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Externality, Pigou and Coase: A Case for Bilateral Taxation and Amenity Rights

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EXTERNALITY, PIGOU AND COASE:

A CASE FOR BILATERAL TAXATION AND AMENITY RIGHTS

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Abstract

While Coase correctly emphasizes the reciprocal nature of an externality, he ignores an important asymmetry. At the initial private equilibrium, the incremental harm on the sufferers of the external cost is significant while the harm on the causers of marginally reducing the damage-causing activity is infinitesimal. This makes a Pigovian tax efficient, ignoring administrative costs. A bilateral tax may be superior as it not only makes the sufferers take account of the costs imposed on the causers in having to reduce the relevant activity, but also ensures that the sufferer has no incentives to exaggerate or understate the true damages. The case for amenity rights is further supported on the following grounds: 1. the Coase theorem is invalid in the presence of conscience effects; 2. effects on future decisions; and 3. the under-provision of environmental quality due to its global public-good and long-term nature and the relative unimportance, at least in rich countries, of additional material consumption in comparison to environmental quality.

Keywords: amenity rights, bilateral taxation, Coase, environment, externality, Pigou.

JEL **Codes:** D62, H23.

1. Introduction

In our spaceship world of interdependency, the problem of environmental disruption is an important problem difficult to overemphasize. The recent big crack in the polar ice in Antarctica, the recurrent big forest fire in Indonesia that affected much of Southeast Asia, the serious sand storms from Northern China that reached as far as Taiwan, and many other events serve to remind us of the severity of the problem. If not properly tackled, the very survival of the world may be at stake. It is thus a problem that deserves the utmost emphasis.

Economists analyze the problem of environmental disruption as a form of external effects. The most cited paper is that of Coase's (1960) on 'The problem of social cost'. Coase's analysis has become so influential that an author (He 2000) of *Economic Highlights* (an influential Chinese weekly on economic issues) criticized a proposal for imposing pollution and congestion taxes on cars and petrol for ignoring Coase's analysis. He writes, "Obviously, ... [the author] is wrong. His mistake is exactly the Pigovian tradition criticized by Coase. He considers only the damage on one side, that of external costs of the usage of private cars. ... But he forgets to calculate another account: the restriction of the usage of private cars results in how much losses on individual utilities, the car and other related industries in China?" This pervasive influence of Coase prompted

me to reconsider his criticism of the Pigovian tradition. This reconsideration reaches the following conclusion. While Coase is correct in emphasizing the reciprocal nature of an externality problem (to avoid the harm to B would inflict harm on A), he ignores an important asymmetry. At the initial private equilibrium before accounting for the external effect (either by agreement, taxation or some other methods), the incremental harm on B (the sufferers of the external cost, say, pollution) is supra-marginal (i.e. significantly larger than infinitesimally small) while the harm on A (the polluters) of marginally reducing the damage-causing activity is infinitesimal. This is so since A has originally optimized with respect to the level of that activity under her control but B has no control on it. This ignored asymmetry is discussed in the next section and in a mathematical model in the appendix. Section 3 discusses the usefulness of a bilateral tax on an external cost not only in making the sufferer take account of the costs imposed on the causer in having to reduce the relevant activity, but also in ensuring that the sufferer has no incentive to exaggerate or understate the true damage. Despite the reciprocal nature of an externality emphasized by Coase, Section 4 argues in favour of amenity rights (or the principle of polluter pays) on the following grounds: 1. the Coase theorem is invalid in the presence of conscience effects; 2. effects on future decisions; and 3. the under-provision of environmental quality due to its global public-good and long-term nature and the relative

4

unimportance, at least in rich countries, of additional material production in comparison to environmental quality. This relative unimportance is in turn due to the diminishing marginal utility of income and the even lower marginal <u>welfare</u> of income. The divergence between utility (representing individual preference) and welfare (true individual well-being or happiness) is in turn due to excessive materialism caused by our accumulation instinct and the omnipresent advertising. This paper does not deny the possibility that the government is not ideal and may be rather inefficient in trying to implement the appropriate tax system, a point emphasized by Demsetz (1996), among others. However, the assessment of the significance of this is beyond the scope of this paper.

2.   The Ignored Asymmetry

Coase's (1960) long paper makes a number of important points, including:

(a)   In the absence of transaction costs, A and B will agree to achieve the efficient solution irrespective of whether A has the right to pollute or B has the right to amenity initially. This is known as the Coase theorem.

(b)   In the presence of significant transaction costs that may prevent the reaching of the efficient solution through agreement, the assignment of property rights matters but there is no presumption in favour of

amenity rights or pollution rights and the total gains and losses involved have to be compared in each specific cases.

(c)   The Pigovian tradition ignores the reciprocal nature of the problem and concentrates only on the restriction of A's activity that harms B. But this restriction harms A. The problem is to avoid the more serious harm. A change of approach is necessary.

