E

Externalities

Ursula W. Kreitmair[1] and Jacob S. Bower-Bir[2,3]
[1]University of Nebraska, Lincoln, NE, USA
[2]Department of Public Policy and Administration, American University in Cairo, Cairo, Egypt
[3]Ostrom Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington, IN, USA

Synonyms

Neighborhood effects; Spillover effects; Spillovers

Definition

Externalities are the "[b]enefits or costs of an individual's activity that the individual does not receive or bear" (Ekelund et al. 2006, p. 415). They arise whenever the actions of one person affect the welfare of another. There are positive (when others receive a benefit) and negative (when others are burdened with costs) externalities that may arise from production and consumption decisions. When the production or consumption of a good carries externalities, the effects spill over outside of the market and consequently are not fully reflected in the good's price. Widespread consumption of schooling leads to a reduction in the crime rate, a positive externality (Lochner and Moretti 2004). Steel production generates air pollution, a negative externality. You receive a benefit living among educated citizens and you pay a cost living downwind of a steel plant, but neither is likely to influence the market price of schooling or steel without some coordination or intervention (for reasons discussed below). The production or consumption of a good can result in multiple, potentially opposite externalities with varying effects across a population. Air pollution from steel production will harm those with respiratory illnesses more than their healthy neighbors and may even benefit air-filtration salespersons. One can frame most negative externalities as positive externalities, or vice versa, by flipping the spillover's reference point. For example, air pollution is a net-negative externality from steel production, and cleaner air is a *positive* externality of *reduced* steel production.

Introduction

While the concept of externalities is not controversial, their consequences for market efficiency, and resultant recommendations for policy interventions, have spurred a wealth of research and considerable disagreement among academics and laypersons alike.

T.K. Shackelford, V.A. Weekes-Shackelford (eds.), *Encyclopedia of Evolutionary Psychological Science*,
DOI 10.1007/978-3-319-16999-6_1597-1

Failing Markets and Policy Responses

Market Failure

Pareto efficiency, or so-called social welfare maximizing outcomes, wherein no individual can be made better off without someone else being made worse off, is a common goal for welfare economists (though it is not necessarily sufficient for a normatively appealing distribution of resources) [A]. Provided a host of conditions are met, competitive markets arrive at such outcomes. One of these conditions is that the costs or benefits from producing/consuming a good accrue only to the decision-maker – that is, there are no externalities. In the presence of externalities, the market "fails" to maximize social welfare as individuals are driven to underproduce/consume goods with positive externalities and overproduce/consume goods with negative externalities. Although Pareto efficient outcomes are still possible, the market *by itself* will not arrive at that distribution of resources.

To see why this happens, consider that individuals strive to maximize their welfare, broadly conceived [B]. They do this by engaging in a desired action until its *private marginal benefit* equals its *private marginal cost*. At that point, net benefit is zero, and additional production/consumption is undesirable as most actions have increasing marginal costs and decreasing marginal benefits [C]. Absent externalities, an action's *social* marginal costs and benefits – its private marginal costs and benefits summed across all affected individuals – are the same as its private marginal costs and benefits because the decision-maker is the sole beneficiary of her action. Not so in the presence of externalities when private actions help or hurt outsiders, too. With positive externalities, an action's social marginal benefit is greater than its private marginal benefit. If individuals do not consider the public ramifications of their decisions, markets will promote *under*production/consumption of the good or service in question (e.g., too few vaccinations) because the decision-maker *bears all the costs* of her actions but *shares their benefits*. With negative externalities, an action's social marginal cost is greater than its private marginal cost, and the market will promote its *over*production/consumption (e.g., too many people texting while driving) because the decision-maker *reaps all the benefits* of her actions but *shares their costs* across society. In both instances, the market has failed to deliver the (economically defined) optimal outcome.

