

Pigovian tax: analysis and overview



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Neo-classicals uphold perfect competition as the ideal state of the market. But in truth, the economy is fraught with market failures. Therefore, we need government interference to correct many of these market failures. Pigovian Tax imposed by the government is one such course of intervention. It helps to curb negative externalities (e. g. pollution) and reduce the burden on the society caused by the externalities (social costs of production and consumption). Moreover, it attacks over-consumption, bringing it closer to the socially optimal level of production and/or consumption. The paper examines the effects of Pigovian tax and analyses its degree of effectiveness on an economy.

What is Pigovian Tax?

Pigovian tax is a kind of tax, which is levied to correct a negative cost that is created by the actions of any business firm, but that is not considered in a firm's private costs or profits. Also known as 'sin tax', it is a tax placed on an action with a negative externality, to correct market failure (Mankiw, 2010). In the presence of negative externalities, the social cost of a market activity is not covered by the private cost of the activity. In such a case, the market outcome is not efficient and may lead to over-consumption of the product. A Pigovian tax equal to the negative externality is thought to correct the market outcome back to the level of efficiency.

For example, a factory does not financially take into consideration the damages caused to the environment by their emissions. By imposing Pigovian Tax, the government can artificially make the firms bear the cost of the damages, which will ideally be equal to what the price would have been if a market for such an activity existed. In a country like Canada with a

publicly funded health care system, that is, where the medical service of every patient is funded from government revenues, the cigarette tax acts as a Pigovian tax – it raises the revenue necessary to offset the expenses towards the health care system, as a consequence of smoking.

Pigovian Tax in Implementation

This idea was first put forward by Arthur Cecil Pigou in the year 1912. In his book, *The Economics of Welfare*, he argued that industrialists seek their own marginal private interest, while not taking into account the social costs of their activities.

Pigovian tax is the difference between marginal social cost and the marginal private cost, which is equal to the marginal external cost, shown as Tax in the diagram. The tax level may not equal the marginal external cost at quantities other than the socially optimum equilibrium level. The diagram indicates that marginal external cost increases with increase in quantity produced or consumed. After imposition of the Pigovian Tax, the new supply curve intersects demand (the marginal benefit) at the socially efficient quantity. As a result, the new competitive equilibrium, taking into account the amount of the tax, is efficient. Although this tax works perfectly in theory, its practical implementation is very difficult due to a lack of complete information on the cost of the damages to the environment.

When Arthur Pigou first came up with the concept, he laid down a set of assumptions, one of which is a perfectly competitive market. Yet, perfect competition is an unrealistic situation. Monopoly, monopsony and oligopoly

markets are commonplace. To internalize the external cost, the government needs to intervene by way of imposing taxes.

Pigovian tax can be applied to all spheres of production, be it production of a good (automobile) or service (transportation, banking etc). Baumol and Oates (1975) argue that if Pigovian tax is set equal to the level of marginal damage (external cost) at the Pareto-optimal level of pollution, the industry will move towards its optimal pollution level.

The tax is applied to the production of a good that has an externality.

Overhead: Pigovian Tax Anatomy from Diagram 2-

- i. Unregulated result (Q, P)
- ii. Socially efficient level of production = Q'
- iii. Efficient Pigovian tax = $P' - P''$
- iv. Tax payment to government (shared by consumer and producers = $P'ACP''$)
- v. Gross benefit from decrease in externality = $ADBC$
- vi. Foregone consumption benefits – i. e., the social cost of abatement = ABC
- vii. Net benefit to society = ADB

Pigovian tax enhances welfare of the society; restricting over-consumption. It also generates additional revenue for the government. Roland Coase (1960) propounded that if markets may not secure the optimal amount of

externality, they “ can be very gently ‘ nudged’ in that direction without the necessity for full-scale regulatory activity”. Yet again, the Coase theorem faces criticism. Property rights are not as strictly defined as required by the Coase theorem. Coase argued that social costs are even worse if only the offender pays for the social harm and not the consumers for whom the goods and services are produced. Under the Pigovian Tax, it is only the firms who pay for the externalities. Moreover, it is difficult to calculate the right tax in a world of imperfect Coasian bargains.

The concept has evolved through time and many similar ideas were developed such as the Coase theorem, emission trading i. e. cap and trade (Europe), Environmental Protection agencies (U. S.) formed with the idea of command and control, carbon tax, and tradable permits.

The principal problem remains that of quantifying the externality. “ There is some debate about whether to quantify externalities if the methods are imperfect. The usual response is that as long as we are honest about the flaws in the numbers, it is better to have some numbers than none” (Phillips, Carl V, 1999). The benefits accrued by taxing externalities are more than that without taxing the externalities as shown with the game theory approach.

The co-ordination game consists of two players, Company A and Company B, with two strategies: Subject to Pigovian Tax and Not Subject to Pigovian Tax. The payoffs of each player are given in the matrix. Nash equilibrium occurs at 2 points, when both companies are subject to Pigovian taxes and when both companies are not subject to Pigovian taxes.

If both the companies are ready to bear the social costs, the benefits of sustainability accrued to the companies and society as a whole are more than if the costs are not borne by either company.

The many forms of Pigovian Tax

Since players don't always come to a socially efficient negotiation, there is a traditional way of limiting externalities – 'command and control'. This approach sets quantity limits on activities that have external effects.