The case of negligible transaction costs is not very realistic and Coase himself recognizes that market transactions 'are often extremely costly' (1960, p.15). He also emphasizes the point thus: "The world of zero transaction costs has often been described as a Coasian world. Nothing could be further from the truth. It is the world of modern economic theory, one which I was hoping to persuade economists to leave" (Coase 1988, pp.174-5). Dixit & Olson (2000) also show that efficient solutions are not robust to the presence of even very small transaction costs. On the other hand, Usher (1998) argues that costless bargaining ensures efficiency without any assignment of property rights at all, a situation clearly not applicable in the real world. Here, more emphasis will be given to points (b) and (c). The simple case of a given external cost by A on B will first be discussed before the consideration of some complicating factors such as the conscience effects and effects on future decisions discussed in the next section.

To see the reciprocal nature of the problem, consider Coase's example of a smoking factory A that is causing damage to B 'valued at $100 per annum. Assume that the taxation solution is adopted and that the factory owner is taxed $100 per annum as long as the factory emits the smoke. Assume further that a smoke-preventing device costing $90 per annum to run is available. In these circumstances, the smoke-preventing device would be installed. Damage of $100 would have been avoided at an expenditure of $90 ... Yet the position achieved may not be optimal. Suppose that those who suffer the damage could avoid it by moving to other locations or by taking various precautions which would cost them, or be equivalent to a loss in income of, $40 per annum. Then there would be a gain in the value of production of $50 if the factory continued to emit its smoke and those now in the district moved elsewhere or made other adjustments to avoid the damage' (Coase 1960, p. 41). All this may be correct (but see a qualification below) and the insight on the reciprocal nature important. However, by considering only all-or-nothing alternatives (probably to facilitate Coase's espositional style using only prose), an important asymmetry is hidden or ignored. To see this, consider the following graphical exposition. (A more general mathematical exposition is contained in the appendix.)

In Figure 1, the horizontal axis measures the value of x, an activity (e.g. pollution) undertaken by A that causes external costs on B. Up to a

point, A derives positive benefits from undertaking the activity. His net marginal valuation curve is given by MV^A. Maximizing his own profit/utility, he undertakes x till the point P, his private optimum. While A's marginal valuation is measured upward from the origin, B's marginal valuation is measured downward from the origin. Thus, the fact that the activity is harmful to B is reflected by the position of MV^B being above the horizontal axis. The fact that MV^A/MV^B is downward/upward sloping ensures that the normal second-order conditions are satisfied, though this may not be needed throughout the whole range. If we make the all-or-nothing comparison of allowing the activity at the point P and completely disallowing it (point O, the origin), it is true that either extreme may turn out to be better than the other. A detailed examination of each specific case is then needed to discover which one is more efficient. In comparison to no activity at the origin, undertaking the activity at the point P gives A a total benefit equal to the area OGP but imposes a total cost on B equal to the area OFCP. Depending on the average heights of the two MV curves over the range OP, either area may exceed the other. The emphasis on this reciprocal nature of the problem hides (though is consistent with) the following asymmetry at the private equilibrium point P. A unit of x imposes a non-infinitesimal cost on B equal to PC but a marginal reduction in x imposes an infinitesimal cost on A. It is this asymmetry that makes a movement from P to S (where the two MV curves intersect at the point E)

an efficient change and a Pareto improvement with some appropriate compensation.

What if a Pigovian tax on x (with the total amount of tax equal to the total damage of x on B) is imposed on A? A will then be motivated to reduce the level of x to the efficient level S. If A can eliminate the smoke at a cost of less than OFCP ($100 in Coase's example), he will do that under the Pigovian tax. What if the sufferer B could completely avoid the damage at even a smaller cost (smaller than OFEP but larger than OFES)? Obviously, this would be even a better option but B is not motivated to do that under the Pigovian tax. It is socially efficient for B to do that as the complete avoidance of damage, in comparison to the undertaking of x at the point S, reduces the damage of OFES to B and increase the net gain of ESP to A as he would then be able to increase x up to P. This is why the area of OFEP is the critical value below which it is socially efficient to undertake the avoidance. However, it may be argued that, appropriately interpreted, the Pigovian tax does not have this disadvantage. If B can completely avoid the damage at a cost of $M smaller than OFEP, her total damage from the smoke cannot exceed this amount. If this avoidance device is an all-or-nothing choice, then the marginal damage curve for B will be truncated to become FEHIP, where the area OFHI equals $M, since B can avoid further damage by incurring a cost of $M. If the avoidance device is not all-or-nothing, it means that, after taking into account the

possibility of reducing the damage of the smoke, the marginal damage curve is really one that is lower than MV^B. In either case, the imposition of the appropriately defined Pigovian tax will not cause the inefficiency mentioned above.

