

The Gujarat Cap-and-Trade System: Understanding Externalities

Rachel Batra | 3rd Year B.A. Honours Economics

St. Stephen's College, Delhi University

Abstract

This research essay endeavours to reconcile the disparities between classical and contemporary literature regarding the strategies employed for internalising externalities. It initiates by grounding its comprehension in the theoretical foundations established by luminaries like Pigou and Arrow, and subsequently integrates modern intricacies into the discourse on externalities, delving into aspects such as context, attributes, and measurements. Furthermore, the study explores the variations in internalisation techniques, contingent upon the entity responsible for implementation, owing to their distinctive motivations. While the private sector seeks to internalize externalities to gain economic advantages, the public sector is driven by the aspiration to enhance societal well-being. We then evaluate the cap-and-trade policy implemented as an experimental project in the fight against climate change in Gujarat in 2019 by the government of India.

Keywords: externality, market failure, welfare economics, Pigouvian tax, Pigouvian subsidy

Introduction

A lot of the net zero goals of institutions today are partly met by internalising their externalities. A simple example is a company that has a negative spillover such as pollution, can now enter into carbon markets and trade carbon dioxide (which becomes the commodity in this market) to offset emissions. Economic externalities are much easier to contextualize as compared to those that find their roots in social domains, thereby affecting other domains of life.

Our interactions and engagement in the social sphere are in fact filled with externalities that, if not identified, remain unnoticed; these are often termed social externalities. If we look at the market for education, often called low-hanging fruit, there is a creation of long-term effects on quality of life, academic achievement, and improved awareness among different sections of the population. On the flip side, there are international spillovers like brain drains and migrations that have since had a significant impact. Even online social networks can be a source of true support by helping provide connection to those who are isolated or can be used as a platform for malicious abuse, bullying, and misinformation. Defining the true value of these 'services' and 'disservices' and accounting for their impact seems like a nearly impossible task. This immediately leads us to the question of what set of mechanisms can lead to the convergence of private and social benefits across a vast variety of spheres. Therefore, the institutional role drastically changes due to contextual differences in arising externalities.

To a great extent, "public goods can be referred to as a particular type of externality" (Moşteanu and Iacob 2009). It is very difficult to draw the distinction between an

externality and a public good. If society at large is benefitting then it is categorised as a public good, but if only a part of society benefits, it is often termed an externality. One might argue that this is still quite a vague classification.

Attributes of an Externality

After contextualization of an externality, we must be able to define an externality for which we shall create categories of attributes. According to Gupta and Prakash (1993), this was done by grouping ten attributes under five categories: occurrence, polluter, spatial, time, and technological. This shall be useful for the policymaker to devise appropriate policies for internalizing externalities (Gupta Anil and Aseem 1993). Firstly, on the basis of occurrence (certain/uncertain). Uncertain externalities are difficult to measure due to their varying distributions. Secondly, the source (identifiable/unidentifiable) and the number of sources (single/multiple). Thirdly, spatial factors (localised/non-localised). Fourthly, the time intervals (sporadic/regular). Fifthly, technological factors (preventable/ non-preventable, unidirectional/reciprocal, insulable/ non-insulable).

Measuring Externalities

Broadly, we can focus on two measures to evaluate an externality. The first is the cost-of-damages approach to understand the extent of damage being caused by the externality. This method brings to the surface the underlying extent of repair required. Second is the cost of control method. This method is famously accepted by various private institutions when there is widespread acceptance of the inability to correct for the externality in itself. Using this method, we see the interplay of preemptive and

preventive steps taken towards the externality. This aligns with the cost-cutting motive of firms today.

For example, emissions that are a negative production externality (contextualising the externality) can be defined using multiple attributes (like multiple sources, regular by-products of the production process of the said polluter, preventable using technological improvements, etc.) and measured using the cost-of-damage method. Depending on the extent of damage done due to the emissions, firms can often be met with abatement costs. Abatement costs are those undertaken by the firm to remove/reduce the negative by-products of their respective production processes. This often has a very negative impact on company earnings and brand value as people demand better and greener practices.

How to Internalise?