However, the method is cumbersome. While this method has been undertaken by the US government, the economies of Europe consider cap and trade as a better solution. It causes the least polluting firms to do the majority of the production since their social cost of production is the lowest.

Rajeev K. Goel and Edward W. T. Hsieh laid down a two-period model in their research (Durable Emissions and Optimal Pigovian Taxes) where a social planner minimizes social damage by setting the per-unit Pigovian tax on a polluting monopolist. Results show that for a given level of production, the durability of emissions and the socially optimal Pigovian tax are negatively related. Mike Moffatt, in his article named 'Pigovian Taxes – Joining the Pigou Club; Promoting Economic Growth and Reducing Externalities', wrote in favor of Pigovian Tax, stating, 'One of the uses of taxes is to discourage activity that has negative externalities, or we believe is otherwise economically/socially harmful.'

The benefits accrued versus the inherent failings

In addition to correcting social disequilibrium, these taxes also raise revenue for the state. In 2004-2005, the Canadian government collected \$16.7 billion

in “ other” taxes, which were largely Pigovian taxes such as energy taxes and excise taxes on cigarettes and alcohol (Moffat, 2006).

In theory, using Pigovian taxes to correct what economists call “ market failures” is simple. But in practice, it’s not so. The important problem often ignored by advocates of Pigovian taxes is what might be called the “ measurement problem” or the “ Knowledge Problem”. Pigou himself also declared that “ it must be confessed, however, that we seldom know enough to decide in what fields and to what extent the State, on account of [the gaps between private and public costs] could interfere with individual choice” (Pigou, 1954). Pigou and Friedrich Hayek point out that the assumption that the government can determine the marginal social cost of a negative externality and convert that amount into a monetary value is a key weakness in the framework of the Pigovian tax. The economist’s blackboard “ model” assumes knowledge we don’t possess – it’s a model with assumed “ givens,” which are in contrast with real-world happenings. Friedrich Hayek would argue that this is knowledge which could not be provided as a “ given” by any “ method”, yet could be discovered, due to insuperable cognitive limits.

However, the key difficulty with this tax is calculating what level of applied tax would counterbalance the negative externalities. Even when a Pigovian tax is charged to correct the market imperfection in a world with regulations and efficient transfers, the observed amount of the externality (e. g., pollution) is unlikely to be zero since we will still observe some externalities as a consequence of the exchanges and transfers. The rate of tax best set should be equal to the per-unit external cost that “ spills over” into the

society. A tax imposed without such calculations may well be inefficient and redundant.

There is also political influence on the levied tax, in such a way that lobbying of government by the polluters may tend to reduce the level of the tax levied and which would ultimately reduce the mitigating effect of tax and lead to increase in production. Instead of accomplishing the goal of the tax imposed, the burden shifts to the society. Thomas A. Barthold (1994) argued that in the US in the year 1994, the actual policy decisions often came from budget requirements, and not concern for the environment. The taxes do not always comply with economic theory because social benefits and costs are hard to measure. He uses the 1989 Montreal Protocol as an example. President George H. W. Bush signed this protocol that allowed either a permit auction or a tax on ozone-depleting chemicals. Barthold attributes the decision to implement the tax to the pressure on the Ways and Means committee to come up with more consistent revenue.

Like the other taxes imposed by the government, Pigovian tax gives air to malpractices like black marketing, smuggling and child labour, especially if they create large differences in the prices of products, which are popular, and if the demand for the product increases in spite of the increase in production.

Pigovian Tax imposed by the government is a complex mechanism. It has its societal merits and elementary de-merits. While it covers the cost of negative externalities and eliminates the burden of society, on the same page, it may also hamper the growth of industries leading to inefficiency of

small industries. In a monopsony market, where there is only one buyer, it is difficult to impose Pigovian tax since the burden of the tax will be borne by one entity. This may consequently lead to rise in the prices of the commodity. When Pigovian tax is imposed, in a monopolistic competitive market, the tax will be borne by a large number of consumers and hence, the burden of tax is divided.

While it can be said that imposing Pigovian tax would lead to a reduction in the level of quantity produced of a commodity by an industry, it can also cause the industries to look upon to new advancements in technologies. This will open doors to research and innovation in the field. For example, the company AkzoNobel Industrial Chemicals is always trying to innovate and make a leap forward in its development to achieve its target to reduce CO₂ emissions. Its production facility in Mariager in Denmark uses wood to generate electricity. Wood and other plant-based materials are also used to produce chemical building blocks. Moreover, this shift in technology by commodity producers will cause the externality to be automatically internalised.

Whatever benefits Pigovian taxes might be able to provide, it will usually give diminishing returns past a certain point, where the government might fail to achieve their objectives of meaningfully reducing the excess social costs. Instead, these kinds of taxes would appear to simply become a vehicle by which politicians may raise tax revenue by imposing a discriminatory tax policy aimed at an “undesirable” minority. Therefore, only where institutional and trade solutions are not efficient, the government should consider whether specific interventions, regulation or specific taxes

are appropriate to address externalities. These measures are preferable when the net efficiency gains from the intervention are larger than the associated administrative and compliance costs. This suggests that intervention is desirable when externalities are reasonably large.