Coase was aware of this qualification on the alleged inefficiency of the Pigovian tax. He conceded that the inefficiency 'could be avoided if it were possible to base the tax, not on the damage caused, but on the fall in the value of production (in its widest sense) resulting from the emission of smoke' (1960, p. 41). However, he dismissed this possibility as informationally impracticable. This may well be true in many cases. However, it is still important to distinguish a failure of principle from a failure of practicability. Moreover, it may not be completely impracticable. For example, if the smoke causes an incurable serious illness, the damage can be seen to be very high. However, when a simple and effective cure is readily and widely known to be available, the damage can be seen to be not very high. In principle, the damage imposed on B must be taken to be that which still remains after optimizing caution by B plus the cost of such caution. For example, before the introduction of motor cars, people could stroll casually in the road without worrying too much about being run over. Now, if a person incurs serious injuries by blindly crossing a busy highway, he certainly has to be responsible for a major part (if not the whole) of the blame himself. Nevertheless, there are grey areas and situations change.

Thus, it may be desirable to have a system of bilateral taxation, as discussed in the next section.

In the above discussion with reference to Figure 1, since only the variable x appears in the axis, and the undertaking of damage-avoidance device is in the background, it may be doubted whether our conclusions still hold when this latter is explicitly allowed to vary. To answer this, Appendix A is provided. As shown there, it remains true that, ignoring administrative costs (which have to be separately estimated), some positive tax on the external-cost producing activity x by party A will be efficient, provided that B takes x and t as beyond her influence, as will be the case where B consists of a large number of individuals typical of problems of pollution and congestion. Further, ignoring second-best and distributional complications, the social optimal amount of tax remains Pigovian, i.e. the tax-rate is equal to the marginal damage. Moreover, this is still true if the taxation is replaced by the compensation from A to B. Moving property rights from the position of full pollution rights towards amenity rights is efficient. These results of the Appendix and the above discussion may be summarized into the following proposition.

Proposition 1: Despite the reciprocal nature of an externality problem emphasized by Coase and despite the fact that the sufferers of an external cost may have recourse to alleviate the damage, it remains

true that some tax on the external cost or some compensation from the causers to the sufferers is socially efficient, provided that the sufferers take the external-cost causing activity and the tax on the sufferers as largely beyond their influence and second-best complications are ignored. Moreover, ignoring distributional considerations, the social optimal amount of tax remains Pigovian, i.e. the tax-rate is equal to the marginal damage.

The case for ignoring distributional considerations is supported by the argument for treating a dollar as a dollar in specific issues, leaving the redistribution of income to the general tax/transfer system (Ng 1984).

3. The Beauty of Bilateral Taxation

In a system of bilateral taxation to tackle the problem of external cost (bilateral subsidy/tax for external benefit), not only should A be taxed (subsidized) according to the damage (benefit) imposed on B, but B should also be taxed in accordance to the cost sustained by A in having to reduce (increase) the level of x from his private optimal point. For the case of external cost, this second tax should be positively related to the reduction in the level of x from the point P and with the total amount of the tax going up in accordance to the area bounded by MV^A and the horizontal axis. In

12

fact, it was Coase who was probably the first to mention such a bilateral tax. "If the factory owner is made to pay a tax equal to the damage caused, it would clearly be desirable to institute a double tax system and to make residents of the district pay an amount equal to the additional cost incurred by the factory owner (or the consumers of his products) in order to avoid the damage' (1960, p. 41). In fact, this largely ignored proposal is, in my view, a much more important contribution than the Coase theorem that has attracted overwhelming attention. However, Coase (1988, p.181) himself does not see his mention of the bilateral tax as a proposal as he is skeptical of the desirability of any taxation solution.

Buchanan & Stubblebine (1962, p. 383) proposed a similar bilateral tax on an external cost. Their reason for doing so is different. After the imposition of the unilateral Pigovian tax on A, A's marginal valuation curve is shifted to $MV^{A'}$ which passes through the social optimal point S. However, $MV^{A'}$ intersects MV^B at E' corresponding to a non-optimal point S'. Given the unilateral tax, Buchanan & Stubblebine are afraid that A and B have incentives to negotiate to move from S to S', as they can gain the area E'SE. This is an inefficient move as the reduction in government tax revenue of E'S'SE has not been taken into account. They thus propose the bilateral tax on B, shifting her marginal valuation curve from MV^B downward to $MV^{B'}$. (This is so since the tax is <u>positively</u> correlated with the <u>reduction</u> in x from the point P and hence is <u>negatively</u> correlated with

x.) The bilateral tax thus ensures that the new marginal valuation curves of both parties intersect at the social optimal point S and hence making them having no incentive to negotiate a movement elsewhere.

The proposed bilateral taxation may be unnecessary for the purpose of avoiding a further movement away from optimality. If negotiation between the parties concerned is feasible, no tax at all is necessary. If negotiation to move from P to S is not feasible such that the Pigovian tax is needed, negotiation to move from S to S' is even less likely to be feasible. In the normal or expected average case of downward/upward sloping MV^A/MV^B, the potential gain for the first movement (from P to S) is the area EPC and is likely to be much larger than that for the second movement, area E'SE. (This can be seen thus. Given the downward-sloping MV^A, if we hypothetically start from a horizontal MV^B, the two areas will be equal. Making MV^B upward sloping increases area EPC and reduces area E'SE. This is also true for making an upward-sloping MV^B even more upward sloping.) Thus, whatever costs that prevent the negotiation for the first movement will *a fortiori* prevent that for the second movement, unless the situation changes drastically in the meantime.

