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### Subsidies

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## Subsidies

Subsidies are direct payments from the government to individuals and/or firms. These payments can be used to address problems associated with the environment and natural resources, however they are seldom implemented under the principle that in most cases the “polluter should pay.” Economic theory can guide policy decisions, informing as to when subsidies are appropriate, where they should be levied, and at what level they should be set. Subsidies are most prevalent in energy and technology policy.

Externalities are an example of a market failure. If some cost or benefit is associated with an economic activity that is not borne by the agent undertaking the activity, that cost or benefit is called an externality. Pollution as a byproduct of the production of a good is a negative externality associated with an external cost: the producer who emits the pollution is not suffering its costs (to the health of nearby people, for instance). Inoculations are a positive externality associated with an external benefit: the consumer who gets the shot provides benefits to others by exposing them to a reduced risk of disease.

Arthur Pigou formulated the idea that the market failure from externalities can be solved if policymakers “internalize the externality,” that is, make the producers of the externality face the true price, including the externality. If producers of negative externalities face a tax per unit of the externality equal to the marginal external damages of the externality, then the social optimum will be reached. This tax is called a Pigouvian tax. Similarly, producers of positive externalities can face a Pigouvian subsidy to bring about the social optimum.

Subsidies can be used for both positive and negative externalities. For positive externalities (e.g. research and development for energy technologies), the subsidy is levied per unit of the externality. For negative externalities (e.g. pollution), the subsidy is levied per unit of *abatement* of the externality. If a baseline level is established, then subsidizing producers for each unit abated will achieve the same level of emissions as taxing each unit of abatement.

Externalities can thus be addressed with either taxes or subsidies. If the subsidy rate and the tax rate are equal to each other, then either policy will result in the same amount of total externality. However, these policies will differ in terms of the distribution of the costs and revenues. Taxes generate revenues, and subsidies entail costs. The distribution of those costs or revenues is a question for policymakers to decide, but it does not impact the efficiency of the policy or the overall level of the externality. However, this equivalence between taxes and subsidies will not hold in cases where firms can enter and exit in response to policy. In that case, subsidies encourage entry and taxes encourage exit.

In an environmental context, subsidies are more commonly used to promote the research and development of energy and environmental technologies. These subsidies are actually addressing market failures from two different externalities: the negative externality of the pollutant or the resource use, and the positive externality from research and development itself (e.g. learning spillovers). For instance, the clean energy industry has received extensive federal subsidies over the past several years.

Energy subsidies are prevalent in federal policy, but these subsidies are rarely "Pigouvian," that is, they are not intended as a policy instrument to address a market failure caused by externalities nor are they set equal to the per unit external cost or benefit. Instead, these policies are often intended to keep energy prices low for consumers, or to reduce costs for producers. One study estimates that, from 2002-2008, federal energy subsidies for fossil fuels in the U.S. totaled \$72 billion, compared to just \$29 billion for renewables. Most of these dollars are attributed to tax breaks for producers, including the Foreign Tax Credit and the Credit for Production of Nonconventional Fuels. About half of the subsidies for renewables went to corn-based ethanol.

Worldwide, energy subsidies look similar. The International Energy Agency has estimated that consumption subsidies for fossil fuels totaled \$409 billion in 2010. Oil subsidies represented about half of that amount. That agency claims that for energy subsidies directed at fossil fuels, the costs outweigh the benefits. A complete phase-out of all energy subsidies by 2020 would reduce global energy demand by 5% and carbon dioxide emissions by 5.8%.

Subsidies in agriculture and resource policy have been used in the context of brownfield redevelopment, erosion control, loans to farmers, and grants for erosion control. In the future, subsidies could be a part of climate change policy at either the federal or international level, including subsidies for renewable energy sources, carbon emissions trading, or other greenhouse gas mitigation strategies. Climate change is an international issue: greenhouse gas emissions from one nation affect the climate of all nations. Thus, climate policy negotiations occur at an international level. The WTO has limits on what subsidies can be levied by individual nations, and some have argued that climate-related subsidies may conflict with trade rules related to subsidies.

Like taxes and emissions trading, subsidies are a policy tool that change relative prices for consumers and producers, altering incentives so that individual decisions coincide with socially optimal allocations. Subsidies have an advantage over traditional command-and-control policies in that they allow for flexibility among consumers and producers, who may face heterogeneity in abatement costs or preferences. While most subsidies in energy and resource policy today are actually exacerbating the problems of environmental externalities rather than solving them, subsidies can be designed efficiently and can be part of an efficient policy toolkit to address market failures in environmental and resource policy.

*Garth Heutel*

**See Also:** Brownfields; Emissions Trading; Externality; Pigou, Arthur; Taxes

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