

A Discussion of the Use of Taxes on Polluting Activities as a Way of Protecting the Environment

It is estimated that, with the current rate of growth of car use in the British Isles, all motorways will be ‘gridlocked’ by the year 2005. The increased pollution will, undoubtedly, have an adverse effect on the planet’s environment, but common sense dictates that this will be a self curing phenomenon; after all, if people know that they will not be able to use the car, they will not start the engine, thus creating a plateau in pollution levels.

This is, however, in the future. The democratic processes in the world demand (often unfairly) more myopic solutions, in order to get the current government re-elected. As the output of a country increases, if left ungoverned so would the pollution problems within that country. This essay looks at the possible ways that pollution could be accounted for, and how the external effects on third parties could be reduced.

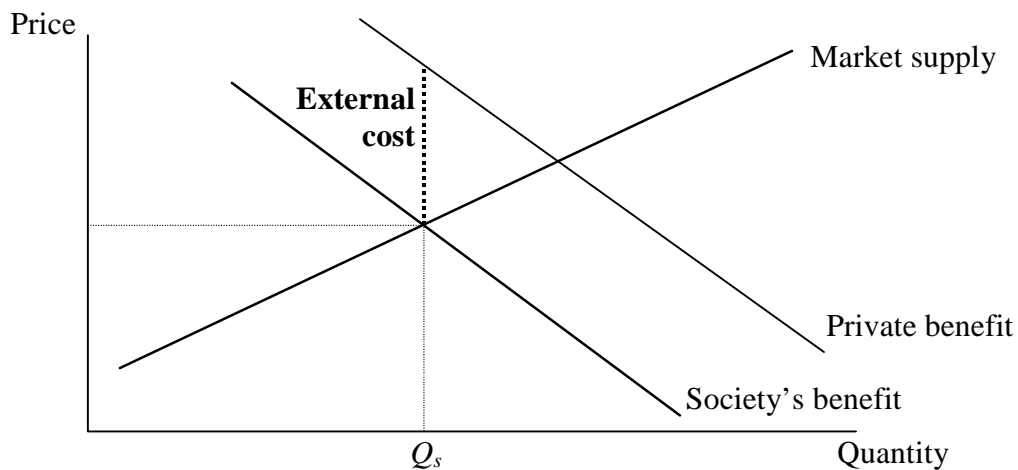
In a case of general externalities, two possible paths are available to any governing party: they can either reduce the externality itself, or compensate any third party affected in an adverse way. With the case of environmental pollution, this latter option is unfeasible, as the environment will be worsened for many years to come, and it would be difficult to compensate all those affected.

In order to examine how a government would be best advised to deal with externalities, it is best to look at one specific case, and then extend the theory thus gained to cover other cases. As mentioned in the title, one of the best cases to study is that of car pollution, not because it is one of the simplest models; quite the reverse, it deals with most possible scenarios that may arise.

Cars produce two different negative externalities: congestion and pollution. An interesting point to note is that increases in one or other of these externalities leads to increases in the other (increased congestion leads to longer periods spent on the roads, and higher pollution levels; higher pollution leads to cars running less efficiently, and

thus more congestion), and so it is particularly important for government to prevent rises in either. For the purposes of this essay, it is the polluting aspect that will be concentrated on, but it is important to acknowledge the existence of congestion, as this may explain why the present government’s transport policy differs from that derived here.

In order to set a policy to reduce the level of externalities, it is important to understand why they exist. When looking at external costs, it is vital to differentiate between social and individual demand curves. The individual’s curve will always be higher than the whole society’s curve:

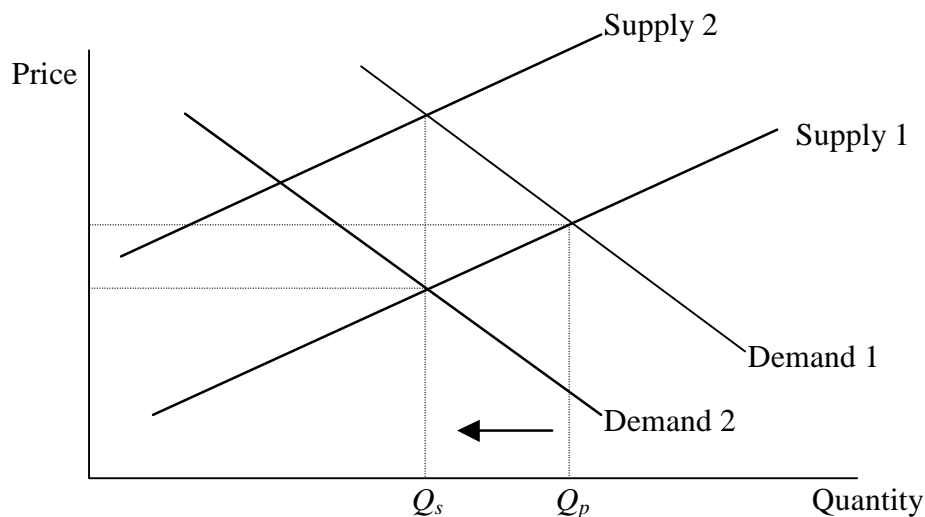


It should be noted that what is described above is an externality of consumption; an externality of production has social and private cost (or supply) curves instead of benefit curves, but the rest of the analysis described below is the same.

When forming policy to deal with such externalities, authorities must decide between several options available to them. The first decision must be whether to affect the output of the good as a whole, or to simply deal with the externalities. In the case examined here, it is quite easy to relate examples to this: should a government tax electric car use, seeing as pollution levels are much reduced with this; should a government reduce the tax on cars with more passengers, as this is helping to reduce pollution per head? If the government decides to simply deal with external effects

(and thus only tax pollution-producers, and taxing per the amount of pollution produced per person), the policies it uses are termed ‘internalising the externality’. This method is usually more efficient than affecting the output of and demand for the good as a whole, but it is not always possible or cheap enough to be implemented.

A controlling body must also decide whether to attempt to affect the demand for or the supply of the good (or externality) under examination. The overall aim should be to reduce the amount of the good supplied in a free market to the socially acceptable level. A general diagram can be used:



If government decides to use supply-side policies (as is the most effective choice when dealing with externalities of production – however, many of these can be used to reduce consumption externalities less effectively), again it has several options to decide between. The most commonly used systems employed by authorities include quotas, bans, taxation, extended property rights, and transferable licences. These can be examined individually. All supply-side policies aim to produce the effects shown on the graph above, with the ‘Demand 2’ curve omitted.

Quotas are an attempt to directly limit the negative externality, and thus to limit the market failure due to it. There are two types of quota: those on the production of the good itself; and those on the production of the externality. Which should be used will depend on whether the externality is one of production or consumption, and whether

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the government has decided to aim for internalisation of the externality, or to reduce the output of the good as a whole.

Complete bans on goods are a specialised case of quotas, where the quota itself is set to zero. These are likely to be used sparingly, as an excess of government intervention is likely to be as harmful in terms of market failure than no intervention at all. Indeed, even with the quota system, the government must examine carefully the amount likely to be socially acceptable, as reducing quotas below this level will cause high prices and excess demand.

Taxation is one of the most popular methods of reducing external costs, as the principle is so varied; the tax may be payable on producing goods, consuming goods, producing externalities, or a combination of these. The effects and implications of taxation shall, however, be examined in greater depth at a later stage in this essay.

Extended property rights are another form of taxation, but here is a plausible method that a government could use to compensate the sufferers from negative externalities. If people are allowed to sue for compensation (if, for example, a car passes outside their house with a significant exhaust trail), not only will the person be compensated, but there will be an added incentive on car users to reduce pollution. This may seem the ideal solution, in that the sufferers receive the compensation and only the polluters have to pay. There are a few minor complications, in that individuals may not sue for personal reasons (fear and so on), and the individual amounts involved would be insignificant enough to be ignored, but at first glance this seems to be an ideal solution, as it does not discourage the positive aspects of motoring, but encourages manufacturers to produce more efficient and environmentally friendly cars. There are two reasons why this scheme is not implemented, which are the same as for the next scheme, so will be discussed slightly later.