However, the bilateral tax may serve two different purposes. The first is Coase's point of encouraging B to use other methods of reducing the damage if efficient. With just the unilateral tax on A, B does not take into account the gain to A if B undertakes some damage-reduction measure

14

which also increases A's optimal level of x through a reduced tax schedule, as discussed in the middle of the preceding section. The bilateral tax gives both parties the right incentives with respect to both the optimal level of x and whatever other arrangements that may affect the damage. In his important defense of the single Pigovian tax against the criticisms of Coase and Buchanan & Stubblebine, Baumol (1972) misses this role of the bilateral tax due to the simplicity of his model. With labour the only input and the cost function given, the possibility of alternative arrangements to reduce the external costs are effectively ruled out. This also reminds us that, while mathematical models may illuminate, they may also mislead. It is safer to use intuition, math, and graphs complementarily. (Baumol's suggestion of using acceptable levels of externality to overcome the difficulties of implementing the Pigovian solution is beyond the scope of this paper. On the effects of new technology on the optimal Pigovian tax, see also Baudry 2000.)

Secondly, and to my knowledge unnoted by other commentators, bilateral taxation is very useful in preventing the exaggeration of the damage. In the real world, the government has no perfect knowledge of the MV curves. To estimate the appropriate amount of tax on A, the government has to rely to some extent on the report of B on the amount of the damage. Under a unilateral tax system, B clearly has the incentives to exaggerate the amount of the damage sustained so as to increase the

amount of the tax on A and hence reduce the level of x further below the social optimal point S. Under the bilateral tax system, B does not have such incentives. Making the tax on A exceed the true damage reduces the equilibrium x below S. But B only benefits from the reduction of x in accordance to her true marginal damage function MV^B but has to pay a tax in accordance to MV^A. Thus, B clearly loses from the reduction of x below S (or E) where the two MV curves intersect. It can also be seen that B has no incentive to understate her damage either. So she will report truthfully under the bilateral tax system. Does A have the same incentives to report his MV curve truthfully? Yes. Over or under-reporting by A does not affect A directly, but undertaking the level of x consistent with either under- or over-reporting is detrimental to B himself, as may be seen from Figure 1. For example, if he overstates his MV from PE to PH (not drawn) and, consistent with this report, undertakes the level of x at I, he has to pay ESIH in extra tax but gains only the area ESIJ, thus losing EJH.

The discussion above assumes that each of A and B is a single person/firm. If either party consists of a number of heterogeneous individuals, the situation is more complicated. Individuals in B, for example, who have higher/lower than average damage functions may then be motivated to exaggerate/understate even under the uniform bilateral tax system. (The non-uniform case is discussed in the next paragraph.) But at least the average individual has the right incentives. Moreover, this

problem is caused by the superimposition of the publicness problem on top of the externality problem. The bilateral tax system is meant to solve the externality problem. For the publicness problem, one may have to use alternative method such as the Vickrey-Clarke-Groves incentive-compatible mechanism. Moreover, in the real world, if B consists of a large number of individuals/firms, their interest will likely be represented by some organizations which then should take appropriate steps to ensure optimal revelation of preferences. Here, we need only be concerned to show that, for B as a group, it has the right incentives.

If the proportionate differences in damage of the individuals in B are known, the bilateral tax on individuals in B can be apportioned accordingly such that there will be no incentives to over- or under-state, just as the case where B is a single individual discussed above. To see this, consider the simple case of just two individuals in B, B_1 and B_2, whose marginal valuation curves are given as MV^B_1 and MV^B_2 in Figure 2. The social optimal point S is determined by the intersection of the vertical sum of the individual MV curves $\sum MV^B$ with MV^A at E. Suppose $MV^B_1 = 2\ MV^B_2$. Then B_1 benefits twice as much as does B_2 from the reduction of x by A. If we apportion the bilateral taxes on B_1 and B_2 (the aggregate sum is still in accordance to the cost imposed on A in reducing x from the point P, i.e. measured leftward from P by the height of MV^A) in accordance to these proportions (i.e. 2/3 on B_1 and 1/3 on B_2), the tax schedules faced by B_1

and B_2 will be T_1 and T_2 respectively, as shown in Figure 2. Obviously, the situation of each individual is similar to the case of a single individual B discussed above. It is easy to see that both B_1 and B_2 will then have the incentives to report truthfully. Where the proportion of damage changes over the relevant range, the apportioning of the tax may change accordingly, though this may be practically difficult to operate.

