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On Divergences between Social Cost and Private Cost*

By RALPH TURVEY

The notion that the resource-allocation effects of divergences between marginal social and private costs can be dealt with by imposing a tax or granting a subsidy equal to the difference now seems too simple a notion. Three recent articles have shown us this. First came Professor Coase's "The Problem of Social Cost", then Davis and Whinston's "Externalities, Welfare and the Theory of Games" appeared, and, finally, Buchanan and Stubblebine have published their paper "Externality".¹ These articles have an aggregate length of eighty pages and are by no means easy to read. The following attempt to synthesise and summarise the main ideas may therefore be useful. It is couched in terms of external diseconomies, i.e. an excess of social over private costs, and the reader is left to invert the analysis himself should he be interested in external economies.

The scope of the following argument can usefully be indicated by starting with a brief statement of its main conclusions. The first is that if the party imposing external diseconomies and the party suffering them are able and willing to negotiate to their mutual advantage, state intervention is unnecessary to secure optimum resource allocation. The second is that the imposition of a tax upon the party imposing external diseconomies can be a very complicated matter, even in principle, so that the *a priori* prescription of such a tax is unwise.

To develop these and other points, let us begin by calling *A* the person, firm or group (of persons or firms) which imposes a diseconomy, and *B* the person, firm or group which suffers it. How much *B* suffers will in many cases depend not only upon the *scale* of *A*'s diseconomy-creating activity, but also upon the precise *nature* of *A*'s activity and upon *B*'s *reaction* to it. If *A* emits smoke, for example, *B*'s loss will depend not only upon the quantity emitted but also upon the height of *A*'s chimney and upon the cost to *B* of installing air-conditioning, indoor clothes-dryers or other means of reducing the effect of the smoke. Thus to ascertain the optimum resource allocation will frequently require an investigation of the nature and costs both of alternative activities open to *A* and of the devices by which *B* can reduce the impact of each activity. The optimum involves that kind and scale of *A*'s activity and that adjustment to it by *B* which maximises the algebraic sum of *A*'s gain and *B*'s loss as against the situation where *A*

* I am indebted to Professor Buchanan, Professor Coase, Mr. Klappholz, Dr. Mishan and Mr. Peston for helpful comments on an earlier draft.

¹ *Journal of Law and Economics*, Vol. III, October, 1960, *Journal of Political Economy*, June, 1962, and *Economica*, November, 1962, respectively.

pursues no diseconomy-creating activity. Note that the optimum will frequently involve *B* suffering a loss, both in total and at the margin.¹

If *A* and *B* are firms, gain and loss can be measured in money terms as profit differences. (In considering a social optimum, allowance has of course to be made for market imperfections.) Now assuming that they both seek to maximise profits, that they know about the available alternatives and adjustments and that they are able and willing to negotiate, they will achieve the optimum without any government interference. They will internalize the externality by merger², or they will make an agreement whereby *B* pays *A* to modify the nature or scale of its activity.³ Alternatively,⁴ if the law gives *B* rights against *A*, *A* will pay *B* to accept the optimal amount of loss imposed by *A*.

If *A* and *B* are people, their gain and loss must be measured as the amount of money they respectively would pay to indulge in and prevent *A*'s activity. It could also be measured as the amount of money they respectively would require to refrain from and to endure *A*'s activity, which will be different unless the marginal utility of income is constant. We shall assume that it is constant for both *A* and *B*, which is reasonable when the payments do not bulk large in relation to their incomes.⁵ Under this assumption, it makes no difference whether *B* pays *A* or, if the law gives *B* rights against *A*, *A* compensates *B*.

Whether *A* and *B* are persons or firms, to levy a tax on *A* which is not received as damages or compensation by *B* may prevent optimal resource allocation from being achieved—still assuming that they can and do negotiate.⁶ The reason is that the resource allocation which maximises *A*'s gain less *B*'s loss may differ from that which maximises *A*'s gain less *A*'s tax less *B*'s loss.

The points made so far can usefully be presented diagrammatically (Figure 1). We assume that *A* has only two alternative activities, I and II, and that their scales and *B*'s losses are all continuously variable. Let us temporarily disregard the dotted curve in the right-hand part of the diagram. The area under *A*'s curves then gives the total gain to *A*. The area under *B*'s curves gives the total loss to *B* after he has made the best adjustment possible to *A*'s activity. This is thus the direct loss as reduced by adjustment, plus the cost of making that adjustment.

If *A* and *B* could not negotiate and if *A* were unhampered by restrictions of any sort, *A* would choose activity I at a scale of *OR*. A scale of *OS* would obviously give a larger social product, but the optimum is clearly activity II at scale *OJ*, since area 2 is greater than area 1. Now *B* will be prepared to pay up to $(1a + 1b - 2a)$ to secure this result, while

¹ Buchanan-Stubblebine, pp. 380–1.

² Davis-Whinston, pp. 244, 252, 256; Coase, pp. 16–17.

³ Coase, p. 6; Buchanan-Stubblebine agree, p. 383.

⁴ See previous references.

⁵ Dr. Mishan has examined the welfare criterion for the case where the only variable is the scale of *A*'s activity, but where neither *A* nor *B* has a constant marginal utility of income; Cf. his paper "Welfare Criteria for External Effects", *American Economic Review*, September, 1961.

⁶ Buchanan-Stubblebine, pp. 381–3.