The final method of reducing supply to a socially desirable level is to implement a system of transferable licences. This is only really relevant in the case of tackling externalities of production, but it is included here for completeness. Transferable

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licences use a combined system of quotas and taxes to ensure that pollution is controlled efficiently. Firms have to buy licences from the government to produce a certain amount of pollution. If the production method is such that the firm does not use up all its pollution quota, it is allowed to sell the rest of the quota to another firm and get some of its money back. A firm which produces in such a way as to produce more than its quota of pollution will have to buy additional license units from more efficient firms, so raising its costs. Those firms with inefficient pollution limits will lose out financially to more efficient firms, and will be forced through the market to either become more efficient or go bust. It would be possible to apply this to car pollution; people pay depending on how much pollution they produce. There are, however, two major problems.

The main problem with the two latter schemes is that of cost. It would be unfeasibly expensive to measure all individual car exhausts to find the pollution levels at all times (it is possible to measure pollution levels, admittedly, at the yearly MOT test, but the infrequency of these tests means that at best a quota system can be implemented). The marginal benefit to society would be far less than the marginal cost; in the case of extended property rights, the £10 (say) compensation would take a legal process costing many thousands of pounds to extract. In this instance society is myopic; nobody would be willing to pay that much simply to ensure that future generations had a slightly cleaner environment.

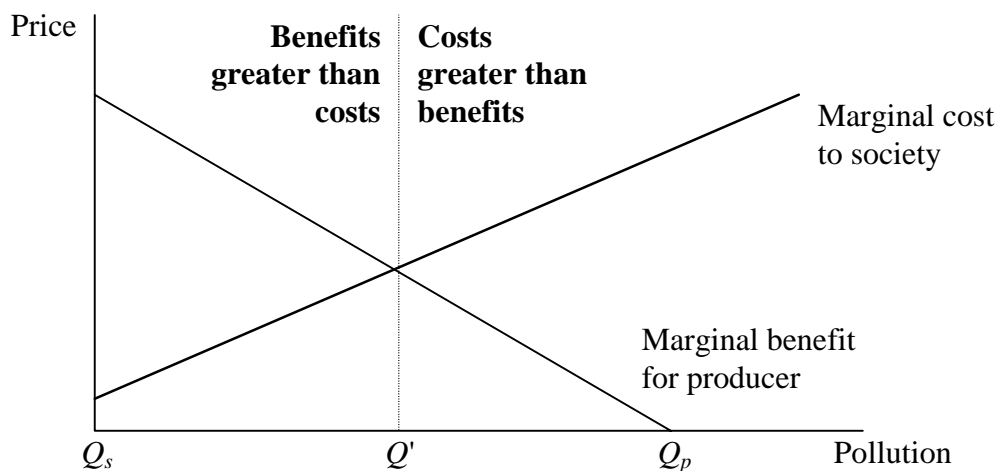
The other major fault is related, but it can be applied to quota methods as well: It is generally very difficult to implement pollution control schemes in any way at all effective. To keep control of pollution from cars, it would be necessary to monitor each car's pollution levels constantly. There may be a time in the near future when this is possible, but for now all methods of reducing supply other than taxation must be deemed inappropriate for this reason.

It is, however, often the consumption of a good which produces negative externalities, and the most efficient way of correcting this type of market failure is to affect the demand for the good directly (omit 'Supply 2' from the general diagram). There are

many possible policies to achieve this, including reducing the size of the population able to buy the good (using age limits, and access by prescription on drugs, for example), by advertising (negative advertising for pollution, education on the environment, and bans on positive advertising), by raising the price of compliments, or lowering the price of substitutes (in our example, other forms of transport such as electric cars, or bicycles), or possible reducing the income of those more likely to use the good. It is, however, normally far easier to affect supply, and it can be as effective if governed and monitored correctly.