It may be thought that, since the exercise here is to motivate the individuals concerned to report truthfully, the assumption that the proportionate differences in damage are known is inconsistent with the very purpose of the exercise. However, while the assumption that the exact MV curves are known would be inconsistent, knowledge about the proportionate differences may not be inconsistent. For example, suppose that the individual households (instead of just individuals) in B have similar income per head and not expected to have other reasons to have very different MV curves except for the numbers of individuals in each household. Moreover, the nature of the damage is that it affects all individuals more or less equally. Then it is reasonable to assume that the damage per household will be proportionate to the number of individuals in each household. Nevertheless, the extent of the damage may yet be unknown and has to be found out from the households. For another example, suppose that the damage is expected to be proportional to the income, property value, or some other known variable of the individuals or

households in B. We may then use this variable to apportion the bilateral tax without inconsistency, as we may not know the exact values of the damage. It is true that, in the real world, the use of such measures to apportion the bilateral tax will not agree exactly with the actual proportionate differences in damage. However, such apportioning may reduce the divergence by a whole order of magnitude. The slight incentives to report untruthfully may then fall within the conscience costs of dishonesty, resulting in largely truthful revelation of preferences.

The main points of this section may be summarized as

Proposition 2: A bilateral tax (subsidy/tax) on an external cost (benefit) does not only tax (subsidize) the causers of the externality according to the damage (benefits) caused but also tax the sufferers (beneficiaries) according to the costs sustained by the causers in reducing (increasing) the externality. Such a bilateral tax may be useful as it:

    i. **Ensures that the parties involved have no incentive to negotiate to deviate from the social optimum (Buchanan & Stubblebine);**

    ii. **Makes the sufferers have the right incentives to adopt damage alleviation measures (Coase);**

    iii. **Makes the sufferers have no incentive to over- or under-state the extent of the damage in either of the following cases:**

        a. **The sufferer is a single individual/firm;**

        b. **The sufferers have the same amount of damage;**

c. The proportionate differences in damage (though not the damages themselves) are known and the bilateral tax is apportioned according to these proportions.

4. The Case for Amenity Rights

In Section 2 and in the Appendix, it is argued that, despite the reciprocal nature of an externality problem emphasized by Coase and despite the fact that the sufferers of an external cost may have recourse to alleviate the damage, it remains true that <u>some</u> tax on the external cost or <u>some</u> compensation from the causers to the sufferers is socially efficient, provided that the sufferers take the external-cost causing activity as largely beyond their influence, as is true for most cases of pollution and congestion involving large numbers of individuals. Moreover, ignoring distributional considerations and such factors as the double dividend (on which see De Mooji 2000, Schwartz & Repetto 2000) of reducing general taxation (which increases the optimal rate of tax), the optimal tax rate remains Pigovian, being equal to the marginal damage caused. However, it has not been shown that amenity rights are more efficient than pollution rights. In terms of Figure 1, point S is more efficient than point P but starting at point O may or may not be more efficient than starting at point P. In this section, it is argued that there is a general case in favour of

amenity rights when we take account of the possible existence of conscience effects, the effects on future decisions, and the importance and the public-good and long-term nature of environmental quality, as discussed below. (For the effects of asymmetric information on the issue of amenity vs. pollution rights, see Huber & Wirl 1998.)

When we consider only an existing externality as discussed with reference to Figure 1 above without considering the effects on future decisions (and without considering conscience effects), there is no presumption that either the system of amenity rights (making the starting point O and B has the rights to receive compensation from A for agreeing to let B pollute) or pollution rights (making the original point P and A has the rights to receive compensation from B for agreeing to decrease the amount of pollution) is more efficient in comparison to the other. However, accounting for either or both effects changes the conclusion in favour of amenity rights even for the case where transaction costs are negligible. In other words, the validity of the Coase theorem depends not only on the absence of transaction costs but also on the absence of effects on future decisions and on the absence of conscience effects. The issue of future decisions has been discussed before with different emphases (e.g. Calabresi 1968, Wellisz 1964, Papandreou 1994). The issue of conscience effects has not been discussed by others.

4.1   The conscience effect invalidates the Coase theorem

Even consider only the simple case of a given externality between two single parties with no transaction costs and without considering the effects on future decisions and other relevant factors discussed below, the Coase theorem does not normally hold in the presence of conscience effects. Here, the conscience effects refer to the possibility that a person (or persons in a firm) that undertakes an activity that externally harms others may feel bad from that and hence enjoys a lower benefits from the activity. (The relevance of conscience and the related altruism to the externality problem has largely been ignored. The closest reference I can locate is McConnell 1997 on the relevance of different forms of altruism for the existence of existence values or passive-use values.) Consider Figure 3 which is similar to Figure 1 in the various axes. In the absence of any conscience effect, A's net marginal valuation curve of x is MV^A and his private optimal/equilibrium point is P if he has the rights to undertake x. In the absence of transaction costs and ignoring the Pareto-efficiency irrelevant income/wealth effects (which shifts the position of the MV curves marginally and hence may affect the exact location but not the Pareto efficient nature of the final solution), the negotiated solution will be at S whether we start from O with amenity rights or start from P with pollution rights. Moreover, in either case, the net gain from the activity is measured by the area FEG.

