation. In J. Margolis, J. and H. Guitton, Public Economics: An Analysis of Public Production and Consumption and Their Relations to the Private Sector. London: MacMillan
Sandler, T. 2010. Common-property resources: privatization, centralization, and hybrid Arrangements. Public Choice, 143(3-4): 317-324.
Shafer, H. 2000. Tort Law: General. In B. Bouckaert and G. De Geest, Encyclopedia of Law and Economics. Cheltenham, UK: Edward Elgar.
Shavell, S. 1987. Economic Analysis of Accident Law, Cambridge: Harvard University Press.
Smith, R. 2014. Global Public Goods and Health. In Encyclopedia of Health Economics. https://www.sciencedirect.com/topics/social-sciences/global-public-goods
Starrett, D. 1988. The Foundations of Public Economics. Cambridge: Cambridge University Press.
Starrett, D. and R. Zeckhauser. 1974. Treating External Diseconomies—Markets or Taxes? In J. Pratt, Statistical and Mathematical Aspects of Pollution Problems, New York: Marcel Decker.
Stigler, G. 1966. The Theory of Price, 3rd edition. New York: Macmillan.
Stigler, G. 1988. Memoirs of an Unregulated Economist. Chicago: The University of Chicago Press.
Tiebout, C. 1956. A Pure Theory of Local Expenditures. Journal of Political Economy, 64(5): 416-416.
Usher, D. 1998. The Coase theorem is tautological, incoherent, or wrong. Economic Letters, 6{1): 3-11.
Wicksell, K. 1896. Finanztheoretische Untersuchungen, Jena: Gustav Fischer. English translation: A new principle of just taxation, in R. Musgrave and A. T. Peacock (eds.). 1958. Classics in the Theory of Public Finance, New York: St. Martin's Press, pp. 72–118.
Wiggins, S. and G. Libecap. Oil Field Unitization: Contractual Failure in the Presence of Imperfect Information. The American Economic Review, 75(3): 368-385.
Wooders, M. 1980. The Tiebout Hypothesis: Near Optimality in Local Public Good Economies, Econometrica, 48(6): 1467-1485.
Wooders, M. 1989. A Tiebout Theorem. Mathematical Social Sciences, 18(1): 33-55.
Zhao, J. 1999. A β-Core Existence Result and Its Application to Oligopoly Markets. Games and Economic Behavior, 27(1): 153-168.