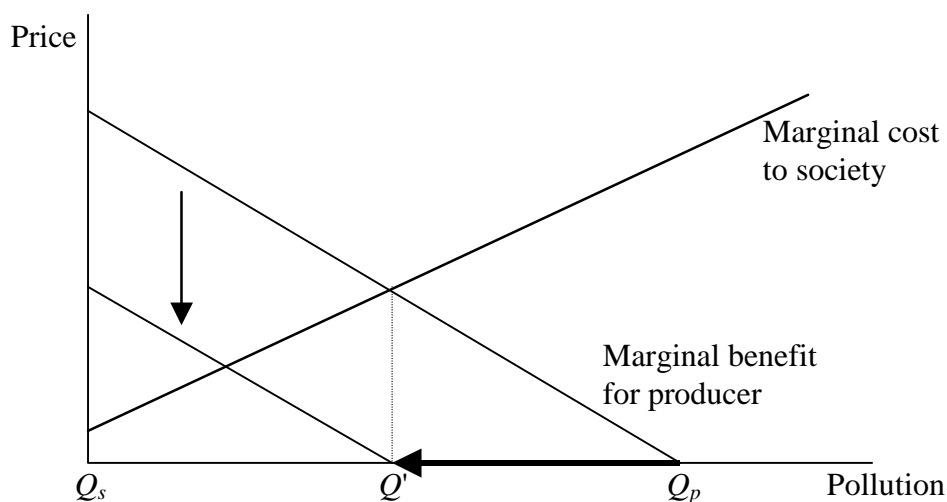
It has been established, therefore, that although there are many economically efficient schemes for reducing the effect of externalities on the market mechanism, few can be implemented in considerable levels. The one option not yet examined is taxation, and it is this that shall be examined now.

If we consider a case where there is one type of pollution (and one ‘producer’ of this pollution), and society as a whole suffers, it is possible to construct a diagram to illustrate how an equilibrium could be reached. It can be assumed that as pollution rises, the marginal cost of society rises, and the marginal benefit for the producer falls; there will come a point where no matter how much more pollution the producer adds, the benefit will rise no more. The model then looks thus:



If there is a totally free market, the producer of the pollution will produce at the point where their marginal benefit equals zero (at Q_p). Society, however, wishes there to be no pollution. In order to reach a compromise, an intervening administration may consider several options, such as quotas (these will be the outcome according to the Coase theorem - private negotiation will lead to an efficient outcome and the polluter will be required to limit pollution), regulation (in terms of transferable licences), or taxation. The first two options have been discussed above, and subsequently dismissed, but the idea of taxation has yet to be explored.

It would be more effective to tax the pollution itself, as this would be a case of purely internalising the externality, but it is usually easier (or only possible) to tax the ‘output’ from producers of the pollution; in the case of firms this would be the output of the firm, in the case of car use it would be necessary to tax the benefit gained from use of the car. The marginal benefit curve would thus shift downwards, until the point at which the pollution producer would wish to produce is equal to the point previously decided by compromise:



It should be obvious here that, as long as a firm’s output depends on how much pollution it generates, this will lead to a socially acceptable and efficient level of pollution. Taxation, therefore, is a fair way of including externalities in the market system. Indeed, it can be seen that the government favours taxes as a deterrent for negative externality producers. There are, however, several disadvantages.

The main problem with the taxation analysis outlined above is that it assumes the government knows how much society values its right to a clean environment (and thus knows the marginal cost to society of pollution). It is plausible that authorities could find a value for the marginal benefit to a producer of pollution (although this figure would likely be exaggerated in the producer's favour), but, without a suitable figure for the cost to society, taxation would be useless.

One way in which a suitable figure can be reached is through simulated negotiation. It is important to note that this negotiation must not lead to alterations in the model under examination, or the eventual outcome with taxation will be very inefficient; rather, negotiation will lead to a figure for the universally acceptable level of pollution, which the government can aim to achieve with taxation.

Taxation also has several non-economic problems; it is a well known fact that tax levels, both direct and indirect, are lowered before an election. These are minor considerations to an economist, though, and can be ignored.

In conclusion, therefore, it is possible to argue that, although there are methods of dealing with externalities that may be more allocatively efficient, taxation is the most realistic in today's society. As a final point, it is interesting to note how taxation can be more effective in cleaning up the environment; if compensation was given to individuals, it is unlikely that they would pay for the environment directly. Compensating society as a whole must be done through the government.

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Tim Miller, March 1997.