Government Responses to Externalities

To increase social welfare, public policymakers seek to correct externality-caused market failures with a variety of instruments, each with their own (dis)advantages, enthusiastic champions, and vehement opponents [D]. Among the most politically heated, governments can counteract the under-/over-provision of positive/negative externalities through "command-and-control" tools, mandating a specific level or method of the good's production/consumption for each actor and levying fines if standards are not met. In the United States, the Affordable Care Act (ACA, aka Obamacare) was such an attempt, aimed at enrolling in health insurance – with its positive social spillovers – citizens who were either unable or unwilling to purchase it. The ACA's "individual mandate" requires individuals to purchase health insurance or face a fine. When policymakers deem externalities sufficiently large, government agencies may take over production to fully regulate the spillovers, as is the case with single-payer healthcare in countries such as Canada, the UK, and France. Although command-and-control approaches inspire strong ideological- and efficiency-based criticisms, there are instances when these tools provide the most (cost-) effective solutions (Cole and Grossman 1999). As such, the question is not whether to employ command-and-control but under what circumstances.

Policymakers can also rely on market forces to improve social welfare by (i) artificially aligning private and public marginal costs and benefits via a per-unit tax or subsidy on the externality or (ii) capping an externality at the socially optimal level and then allowing producers/consumers to trade rights to produce/consume the externality among themselves. These "market-based" instruments rely on government agencies to set the price or the quantity of the externality but let the market reduce compliance costs [E]. For example, a

Pigouvian tax forces steel mills to internalize the social cost of their production externality by taxing each ton of air pollution they generate. The value of that tax will equal the difference between (i) the marginal cost of one ton of pollution to *society*, which is relatively high, and (ii) the marginal cost of one ton of pollution to *the mill*, which is relatively low. Making the mills cover the full cost of their actions yields efficient production decisions (Pigou 1920). Similarly, cap and trade systems mandate the amount of an externality that an industry may produce but then allow producers within that industry to efficiently distribute externality production among themselves through a market. For example, in the 1990s, the Environmental Protection Agency (EPA) capped the amount of sulfur dioxide the US energy industry could emit. It then distributed emission permits to the individual energy providers, who could trade those permits, meaning providers who found it cheapest to reduce emissions could sell their permits to higher-cost emitters. This approach resulted in more cost-effective emission reductions than would have occurred via command-and-control (Keohane 2007).

In general, market-based interventions are more cost-effective than strict command and control because the most efficient actors will be the ones to achieve the abatement in negative externalities or the provision of positive externalities. The distribution of regulatory burden is different from that of command-and-control approaches, which mandate individual targets (Baumol and Oates 1988). In addition, market-based instruments encourage *innovation* as there is now an incentive to lower the cost of reducing/producing a negative/positive externality. However, for a number of reasons, market approaches have not always received the widespread application that these benefits might warrant [F].

Market-based interventions are attractive, but humans systematically deviate from the rational actor models that undergird them (Kahneman 2011). Policymakers can leverage these deviations from rational behavior by restructuring the decision-making environment (without limiting options available to the decision-maker) so that it nudges people into making choices that improve their and society's welfare (Thaler and Sunstein 2008). For example, individuals often struggle to align their immediate preferences and behaviors with their long-term goals. Consequently, relatively few individuals join employer-offered retirement saving programs despite their long-term advantages, and many who do participate do not save enough for the kind of retirement they want. The cognitive and disciplinary demands of forgoing present consumption for greater future consumption are challenging even for people who care about their retirement. But what if the decision were reversed? Policymakers can make saving, rather than deciding on whether and how much to save, the default so that individuals have to opt out rather than opt in. Automatically enrolling employees in such programs and periodically increasing the minimum contribution rate substantially increase retirement savings (Benartzi and Thaler 2013). This carries benefits for savers because their lifetime consumption is now more even across time, and it benefits their compatriots by reducing the costs of communal elderly care. Policies of this sort, which rest on the growing cognitive and behavioral science literatures, highlight the importance of nuanced institutional design to individual and social welfare (Ostrom 2009), thus expanding the debate beyond state versus market and market instruments versus command-and-control [G].