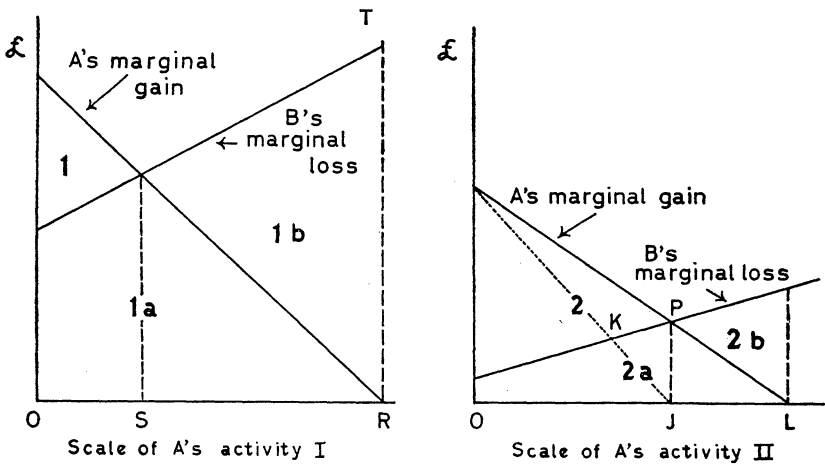


FIGURE 1

A will be prepared to accept down to $(1 + 1a - 2 - 2a)$ to assure it. The difference is $(1b - 1 + 2)$, the maximum gain to be shared between them, and this is clearly positive.

If *A* is liable to compensate *B* for actual damages caused by either activity I or II, he will choose activity II at scale *OJ* (i.e. the optimum allocation), pay $2a$ to *B* and retain a net gain of 2. The result is the same as when there is no such liability, though the distribution of the gain is very different: *B* will pay *A* up to $(1a + 1b - 2a)$ to secure this result. Hence whether or not we should advocate the imposition of a liability on *A* for damages caused is a matter of fairness, not of resource allocation. Our judgment will presumably depend on such factors as who got there first, whether one of them is a non-conforming user (e.g. an establishment for the breeding of maggots on putrescible vegetable matter in a residential district), who is richer, and so on. Efficient resource allocation requires the imposition of a liability upon *A* only if we can show that inertia, obstinacy, etc. inhibit *A* and *B* from reaching a voluntary agreement.¹

We can now make the point implicit in Buchanan-Stubblebine's argument, namely that there is a necessity for any impost levied on *A* to be paid to *B* when *A* and *B* are able to negotiate. Suppose that *A* is charged an amount equal to the loss he imposes on *B*; subtracting this from his marginal gain curve in the right-hand part of the diagram gives us the dotted line as his marginal net gain. If *A* moves to point *J* it will then pay *B* to induce him to move back to position *K* (which is sub-optimal) as it is this position which maximises the joint net gain to *A* and *B* together.

There is a final point to be made about the case where *A* and *B* can negotiate. This is that if the external diseconomies are reciprocal, so

¹ Cf. the comparable argument on pp. 94-8 of my *The Economics of Real Property*, 1957, about the external economy to landlords of tenants' improvements.

that each imposes a loss upon the other, the problem is still more complicated.¹

We now turn to the case where A and B cannot negotiate, which in most cases will result from A and/or B being too large a group for the members to get together. Here there are certain benefits to be had from resource re-allocation which are not privately appropriable. Just as with collective goods,² therefore, there is thus a case for collective action to achieve optimum allocation. But all this means is that *if* the state can ascertain and enforce a move to the optimum position at a cost less than the gain to be had, and *if* it can do this in a way which does not have unfavourable effects upon income distribution, then it should take action.

These two "ifs" are very important. The second is obvious and requires no elaboration. The first, however, deserves a few words. In order to ascertain the optimum type and scale of A 's activity, the authorities must estimate all of the curves in the diagrams. They must, in other words, list and evaluate all the alternatives open to A and examine their effects upon B and the adjustments B could make to reduce the loss suffered. When this is done, if it can be done, it is necessary to consider how to reach the optimum. Now, where the nature as well as the scale of A 's activity is variable, it may be necessary to control both, and this may require two controls, not one. Suppose, for instance, that in the diagram, both activities are the emission of smoke: I from a low chimney and II from a tall chimney. To induce A to shift from emitting OR smoke from the low chimney to emitting OJ smoke from the tall chimney, it will not suffice to levy a tax of PJ per unit of smoke.³ If this alone were done, A would continue to use a low chimney, emitting slightly less than OR smoke. It will also be necessary to regulate chimney heights. A tax would do the trick alone only if it were proportioned to losses imposed rather than to smoke emitted, and that would be very difficult.

These complications show that in many cases the cost of achieving optimum resource allocation may outweigh the gain. If this is the case, a second-best solution may be appropriate. Thus a prohibition of all smoke emission would be better than OR smoke from a low chimney (since 1 is less than $1b$) and a requirement that all chimneys be tall would be better still (giving a net gain of 2 less $2b$). Whether these requirements should be imposed on existing chimney-owners as well as on new ones then introduces further complications relating to the short run and the long run.

There is no need to carry the example any further. It is now abundantly clear that any general prescription of a tax to deal with external diseconomies is useless. Each case must be considered on its own and

¹ Davis-Whinston devote several pages of game theory to this problem.

² Buchanan-Stubblebine, p. 383.

³ Note how different PJ is from RT , the initial observable marginal external dis-economy.

there is no *a priori* reason to suppose that the imposition of a tax is better than alternative measures or indeed, that any measures at all are desirable unless we assume that information and administration are both costless.¹

To sum up, then: when negotiation is possible, the case for government intervention is one of justice not of economic efficiency; when it is not, the theorist should be silent and call in the applied economist.

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¹ Coase, pp. 18, 44.