Understanding internalisation can be done from an institutional point of view; as in the institution in charge of the externality itself. We start by assuming that all externalities are economic in nature (see Table 1). The public (e.g., government) and the private (e.g., business enterprises) often undertake multiple internalisation techniques that align with their incentives for the same, facilitating interaction in the commonplace like that of markets. This paper analyses academic scholarship in this field through the binary institutional dichotomy of the market versus the state.

Table 1: Example of different types of externalities (Moşteanu and Iacob 2009)

Types of externality	External costs	External benefits
Pure production externalities (generated and received in production)	Acid rain pollution discharged by a power station harming a nearby commercially run forest	A farmer benefiting from drainage undertaken by a neighbouring farmer
Mixed production externalities (generated in production but received in consumption)	Dust polluting discharged by brickwork, breathed by asthmatic children living nearby	Commercially owned bees pollinating fruit trees in neighbouring gardens
Pure consumption externalities (generated and received in consumption)	Noisy music at a party disturbing neighbouring households	Households benefiting from the beauty of neighbouring gardens
Mixed consumption externalities (generated in consumption but received in production)	Congestion caused by private motorists increasing firms' transport and delivery costs	Commercial bee keepers benefiting from private gardens of nearby houses

Private Sector Remedies

The private sector accounts for only small-scale/ localised externalities where the sources have been well defined. They choose the route of internalising whereby total costs can be minimised to gain some economic advantage. Total costs include costs of technology, transaction costs, and the cost of management. The cost of technology includes the cost of purchasing the technology and the cost of using that technology. The transaction costs are those that are associated with property rights such as conflict resolution, contract creation, negotiations, informational distribution, etc. Finally, the cost of management, as the name suggests, is incurred depending on the internal organisation of the firm such as the cost of labour, factory units, inputs, etc.

Public Sector Remedies

According to Wolf, the existence of externalities in a given exchange situation is neither necessary nor sufficient justification for governmental intervention (Wolf Jr 1979). The public sector intervenes only when the said externality is detrimental to society at large or is negatively impacting welfare. They push for more 'centralised, cooperative decision-making' (Fleurbaey, Kanbur, and Viney 2021). The government uses mechanisms like:

- a) Pigouvian subsidy given to those who are impacted by the negative externality.
- b) Pigouvian tax: imposed on those causing negative impact activities like pollution.
- c) Legal regulations that set a system of cap and trade.
- d) The subsidy paid to agents responsible for positive externalities.
- e) Quantity regulation through trading permits.

For most of these solutions, mathematically, the government must maximise the social welfare function with its respective constraints. The first part of the Coase theorem put forward by Ronald Coase states that “when property rights are adequately defined, negotiations between the parties creating externality and the party affected by it determine reaching social equilibrium” (Coase 1960). The second part of the theorem states that “the efficient solution doesn’t depend on which party receives the property rights, as long as these are given to one party.” The distribution of ownership ensures some sense of convergence between private and social costs, thereby reducing the impacts of externalities. However, Coase’s work has been met with much criticism simply because in macro-level situations, the assignment of property rights is in itself challenging. The Pigouvian tax is a corrective tax that charges a price on externality-producing commodities until it is equivalent to the social marginal cost of production. Subsidies, on the other hand, function like a negative tax. Subsidies can be given for those activities that have positive externalities, thereby shifting out the supply curve of such productive enterprises. They are also given to passengers, like subsidised train passes, to promote public transport. Regulations are mainly done through a limits system during a specific period of time and often involve negotiable components.

Case Study: Gujarat’s Cap-and-Trade Policy

The cap-and-trade system is one of the three flexible Emission Trading Schemes (ETS) as suggested by the Kyoto Protocol, which has proven to be successful across many regions of the world to fight global warming. ETS has different advantages like certainty in emission reduction, flexibility in the selection of different alternatives, etc.

On the other hand, ETS also has different disadvantages like high transaction costs, complexity of the scheme, free rider problems (Hazra 2023). As the name suggests, it puts a cap to regulate pollution from industries and, in return, issues permits. Plants that are able to curb pollution are then able to sell permits to other plants that cross the cap. Thus by facilitating exchange through permits, pollution is curbed and firms earn profits while ensuring that the total costs of regulation are systematically reduced. This system thereby encourages firms to also invest in environmentally friendly technology to further reap the benefits of raising profits through the effective sale of permits.

