The Coase Theorem and Environmental Externalities: Theory, Evidence, and Policy Recommendations

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Abstract- The Coase Theorem is key to environmental economics and regulation. Many people question whether the theorem can be used to solve real-world problems. By evaluating both theories and empirical reviews, the study will be focused on whether negotiating privately can effectively resolve environmental issues. The study will test the assumptions around the coarse theorem and the practical applications of the Coase theorem about ecological problems, and differentiate the situations in which a polluter pays a pollute and vice versa. The practical examples are however limited by transaction costs, legal costs, asymmetric information, and the magnitude of the specific environmental problems. The policy recommendations proposed are to emphasize the solutions that involve both the Coasian agreements and regulatory frameworks.

Indexed Terms- Property rights, bargaining, transaction cost.

I. INTRODUCTION

The Coase Theorem shows how bargaining between two parties will lead to an efficient outcome if certain conditions are met. It presents solutions to solve the problem of negative externalities out of court or without the direct involvement of the government. Environmental degradation, mostly due to water and air pollution, presents difficult challenges in the current world. The marginal social cost (MSC) of production or consumption exceeds the marginal private cost (MPC).

The Coase theorem resolves that if the property rights are known and transactional costs are negligible, the two parties will bargain to reach a beneficial outcome. Environmental economists are however divided on the practicability of the Coase Theorem under conditions that make up the environmental problem like information asymmetry and transaction costs.

This paper will assess the relevance of the Coase Theorem to environmental problems and seek to answer the question*: Can private negotiations provide an effective solution to environmental externalities?* This question will be answered by analyzing the theoretical and empirical reviews of the Coase theorem and its applicability to real-world problems.

II. LITERATURE REVIEW

2.1 Theoretical literature review

According to Coase, R. H. (2013), the Coase theory was developed by economist Ronald Coase in the year 1960 in the paper 'The Problem of Social Cost'. In the paper, Ronald Coase explains the theorem using a story of a land use conflict between a cattle farm and a wheat farm. Ronald Coase narrates how the herd of cattle on the cattle farm strayed into the wheat farm, eating some of the crops. The question arose of what should be done. Should a fence be erected to separate the two farms? And if that is the action, who should erect the fence, and when should this be done?

Another point of focus is whether the wheat farmer should sue the cattle farmer under the law of torts for damages incurred. There are two scenarios in the paper, where Coase explains the scenario where the cattle raiser should pay for damages to the wheat farmer (scenario 1) and the cattle raiser is not liable to pay for the damages (scenario 2). In scenario 1, the marginal cost of liability to payment is in line with the marginal benefit, justifying the argument to erect a fence. In the second scenario, the focus is on how the wheat farmer, since he is affected, would pay off the cattle raiser while considering his marginal cost and marginal benefits (Lai, L. W. C., 2007).

Therefore, when a conflict arises between property rights holders, when the two parties bargain, they will both reach an efficient outcome, regardless of who will be awarded the property rights. The theory assumes that the transaction costs associated with bargaining should be negligible for such an agreement to be met. When both parties bargain, with an externality in play, there will be a more efficient outcome regardless of the initial allocation of property rights.

The Coase theorem is based on the following assumptions:
1. Perfect information, the parties involved know each other.
2. Clear definition of property rights.
3. No transaction cost. There must be related parties that reduce the transaction cost of organizing them.
4. No effect on wealth. Regardless of who gets the initial property rights, bargaining should not affect any party.

2.2 Empirical literature review

Libecap (2003) in his study on *Contracting for Property Rights*, concluded that property rights are key elements to prevent wealth loss associated with a common pool. A clear definition of ownership over valuable assets will make parties not wastefully compete for them and not underinvest in them. This can affect the value of the assets when the parties take too long to bargain due to the competition for control. There is a risk of also losing opportunities for investments, negatively impacting the potential wealth that could be earned from exploiting the properties/ resources. Libecap explains that since some agreement on property rules is possible, its outcome may deviate from what would seem as the most desirable agreement. In the Coase theorem, the Pareto optimum will be achieved regardless of how property rights are bargained (Deryugina, T et al., 2021).