The knowledge that the activity is externally imposing a cost on B measured by MV^B makes A feel bad if he has a conscience effect. This may shift his MV curve from MV^A to MV^A_c (where C indicates the presence of conscience effects). It may be thought that this should only shift the private optimal point under pollution rights without negotiation from P to P' and the negotiated solution from S to S', without affecting the optimal nature of either amenity rights or pollution rights, with the net gain from the activity reduced to FE'G' in either case. However, this is likely to be the case only under pollution rights. Under amenity rights, A has to agree to pay B at least an amount of compensation no smaller than the damage (area FOSE) suffered by B for agreeing to let A undertake the activity at the level S. With the payment of this compensation, the activity becomes a mutually advantageous trade. A no longer imposes damage on B and hence A has no reason to suffer a bad conscience. His MV curve will thus revert to MV^A. Thus, under amenity rights, the negotiated solution will occur at S, not at S'. More importantly, the net gain of the activity will be the area FEG which is larger than the net gain of area FE'G' by the area GG'E'E which is the amount of conscience effect (or bad-conscience relieving effect) over the relevant range. The payment of compensation from the damage-causing party relieves him from having to suffer from a bad conscience and hence is value-creating (on top of creating the mutual gain of FE'G' and on top of being a transfer which is a

cost to the payer and a value to the receiver). What about the payment of compensation from the sufferers of the external cost to the causer? Shouldn't it also be creative of value? In fact, it is likely to be destructive instead of creative of value.

The bad conscience is suffered by the causer of the external cost if he makes the affected party suffer without compensation. Hence, if the causer has to pay full compensation, the bad conscience will be relieved. If the affected party has to pay the causer compensation instead, the situation will be quite different. It is true that, as the level of x is reduced from P' to S', A no longer has to suffer a bad conscience for that part of the activity he is no longer undertaking. But the relevant range of the activity when comparing amenity vs. pollution rights under negligible transaction costs is the range of activity OS or OS', not the irrelevant range beyond S or S'. For this range of activity that A is still undertaking after the negotiated solution, A is unlikely to have a relief of bad conscience since he is still imposing damage on B without compensation. Moreover, two additional negative effects are likely to apply:

(1) In comparison to the pre-negotiation free-pollution point P' (but not in comparison to the case of amenity rights), while A no longer suffers a bad conscience for the range S'P', he may suffer from a similar bad conscience for making B pay him to reduce the activity level form P' to S'.

(2)   B may suffer from a feeling of injustice in having to pay to get the nuisance causing activity reduced.

Even if we ignore these two negative effects, the institutional or property rights arrangement of pollution rights is still inferior to that of amenity rights as the net gain is lower by the area GG'E'E, the bad conscience-relieving effect under amenity rights.

It may be argued that, if A may suffer from a bad conscience for imposing damage on B without compensation, why should B not suffer from a bad conscience for not letting A do what is valuable to him (A) unless fully compensated. Why is there a bad conscience in causing uncompensated pollution in pursuit of valued production but no bad conscience in denying valued production in pursuit of amenity? A full answer to this philosophical and behavioural question is beyond the scope of this paper and the competency of its author. However, several points may be noted.

First, whatever the reasons, rational or irrational, people have the above preferences, the fact is that they do. Economists, especially those in favour of the Coasean view of the reciprocal nature of an external effect, are usually agreeable to accept people's preferences as they are without questioning the reasons behind them. By and large, people do have such preferences. Most people feel uneasy if the smoke from their Bar-B-Q (or factories) or their party noise is adversely affecting the amenity of their

neighbours, but few if anyone will be concerned with the fact that their rights to amenity may be preventing some valued production/activities from taking place. Secondly, this asymmetry (if it is asymmetrical) may be partly explained by the fact that the smoke, noise, or other nuisance actually exists and is visible/audible, while the prevented production/activities are hypothetical ('could be if …'). Thirdly, rightly or wrongly and for whatever reasons, people regard amenity or freedom from damage as a right while undertaking production or activities only as an opportunity which has to be subject to not violating the right to amenity. Fourthly, in rich countries at least, additional production has become unimportant, and environmental protection has become more important. This is related to another reason in favour of amenity rights discussed in Section 4.3 below.

4.2 Effects on future decisions

The discussion above considers a given external effect. Though the possible effects on and of a third activity z by the affected party B has also been considered (mainly in the appendix), possible effects on other parties have not been considered. This problem has been touched on by a number of contributions (e.g. Calabresi 1968, Wellisz 1964, Papandreou 1994). Among others, it has been emphasized that, if people causing damages to

others may stand to receive compensations, the encouragement of nuisance causing activities will certainly be most inefficient. Here, only one aspect of the problem is emphasized. To reduce inefficient future decisions, Ng (1971, p.171) proposed that, instead of either the causers or the sufferers of the external cost, it should be 'the first party ... [who] has prior claim to receive compensation'. The point was that, given the location of the smoking factory, it may be inefficient to built houses close to it; given the houses, it may be inefficient to have a smoke-emitting factory close by. Although the issue of first party priority may have some relevance, the case for amenity rights may still be made. The reason is partly due to the point discussed in the next subsection and partly to the following consideration.