As per the National Ambient Air Quality Standards (NAAQS) 2009, three states- Gujarat, Tamil Nadu, and Maharashtra- have higher concentrations of particulate matter than the standard norms in the air (2023). The Surat cap-and-trade market was the first ETS for India, launched as a large-scale pilot program on July 15, 2019, in Surat, Gujarat. It was launched by the Gujarat Pollution Control Board (GPCB) in collaboration with Energy Policy Institute of Chicago (EPIC), Evidence for Policy Design (EPoD), the Economic Center at Yale University, and the Abdul Latif Jameel Poverty Action Lab (J-PAL) and is directed to curb particulate pollution¹ to 280 tonnes per month, which was a reduction of about 29 percent in pollution (see Figure 1) of the total amount all the plants were emitting prior to the implementation of the policy. A high portion of the industries qualify for this program and more than 50 percent that registered were textile manufacturing plants, which covers a significant proportion of the emitting industry in Surat. Therefore, the target industry of this cap-and-trade is high-polluting, thereby addressing the issue head-on.

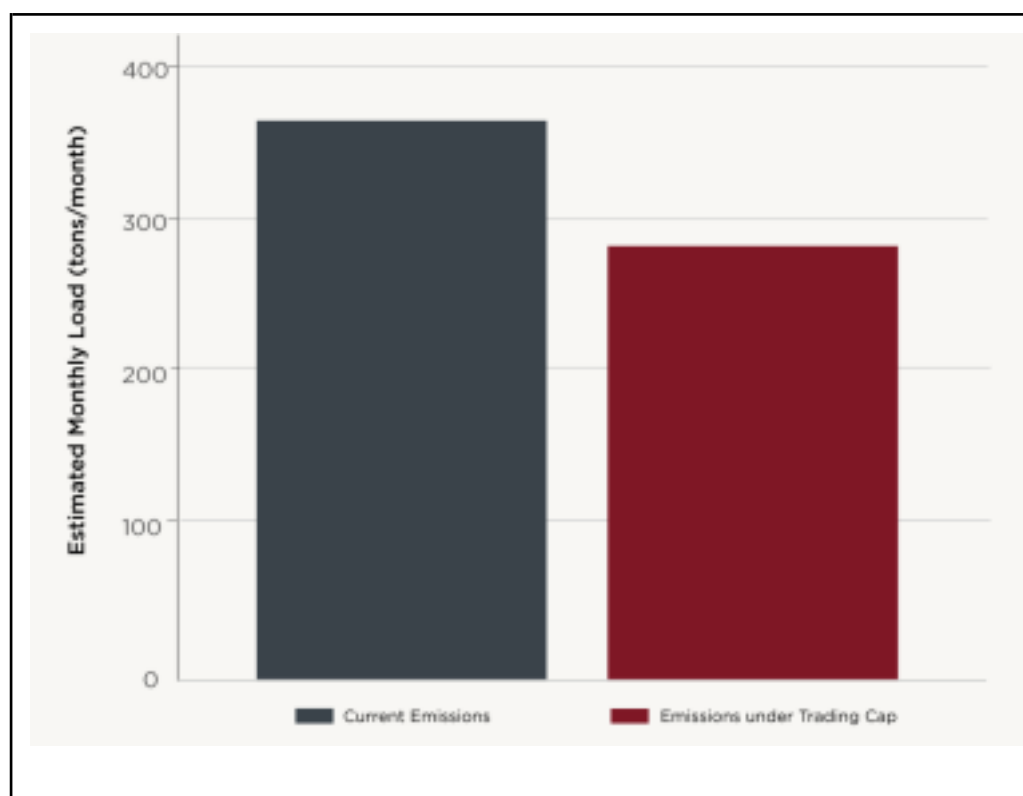


Figure 1: The ETS is projected to reduce particulate emissions by 29 percent (Greenstone et al. 2019)

The most significant advantage of this system was the certainty in emission reduction since the maximum amount of emission is fixed by the central authority and is aimed to keep declining over the years. Since the target of the scheme is the total pollution and not just the dirt released into the atmosphere, this was a significant improvement from the previous policies implemented in India. Due to the gradual decline in the cap, there was not a lot of immediate pressure on plants to incur significant costs and seek alternate methods of technologies; hence, abatement costs were also lower.