Coasean Bargaining

Because government is not subject to the same profit-based efficiency motivation as industry, and because calculating private and social marginal costs and benefits can be difficult, some academics argue that government intervention may be worse than the market failures it tries to correct. In situations where enforceable property rights exist and there are few barriers (i.e., "transaction costs") to individuals bargaining, parties affected by externalities may resolve market failures themselves, without recourse to the interventions discussed earlier (Coase 1960). To illustrate this approach, consider if our steel mill was located upstream from a fishery. In the absence of regulation, the steel mill imposes a negative externality on the fishery in the form of water pollution. If,

however, the fishery possesses property rights over clean water, its owners can demand compensation from the steel mill for the damages to their fish stock. The steel mill is thus forced to include in their production decisions the marginal cost that their behavior imposes on the fishery, thereby aligning private and social marginal costs and benefits and ensuring an efficient market outcome [H]. Here, government's role may be limited to establishing and maintaining the conditions under which the market can overcome potential failures. Among these conditions are well-defined property rights, rule of law, and so forth. There exist, however, many situations where property rights are difficult to enforce, or where transactions costs are high due to numerous parties involved in negotiations, such that efficient outcomes may require more extensive intervention.

Externalities and Cooperation

Externalities are essential to understanding cooperation (or lack thereof) on matters of social import. Free riding on others' efforts or investments is often a winning strategy when externalities are present, making cooperation difficult. To illustrate, let us return to the Coasean bargaining example, but with a twist: the steel mill, now with rights to pollute the river, finds itself upstream of *numerous* fisheries all equally affected by its pollution. No fishery alone can compensate the steel mill for its reduced production; they must cooperate to raise sufficient funds. All of the fishery owners want a cleaner river, but each knows she will enjoy its benefits *whether or not* she contributes toward the mill's compensatory sum, so long as that sum is reached. The environmental improvement is a positive externality and its benefits non-excludable. Its costs, however, can be shared and shirked. The fisheries benefit most overall if all fisheries pay to compensate the steel mill to reduce pollution as much as possible, but each fishery owner has an incentive to *free ride* – withhold her funds and hope that the other owners will make up for her lost contribution [I]. Because all the fishery owners have the same incentive to free ride, there is a real possibility that the fisheries will not raise enough funds to stop the mill's polluting, making everyone worse off than if all or even a few fisheries had shouldered the financial burden. Game theory predicts that there is little chance of cooperation in social situations centered around such externalities – discouraging given the number of situations that display this general incentive structure (e.g., charitable giving, open-access computer code, environmental resource management, student group projects, etc.) [J].

Remarkably, the externality-borne incentives at the heart of the market failures discussed earlier are the same as those leading to the cooperative breakdowns just laid out. (Technically, defecting in a prisoner's dilemma constitutes a market failure and full cooperation the Pareto optimum.) When studying cooperation, however, researchers focus less on externally imposed market corrections (such as command-and-control tools or market-based instruments) in favor of studying the conditions under which cooperative success might be achieved endogenously (i.e., from within the system as it already exists), often via group-imposed incentives. For instance, behavioral economists and psychologists research the conditions under which individuals are willing to cooperate in creating/reducing goods with positive/negative externalities (e.g., see Chaudhuri 2011), finding that individuals vary widely in (i) their proclivities to cooperate (e.g., Fischbacher and Gächter 2010) and/or (ii) in their expectations of how others might respond to cooperation on their part. For example, some display ostensibly altruistic behavior (i.e., cooperating regardless of what others are doing) or conditionally cooperative behavior (i.e., cooperating if others are too), suggesting that cooperative success is not impossible [K]. Even when group composition is not favorable to cooperation (e.g., when few altruists are present), institutional settings (e.g., how much oversight there is, whether punishment is possible, how benefits are distributed, etc.) can discourage free riding on others' efforts to produce/reduce goods with externalities (Ostrom et al. 1994). These institutions then mirror, in part, the exogenous market corrections implemented by government officials, albeit with more reliance on self-governance.

