An Investigation of Externality:  
It’s Concept and Applications

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1. Introduction

There are several circumstances lead to market failure, which stands of the welfare theorems do not hold such that market equilibrium does not yield Pareto optimal outcomes. The concept of externality\(^1\) has a quite long history and becomes one of well-known knowledge in the world, not only in the “Economists’ World”. But when we ask to somebody, even an economist, it seems nobody could tell accurately what “Externality” is. So that makes the motivation for me to take such an investigation.

2. Vague in Definition

Let’s begin with some graduate-level textbooks such like Mas-Colell, Whinston, and Green (1995). We can surprisingly discover that this book gives an informal definition of externality, which illustrated as follow:

Definition 11.B.1: An externality is present whenever the well-being of a consumer or the production possibilities of a firm are directly affected by the actions of another agent in the economy.

[Mas-Colel et al., 1995, p. 352]


Up to here, we must be more conscious. Different definition may lead to

\(^1\) When talking about the “concept” of externality, I’ll use italic type in order to distinguish.
various conclusions. A survey presented by Baumol and Oates (1988), who state that there are two major categories of definition. The first one is more broadly that includes production externality, consumption externality, and welfare externality. The second kind of definition put emphasis on the non-existence of markets that lead to Pareto-optimal equilibrium. There are still several flaws within these two categories of definitions. When we follow the first kind of definition of externality, then there are externalities everywhere in the real world. So the whole theories of Economics have to rewrite under externality frameworks. But if we follow the second kind of definition, can we say that the lack of organ transplant “market” is a kind of externality? No wonder that those textbooks avoid giving an explicit definition of externality.

3. The Source of the Concepts of Externality

As far as my knowledge, it can be traced back to Pigou (1920) who gives the very first word to this concept. Pigou (1932) also provide a mechanism, which designed to eliminate environmental externalities so called “Pigouvian Tax” afterward. The thought of Pigou formed a stream of Pigouvian school and becomes the fundamental argument of the first definition of externality.

In opposition to the Pigouvian school, Coase (1960) made a ruthlessly criticism, which is the celebrated article “The Problem of Social Cost”, toward Pigou (1932).

Coase (1960) argued that under an economy without transaction cost, regardless of the property rights, externalities would be eliminated by the negotiation between the agents within the economy. This result is named as the “Coase Theorem” given by Stigler (1966) and claimed that private cost would equal to social cost under competitive markets. The Coasian schools emphasizes on the transaction cost within the economy which leading to non-Pareto optimality.

4. Pigouvian School

To call those economists “Pigouvian” is not so fair. But to simplify discussion, those economists who believe tax or compensation policies can “internalize” externality may conservatively called Pigouvian, cause they follow and

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2 There are not so many differences of the examples that given between Pigou (1920) and Pigou (1932) which is merely the difference between version 1st. and version 4th. The main argument of Pigou was first appeared in Pigou (1912). Much earlier.
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operate the first definition of externality. Even there were lots of economists like Kamien, Schwartz, and Dolbear (1966), Bramhall and Mills (1966), and Freeman (1967) argue that taxes and subsidies do not have symmetric effects. But that’s not the point now.

Meade (1952) had provided a poetic example that no one could ignore that talking about beekeeper and apple farmer when describing the circumstance of positive externality. Cheung (1973) had undertaken a detail study of this example.

Varian (1994) may be the representative research in the recent years. Varian (1994) analyzed compensation mechanisms under the first definition of externality. This research was also written into his textbook (Varian, 1992).

5. Coasian School

The most cited paper is that of Coase (1960) on “The Problem of Social Cost”. Coase emphasized the reciprocal nature of an externality problem. But the case of ignorant transaction cost in not very realistic. Coase himself also emphasized the point thus: “The world of zero transaction costs has often been described as a Coasian world. Nothing could be further from truth. It is the world of modern economic theory, one which I was hoping to persuade economists to leave” (Coase, 1988). Dixit and 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.