The drawbacks of the scheme involved high amounts of costs incurred by the central authority to determine the effective cap and thereby issue permits. The complexity of the system was another reason why there was a lot of asymmetric information in the market, making some players worse off than the others. Many also argued that the system should not lose its stringency, that is, multiple ETS systems implemented in

other countries have been criticised for issuing excessive permits, thereby allowing firms to emit more. This destroys the purpose of implementing the ETS in the first place. Hence, while setting future caps, it is important that policymakers strive for a balance between setting the right cap (and thereby permits) and ensuring enough incentive for growth to not discourage firms from actively taking part in the ETS.

Conclusion

One can still say that we are nowhere close to completely accounting for externalities. However, many economists and policymakers are plagued with questions on how much of the externalities of today will actually be internalised. Will non-market mechanisms still hold onto their true essence once markets for such phenomena have been created? Much debate encompasses how non-economic externalities like that of education could flow into economic spheres thereby leading to virtuous cycles due to their positive spillovers. In such oversimplified cases of feedback loops, how does one even account for an externality?

The case of translating our theoretical foundations into the policy domain is not always easy due to the multiple drawbacks that can exist due to the contextual differences in which externalities can arise. The Surat cap-and-trade policy, despite its drawbacks, still plays a crucial first in India's battle against emissions. But only time can tell whether it is a policy of true stringency and compliance.

Bibliography

- Coase, Ronald Harry. "The problem of social cost." *The Journal of Law and Economics* 3 (1960): 1–44. DeNyse, Gavin, and Sustainable Energy. "How Can We Get There?" Retrieved March 10 (2000): 2014. Ellickson, Robert C. "The case for Coase and against Coaseanism." *Yale LJ* 99 (1989): 611.
- Fleurbaey, Marc, Ravi Kanbur, and Brody Viney. "Social externalities and economic analysis." *Social Research: An International Quarterly* 88, no. 1 (2021): 171–202.
- Greenstone, Michael, Rohini Pande, Nicholas Ryan, and Anant Sudarshan. "The Surat Emissions Trading Scheme." *Energy Policy Institute at the University of Chicago*. [https://epic.uchicago.edu/research/the-surat-emissions-trading-scheme-a-first-look-at-the-worlds-first-particulate-trading-sy](https://epic.uchicago.edu/research/the-surat-emissions-trading-scheme-a-first-look-at-the-worlds-first-particulate-trading-system)stem, 2019.
- Gupta Anil, K, and Prakash Aseem. "On Internalization of Externalities." *IIMA Working Papers*, 1993.
- Hazra, Nanda Dulal. "Emission Trading Schemes (ETS) in India: An Overview." *Sustainability, Agri, Food and Environmental Research* 11 (2023).
- Kavitha, BV, Bhimani Chirag, and A Sudhakar. "Issues and challenges for emission trading scheme for particulate matter in India." *Journal of Environmental Research and Development* 9, no. 3 (2015): 696.
- Martin, Weitzman, et al. "Prices vs. quantities." *Review of Economic Studies* 41, no. 4 (1974): 477–491. McMahon, Walter W. "Externalities in education." In *Economics of education*, 133–137. Elsevier, 1987.
- Moşteanu, Tatiana, and Mihaela Iacob. "Principles for Private and Public Internalisation of Externalities. A Synoptic View." *Theoretical & Applied Economics* 16, no. 10 (2009).
- Pigou, Arthur. *The economics of welfare*. Routledge, 2017.
- Seo, S Niggol. *The behavioral economics of climate change: adaptation behaviors, global public goods, breakthrough technologies, and policy-making*, 65–99. Academic Press, 2017.

Wolf Jr, Charles. "A theory of nonmarket failure: Framework for implementation analysis." *The Journal of Law and Economics* 22, no. 1 (1979): 107–139.