Conclusion

While the theory on externalities is well established, the real-world implications are, unsurprisingly, controversial. Externalities are prevalent in society – few decisions do not impact those around us. But society often struggles over whether and how to address externalities. Strict economic efficiency analyses, probably the most common approach to evaluate how to tackle externalities, may not be sufficient to make policy decisions – in part because analyses on the cost-effectiveness of solutions to problems that arise out of externalities often disregard costs and constraints that go beyond economic considerations, such as political realities and societal preferences (Richards 1999). There are a variety of reasons why society might often prefer one approach over a more efficient one.

Further, there is often disagreement over whether something constitutes an externality in the first place. People will disagree over how "public" a problem is. The recent debate regarding gay marriage demonstrates this well. Some advocates argue that no one but the consenting individuals marrying are affected by the ability to lawfully wed, while opponents argue that such relationships spill over to them, undermining their own heterosexual coupling. Moreover, some people may view gay marriage as a right (constitutional, human, or otherwise). In this case, these individuals will argue that economic efficiency criteria are irrelevant – the debate over whether externalities exist ceases to be of importance. Additional philosophical issues arise in the debate over whether animal welfare in, say, food production or product testing constitutes a negative externality even though humans are not directly affected. If so, does it warrant increased regulation with potential impacts on the cost of food and welfare implications for food producers?

Externalities exist, and economic theory gives us many of the tools to assess and regulate their efficient distribution. However, the realities of designing effective policies are complicated, in part because of the difficulty of grappling with the underlying questions about how to conceive of goods and how far afield we are willing to look for their impacts.

Connections and Extensions

[A] Well-functioning markets arrive at *a* Pareto efficient resource distribution, of which there may be many, but there is no guarantee that the specific distribution of resources is politically or morally palatable. In addition, the "liberal paradox" shows the impossibility of achieving Pareto efficiencies while respecting individual liberties.

[B] The classic rational choice model of human decision-making allows individuals to receive (dis)utility from numerous and often non-pecuniary sources such as social standing, kudos from others, the warm fuzzy feeling you get from sharing/voting/volunteering, etc. and is thus broad in its view of what motivates individuals to act. However, it does posit (at times unrealistically) that actors have the time, desire, and cognitive capacity to calculate the costs and benefits associated with available actions, allowing them to choose the course that results in maximum net utility. Consequently, researchers have identified instances when individuals violate the classic model's assumptions and behavioral predictions (Kahneman 2011), and subsequent extensions to the rational choice approach have incorporated general and context-specific bounds on human cognition. Still, given the model's intuitive appeal, its mathematical tractability, and its ability to provide clear and, in some cases, accurate predictions, the classic rational choice model remains at the core of public policy analysis.

[C] "Marginal" means consuming or creating a single unit of a good or service on top of what already exists. For example, building an additional floor in a skyscraper costs more than the last because it requires reinforcing the foundation and lower levels (increasing marginal cost), and eating an additional scoop of ice cream yields less joy than its predecessor (decreasing marginal benefit).

[D] Market failure stemming from externalities and their subsequent violations of the Pareto conditions is one of the main motivations for public policy intervention in the economy, along with lowering transaction costs and changing resource allocations on moral grounds (Weimer and Vining 2017). However, there are several requirements

for Pareto efficiency beyond those related to externalities, and they also frequently go unmet. Thus, almost all markets exhibit market failure to varying degrees, and economists and policymakers spend much time and effort determining *which* market failures government should try to correct.

[E] Compliance costs refer to the resources (e.g., time and money) spent by industry (or individual consumers) to comply with a given regulation.

[F] Among the reasons for the relative lack of market-based instruments are industry opposition to regulation generaly, regulator experience with command-and-control over market-based instruments, and legislators-who are often trained lawyers-preferring policy rooted in law rather than economics (Stavins 1998).

[G] It is important to distinguish between the state versus market debate and the market instruments versus command and control debate. The first contests whether government should intervene at all. Contrast this with the second debate, where the issue is not intervention per se, but what form the intervention should take. Market-based instruments are still government interventions, but do not mandate individual behavior as command-and-control would.