Stigler (1972) reinterpreted the Coase Theorem with simple logic manipulation: if there’s no transaction cost in the economy, then there’s no externality problem (if \( p \) then \( q \)). Stigler (1972) argued that the externality problem is caused by the problem of transaction costs (if not \( q \) then not \( p \)). And so does the different decree of property rights may related to inefficiency or not. Cheung (1970) also replied to this point of view. Cheung (1970) even claimed that when regardless of transaction costs, externality is a meaningless concept. He had tried to redefine that the essence of externality is transaction cost.

We can make a brief summary. The Pigouvian School deems that government intervention can internalize externality problems. And the Coasian School reminds other economists not to exclude transaction costs when analyze externality problems. Buchanan and Tolluck (1975) who could
be the representative opinion of Coasian School stated that regulation is less desirable even in the presence of full information.

Now turn to look some extensions about externalities.

6. Mechanism Design

No matter which definition of externality is. Externality is the last thing what economists want, so that economists want to eliminate it. Because once externalities are admitted, the first welfare theorem no longer applies. To eliminate externality, Pigou (1920) had called for government-imposed mechanisms, such like taxes on pollution, as a way of redressing the market failure. Coase (1960) argued that, even in presence of externalities, economic agents should still be able to ensure a Pareto-efficient outcome without government intervention provided that there are no constraint on their ability to bargain and contract.

As mentioned above, Varian (1994) had provided a simple compensation mechanism between firms. Vickery (1961) and, more generally, Clarke (1971) and Groves (1973) have shown that much more positive results are obtainable when agents’ preferences are quasi-linear. Groves (1973) called that “Grove schemes” or the Vickery-Clarke-Groves mechanism. Green and Laffont (1977) implied that Groves schemes are essentially the only mechanisms that implement social choice functions with Pareto-efficient externality reductions.

Radner and Williams (1988) extend the analysis to the case when player’s payoff may depend on the entire profile. Dasgupta, Hammond, and Maskin (1980) examine dominant-strategy implementation of more general social choice functions. Arrow (1979) has extended Groves mechanism via Bayesian game theoretical approach.

7. Environmental Policies

It’s a fertile land of policies applying economic theories that I am afraid of missing any significant work when doing this survey.

Economists analyze the problem of environmental disruption as a form of external effect. Various policy instruments inclusive of direct regulation, compensation, taxation, or incentive mechanism design are supposed and supported by different schools of economists. To get to the bottom of the affair, it has to look up with the philosophical thought of economic theories.

From the normative theory to policies, there are some asymmetries between subsidies and taxes that shown by Kamien, Schwartz, and Dolbear (1966), Bramhall and Mills (1966), and Kneese and Bower (1968). The policy is quite different implication of production in a polluting industry. The Pigouvian tax seems to deter the industry supply, and subsidy policy could result in an increase in the total amount of pollution.

Environmental economics is a whole new page in economic thought. For the sake of avoiding digression, I have to make a break here.

8. Other Applications: Network Externality

The theory of demand interdependence is a kind of consumption externality. Since an agent’s consumption may affected by another agent, the theory of network externality is taking this phenomenon, so called “network effect”, into consideration. It’s also the starting point of Chaos Theory with a proper noun of “positive feedback”.


There’re some economists believed that externalities is arisen endogenously within network economy. The Theory of endogenous externality is formalized by Milgrom and Roberts (1992), Yang and Wills (1990), and Lio (1998).

The recent and integrated development of network externalities and network effects are discussed in Shapiro and Varian (1999), which is much far from the original definition of externalities.

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9. Summary

There are two different research lines regarding externalities in public economics. The traditional line is Pigouvian school, the other is Coasian school. Of course there’re conversations and controversies between these two schools over each topic that I categorized as mechanism design, environmental economics, and network externalities. There’s also an eclectic research framework of the two schools provided by Yang and Ng (1993).

As we can see, the celebrated paper of Coase (1960) had evolved to several sects of economics, such like Law Economics, Institutional Economics, Inframarginal Economics, or Property Right Economics. This survey thoroughly overhauls the source and several important extensions of externality. The concept of externality has had affected the economists significantly due to various interpretation of the context. How could the pupils of Economics like me be unconscious when learning this concept?
REFERENCES