For a smoke-emitting factory to be efficient, it must not only be able to compensate the damage done to nearby residents now (ignoring the global damage of smoke) but also to residents that are likely to emerge in the future in the natural course of events. Thus, it is efficient to make a factory built now at the outskirt of an expanding city take into account the likely existence of houses nearby in the future. The fact that it is there first should thus not preclude it from its liability to compensate residents for smoke damage in the future. However, this does not mean that a blackmailer who has no real intention of building a house close to a factory in a remote area should also have the rights to receive compensation by

extortion. Sustaining damage from some amenity-destructive activities should be distinguished from both carelessly causing damage on oneself (like the case of blindly crossing a busy highway mentioned above) and attempting to benefit from blackmailing.

4.3   Further considerations in favour of amenity rights

In addition to the above, there are a number of considerations suggesting that amenity rights may be more efficient in comparison to pollution rights.

First, environmental quality is to a large extent a global public good and hence under-provided even if national governments have optimized in accordance to the national interest in the trade-off between environmental quality and additional production and consumption. Thus, amenity rights that bias in favour of environmental quality may be an efficient offset from a global point of view. Secondly, environmental disruption also largely has long lasting effects, with many pollutants being cumulative and stays in the atmosphere for a long time or even indefinitely. National governments, either democratic or authoritarian, typically have relatively short time horizons. This also make environmental amenity under-provided and amenity rights an offset in the right direction.

Thirdly, at least in rich countries, additional production and consumption have become relatively unimportant and environmental

quality more important and increasingly so. The bias due to amenity rights may just mean sacrificing some output with low marginal utilities; the bias due to pollution rights may threaten our very survival. In terms of Figure 1, this means that the area EPC is likely to be larger than the area GFE for cases of environmental importance. Fourthly, on top of the low marginal utility, the real marginal welfare of additional material output is even lower. This divergence between utility (which representing preference) and welfare (which is the real well being or happiness) is due to the materialistic bias caused both by our accumulation instinct and by the omnipresent advertising in the commercial society that we live in, as argued by Ng (2000). This divergence may also partly explain the fact that virtually all individuals are engaging in the rat race for making more money but surveys after surveys of happiness indicate that the level of happiness has failed to increase with the ever-increasing real per capita output. (See Blanchflower & Oswald 2000; Diener & Suh 1997; Frank 1999; Kahneman *et al.* 1999; Myers 1996, p. 445.)

The main points of this section may be summarized as

Proposition 3: While specific cases to the contrary may exist, a general case for amenity rights may be made as:

i.   **Even in the absence of transaction costs, it is more efficient to have amenity rights instead of pollution rights in the presence**

of conscience effects or when the effects on future decisions are taken into account;

ii. Environmental quality is partly a global public good with long-term effects and hence underprovided;

iii. At least in rich countries, additional production and consumption are socially unimportant despite being viewed as important at the individual level due to relative-income effects and the materialistic bias caused by our accumulation instinct and advertising.

5. Concluding Remarks

Surprisingly, even in our era of environmental consciousness, there are economists who believe that externalities do not exist and that fortunately, the concept of externality has been killed after several decades of hard work by the free market economists. There are more economists believing that the reciprocal nature of external costs emphasized by Coase means that the Pigovian solution of attempting to reduce external costs by taxation is mistaken and that a change of approach is necessary. The analysis of this paper shows that, at least for substantial external costs like environmental disruption, Pigovian taxes and especially bilateral taxes may still be desirable and that a strong case for amenity rights can be made despite the reciprocal nature of externalities. However, the administrative

costs and the often inefficiencies of government intervention also have to be taken into account. Nevertheless, due to the importance of environmental protection and the relatively unimportance of additional consumption at least in rich countries, perhaps we may afford some government inefficiencies provided that the objective of environmental protection may be fostered.

APPENDIX

THE IGNORED ASYMMETRY

In this appendix, it is shown in a simple model that, despite the fact that the party (B) affected by an external cost may undertake certain activity that may affect (either increase or decrease) the amount of the external cost, it remains true that, ignoring administrative costs (which have to be separately estimated), some positive tax on the external-cost producing activity x by party A will be efficient, provided that B takes x and t (tax rate on A) as beyond her influence, as will be the case where B consists of a large number of individuals typical of problems of pollution and congestion.

For simplicity but sufficient for the purpose, we assume that only A and B are affected, and only the variables concerned are affected. We have an activity x undertaken by A that externally affects B. The pre-activity levels of other variables including the pre-activity levels of incomes of both are not affected. (The post-activity levels could be affected.) In effect, this simplification abstracts away the complication of second best. Clearly, in the presence of second-best complications, an apparent first-best improvement in any sector may be a deterioration. However, unless specific information is available that such is the case, the expected average value of a first-best improvement is still positive. (This is the principle of

the third best: In the absence of specific information, follow the first-best rules. See Ng 1979/83, Ch.9.) Thus, the abstraction away of the second-best complication is natural for our problem here.