2.2.1 Transaction cost

These are the costs of maintaining and establishing property rights (Allen, D. W., 1991). Neoclassical economists, however, assume there is no transaction cost in an economy. Other definitions have been developed by scholars to make them in line with the Coase Theorem, while others are specific for individual situations. Yousuf, A. (2017) posits that transaction cost economic theory is a subset of new institutional economics. Yousuf further explains that the performance of the firms that consider transactional cost is better than the performance of the firms that do not consider transactional cost. When a company follows the transaction cost hypothesis, i.e., having high costs of finding and negotiating with partners, its magnitude of control will be higher.

Generally, there are two types of transaction costs: internal transaction costs and external transaction costs, as shown in the figure below.
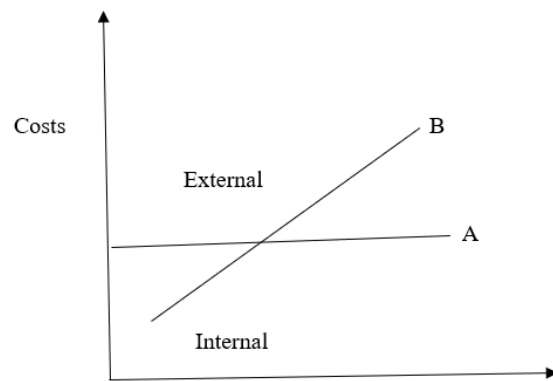
Line B shows the cost of conducting transactions in a firm. They are the fixed costs of overhead. In line with the Coase theorem, a firm will want to operate where line A is below line B, as the costs are lower. If the external transaction costs are higher than the internal transaction costs, the firm needs to grow and expand to meet its external costs. When the firm's internal transaction costs are higher than the external transaction costs, a decision to downsize or outsource should be made.

Therefore, productivity is a function of both production cost and transaction cost. This functional relationship shows how key transactional costs are to economic productivity.

Therefore;
$$Productivity = f(C_P, C_t)$$
Where;
C_P = Production cost
C_t = Transaction cost
f = a function that shows that productivity depends on both production cost and transaction cost.

When we want to know the effect of a change in productivity when either of the two costs increases or decreases, the new function can be written as;

Productivity= $\dfrac{Q}{C_p + C_t}$

Where;

Q = Quantity or output of goods/services produced

$C_P + C_t$ = Total cost (Production cost + Transaction cost)

The productivity function can be modified to include the environmental costs and externalities, which are key in the Coase theorem, with the environmental context as our case study. Productivity, therefore, can be conceptualized as a function of production cost, transaction cost, and all other costs that constitute environmental externalities.

In environmental economics, productivity could mirror the effective and efficient use of resources, given environmental constraints such as air and water pollution and the costs involved in negotiation and enforcement of property rights.

Therefore, our production function can be modified to incorporate the externality costs as;

Environmental Productivity= $\dfrac{Q_e}{C_p + C_t + C_e}$

Q_e = Environmentally sustainable output

C_p = Production cost

C_t = Transaction cost (negotiation, enforcement, bargaining costs)

C_e = Environmental compliance cost or cost of internalizing externalities (e.g. pollution control, permit acquisition)

From the above equation, when the transaction costs are low (as per the assumption of Coase), more resources can be shifted to more productive and sustainable outputs. If the environmental costs are internalized efficiently, this can be through a formulated policy or bargaining, then, through the Coasean framework, the whole system will be more productive.

III. APPLICATION OF THE COASE THEOREM

3.1 Fishmen vs a sugar manufacturing company

Coase's school of thought can and has been used to solve negative environmental externalities. An example of fishermen and a sugar manufacturing industry as a real-life example, negative externalities can occur when the manufacturing activity of the sugar company generates costs and losses to the fishermen. This can be through direct deposit of toxic waste into a water body where the fishermen have set cages to trap fish. The toxic waste ends up killing all the fish of the fishermen. The fishermen, in return, retaliate and threaten to sue the sugar milling company.