[H] Efficient market outcomes are not contingent upon which party holds property rights (Coase 1960). If the steel mill has property rights over the water, then the fishery pays it to reduce its pollution, but the final level of pollution will be the same as when the fishery holds the rights.

[I] This assumes constant marginal costs and benefits of pollution reduction.

[J] Scenarios like these, where community welfare is at odds with individual incentives, are called "social dilemmas." To study behavior in these settings, researchers often abstract these scenarios as n-player prisoner's dilemmas and public goods games.

[K] Evolutionary game theory provides justification for why these preferences may exist despite these preferences often leading to less desirable outcomes for the individual. In repeated games, cooperating when others cooperate can lead to mutually beneficial outcomes over mutual defection, thus suggesting that evolving cooperative strategies and preferences may provide an advantage (Axelrod 1984).

Cross-References

- ▶ Cooperation Indirect Costs
- ▶ Economic Decisions
- ▶ Game Theory
- ▶ Indirect Reciprocity
- ▶ Prisoner's Dilemma
- ▶ Theory of Games and Economic Behavior

References

Axelrod, R. M. (1984). *The evolution of cooperation*. New York: Basic Books.

Baumol, W. J., & Oates, W. E. (1988). *The theory of environmental policy* (2nd ed.). New York: Cambridge University Press.

Benartzi, S., & Thaler, R. H. (2013). Behavioral economics and the retirement savings crisis. *Science, 339*(6124), 1152–1153.

Chaudhuri, A. (2011). Sustaining cooperation in laboratory public goods experiments: A selective survey of the literature. *Experimental Economics, 14*, 47–83.

Coase, R. H. (1960). The problem of social cost. *The Journal of Law & Economics, 3*, 1–44.

Cole, D. H., & Grossman, P. Z. (1999). When is command-and-control efficient? Institutions, technology, and the comparative efficiency of alternative regulatory regimes for environmental protection. *Wisconsin Law Review, 5*, 887.

Ekelund, R. B., Jr., Resseler, R. W., & Tollison, R. D. (2006). *Microeconomics: Private markets and public choices* (7th ed.). Boston: Addison Wesley.

Fischbacher, U., & Gächter, S. (2010). Social preferences, beliefs, and the dynamics of free riding in public goods experiments. *The American Economic Review, 100*(1), 541–556.

Kahneman, D. (2011). *Thinking, fast and slow*. New York: Farrar, Straus and Groux.

Keohane, N. O. (2007). Cost savings from allowance trading in the 1990 Clean Air Act: Estimates from a choice-based model. In J. Freeman & C. D. Kolstad (Eds.), *Moving to markets in environmental regulation: Lessons from twenty years of experience* (pp. 194–229). New York: Oxford University Press.

Lochner, L., & Moretti, E. (2004). The effect of education on crime: Evidence from prison inmates, arrests, and self-reports. *The American Economic Review, 94*(1), 155–189.

Ostrom, E. (2009). *Beyond markets and states: Polycentric governance of complex economic systems*. Nobel Prize Lecture, Stockholm (8 Dec 2009).

Ostrom, E., Gardner, R., & Walker, J. (1994). *Rules, games, and common-pool resources*. Ann Arbor: University of Michigan Press.

Pigou, A. C. (1920). *The economics of welfare*. London: Macmillan and Company.

Richards, K. R. (1999). Framing environmental policy instrument choice. *Duke Environmental Law & Policy Forum, 10*, 221.

Stavins, R. N. (1998). What can we learn from the grand policy experiment? Lessons from SO_2 allowance trading. *The Journal of Economic Perspectives, 12*(3), 69–88.

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge improving decisions about health, wealth, and happiness*. New Haven: Yale University Press.

Weimer, D. L., & Vining, A. R. (2017). *Policy analysis: Concepts and practice* (6th ed.). New York: Routledge.