Let A's utility U^A depend on the relevant activity x, the amount of his income y^A available for other goods/activities, and possibly some other variables (which, being held constant, are not shown explicitly)

(1) $U^A = U^A(x, y^A)$

The net-of-x income y^A is simply the pre-activity income $\bar{y}^A$ (taken as exogenous for the problem here) less the tax on x if any (a per unit tax rate t is used for simplicity) and less the monetary cost of x, $C(x)$. (The non-monetary costs, if any, are included in the form of the utility function, making the marginal utility of x being the one that is net of the non-monetary cost of x.)

(2) $y^A = \bar{y}^A - C(x) - tx$

A choose x to maximize U^A subject to (2), giving the first-order condition

(3) $U^A_x / U^A_y = c(x) + t$

where a subscript denotes partial differentiation, i.e. $U^A_x \equiv \partial U^A/\partial x$, $U^A_y \equiv \partial U^A/\partial y^A$ and $c \equiv \partial C/\partial x$ is the marginal cost of x.

The utility level of B is given by

(4) $U^B = U^B(x, z, y^B); U^B_x < 0$

where x is the same variable as above, over which B has no direct control and z is a variable under B's direct control that may affect the amount of the damage of x on her, and y^B is B's net-of-z income.

(5) $y^B = \bar{y}^B - K(z)$

where K is the monetary cost of z. Taking x as given, B's maximization of (4) subject to (5) gives the first-order condition

(6) $U^B_z / U^B_y = k(z)$

Where a subscript denotes partial differentiation as above and $k \equiv \partial K / \partial z$ is the marginal cost of z.

Given that the rest of the society is assumed unaffected by this problem, the social welfare function may be taken as

(7) $W = W(U^A, U^B, R)$; $W_A, W_B, W_R > 0$

where $W_R \equiv \partial W / \partial R$, $W_A \equiv \partial W / \partial U^A$, etc. and R is the revenue from the tax on B and is given by

(8) $R = tx$

As the revenue may be given to either individual as a lump sum (independent of x or z) if desired, we may take

(9) $W_R \geq W_A U^A_y$; $W_R \geq W_B U^B_y$

To examine the effect of a marginal increase in the tax rate on A from the original level of zero, totally differentiate (8), yielding

(10) $dW/dt = W_A(dU^A/dt) + W_B(dU^B/dt) + W_R(dR/dt)$

34

The total differentiation of (1) gives, after substituting in the first-order condition (2) which apply before and after the change (alternatively, apply the envelope theorem),

(11) $dU^A/dt = - xU^A_y$

which means that an increase in t reduces A's utility at the rate x times the marginal utility of income. Similarly, from (4), we may derive

(12) $dU^B/dt = U^B_x (dx/dt)$

which holds since t does not directly affect B but through the effect on x. The total differentiation of (8) gives

(13) $dR/dt = x + t(dx/dt)$

From the total differentiation of (2) and (3) and the use of the second-order condition for A's maximization problem, we have

(14) $dx/dt < 0$

which just says that an increase in the tax rate on the activity x reduces its equilibrium value. (Otherwise, there is no point in having this Pigovian tax.)

Substitute (11) – (13) into (10), giving

(15) $dW/dt = W_B U^B_x (dx/dt) - W_A x U^A_y + W_R[x + t(dx/dt)]$

Starting from the original position of $t = 0$ and using (9), we have from (14),

(16) $dW/dt \geq W_B U^B_x (dx/dt) > 0$

where the last inequality follows from (14) and from the fact that the external effect is negative (a cost instead of a benefit). This shows that some tax on an external cost is efficient, ignoring administrative costs, even if the sufferers of this external cost may have some recourse (activity z above) that may reduce the damage.

To find what is the optimal rate of tax t^* assuming continuity in the relevant functions and the satisfaction of second-order condition, set the right hand side of (15) to zero (since dW/dt = 0 when t maximizes W), we have

(17) $t^* = - U^B_x/U^B_y$

for the case when (9) is held as equalities. (With inequalities, $t^* > - U^B_x/U^B_y$). In other words, the Pigovian tax rate in accordance with the marginal damage remains optimal.

Coase' argument on the reciprocal nature of an externality is more concerned with the assignment of property rights or with deciding party is entitled to receive compensation than with the taxation solution (where the tax revenue goes to the government than to the party with the property rights). So, what if the amount of revenue/compensation is received by B instead? (But B is assumed to take x and t as beyond her control.) In this case, the model above remains unchanged except that R = 0 and B's budget constraint (5) is replaced by

(18) $y^B = \bar{y}^B - K(z) + tx$

Correspondingly, (12) is replaced by

(19) $dU^B/dt = U^B_x (dx/dt) + U^B_y [x + t(dx/dt)]$

and (15) replaced by

(20) $dW/dt = W_B \{U^B_x (dx/dt) + U^B_y[x + t(dx/dt)]\} - W_A x U^A_y$

If we are concerned purely with the efficiency issue and ignore distributional effects or assume optimal redistribution, we may take the social significance of a marginal dollar to A and to B as equal, i.e. $W_A U^A_y$ $= W_B U^B_y$. Then, starting from $t = 0$, we still have exactly (16) from (19). Thus, starting from the original position of pollution rights, a movement towards amenity rights is efficient.

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Figure 1

Figure 2

Figure 3

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