The questions that Ronald Coase asked in the paper "The problem of social cost" on who to pay whom come into play. Borrowing thoughts from Regan, D. H. (1972) with the assumption that the economy is perfect, with perfect information and no transaction cost, regardless of the legal rules and the costs from the initial impact of the externality (i.e water pollution that killed the fish), through bargaining, the allocation of the resources would be efficient for both the fishermen and the sugar manufacturing company.

The sugar manufacturing company can choose to pay the fishermen for the damages incurred, or they could pay the fishermen to relocate to another fishing spot. In both situations, both the fishermen and the sugar company will benefit, considering the marginal social cost vis-a-vis the marginal social benefit.

Graphically, the representation of the costs to the benefits will be as below;
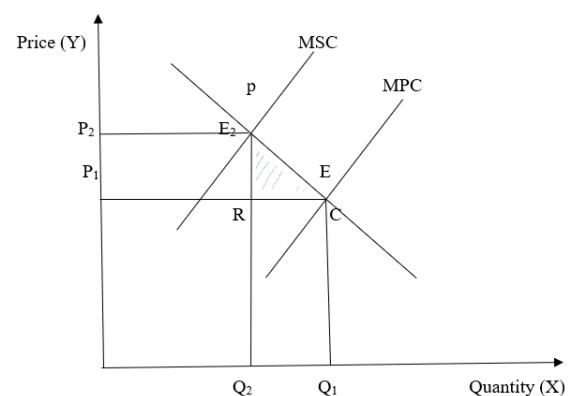
MSC= Marginal Social Cost
MEB= Marginal External Benefit
MSB= Marginal Social Benefit
MPC= Marginal Private Cost
MEC= Marginal External Cost
MPB= Marginal Private Benefit

Where;
MSC = MPC + MEC
MSB = MPB + MEB

At point E, there is no social cost because it is the initial point at the beginning, where both the fishermen and the sugar manufacturing company are not in conflict.

In case the fishermen take the sugar manufacturing company to court, production reduces from point Q_1 to Q_2. This affects the prices, which will shoot from P_1 to P_2. This leads to the formation of a new equilibrium E_2, and this will equal the Marginal Social Cost (MSC). MSC at point E_2 equals MSB.

Therefore $E_2 = MSC = MSB$
At E_2, when bargaining happens, the extra unit charge that will be incurred for settlement by both parties will be equal to the extra benefit that both the fishermen and the sugar manufacturing company will enjoy. The shaded region is the cost that is incurred by the sugar manufacturing company to benefit the fishermen. The demand for the quantity will be equal to the Marginal Private Benefit, which is also equal to the Marginal Social Benefit.

Demand for quantity (X) = MPB = MSB
The supply for the quantity will equal the Marginal Private Cost
Supply of quantity (X) = MPC

IV. POLICY RECOMMENDATION

The following policy recommendations can help effectively address environmental externalities using the Coase Theorem;
- Clearly defining and strengthening property rights will ensure that the community and manufacturers understand their legal obligations and thus avoid such externalities.
- By reducing the transactional cost, negotiation platforms can adequately settle disputes out of court.
- The government can create a subsidy that helps in situations where negotiations will be socially beneficial, but could be very costly at an individual level.
- For transparency and trust during negotiations, different stakeholders related to the parties should be involved. This promotes participatory governance by encouraging stakeholder engagement.

V. CONCLUSION

Environmental economic thought bases principles on the Coase Theorem, which demonstrates how conflicting parties can solve their issues without the involvement of the government. Environmental problems, therefore, require a more sophisticated application because they are both complex and extensive. Policy recommendations are there to establish necessary conditions for Coasian bargaining to achieve results, even though this model produces limited outcomes in particular situations. Environmental governance should seek to unify markets with regulation instead of replacing one with the other.

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