Noise

Noise pollution consists of all the myriad sources of irritating (and often unhealthy) sounds emanating from other people and other things in the world around us. Loud noises from any source can be physically harmful; chronic exposure to moderate to high levels of noise has been shown in numerous studies to be linked to a wide variety of physical and psychological problems, including hearing loss, aggression, elevated stress, and cardiovascular effects such as hypertension. As a result, a number of studies have tried to measure the impact of living close to a source of noise such as a busy road or airport. In addition, as people increasingly move to large cities where expensive housing translates into dense living conditions, they may be subjected to yet another source of noise that has received much less academic and policy attention: neighbor noise. Some of this noise is caused by inconsiderate behavior, but other noise related to everyday living may more rightly be attributed to poor acoustic insulation from inadequate planning and building.

If you walk on a hard wood floor, practice the drums, or teach your dog to speak on command, chances are you will not chafe at the sound of your own steps, beats, or barks. However noise coming from the outside world that is not under your control may have a very different psychological effect, depending on your tolerance (or *perturbability*) for such things. Thus to the extent that the noisemakers of the outside world do not take into account the full harm inflicted on nearby ears when making decisions about the level of (loud) activity to engage in, noise pollution—like many other forms of pollution—is an *externality*.

In economics there is naturally an interest in calculating the costs of noise pollution and comparing these to the costs of noise abatement policies. However, there is no off-the-shelf observable market price for noise reduction, so researchers must infer a price from people's behavior. One popular approach to valuing noise is to use hedonic house price regressions to analyze the relationship between house prices and proximity to noise sources (usually airports) in order to estimate a shadow price of noise from the market data. All else equal, if similar homes sell for less the closer they are to the airport, the conditional difference in price is interpreted as the market discount attributed to the noise problem. The imputed noise costs found by many of these studies are substantial: for example, one study finds a $200,000 house would sell for $20,000 to $24,000 less if exposed to airplane noise.

In theory, with perfect information and costless mobility, in equilibrium house prices should completely compensate the noise differentials and the average homeowner should be left observationally indifferent between house #1 with noise level x and house #2 with noise level y. In practice, however, information on noise is often difficult to observe (or elicit from sellers), and mobility is far from free. Many people who optimally chose a home 5 or 10 years ago may find themselves in a suboptimal noise situation years later for a number of reasons: increases in local

traffic, changes in airplane flight paths, or loud new neighbors next door (indeed, many an excited new urban apartment dweller have faced a rude welcome upon discovering heretofore hidden sources of noise once they move in, a factor which may help explain the popularity of renting in big cities). Furthermore, many housing markets are highly regulated with a large amount of rationing. For all these reasons, house prices may not fully compensate for undesirable characteristics like noise and there will be *residual* welfare costs.

A further complication in using hedonic methods arises due to heterogeneity in individuals' tolerance toward noise, with more perturbable people self-selecting into quieter areas, and more noise-tolerant people self-selecting into louder areas (taking advantage of the lower prices). This self-selection leads to a downward bias in any estimate of the average welfare costs of noise; we cannot necessarily interpret the difference in house prices attributed to noise differentials as the total cost that would be imposed on a particular individual exposed to that noise.

Given these difficulties, several alternative approaches to hedonic models have also been used to measure the welfare impacts of noise. One is to use a contingent valuation or stated choice method where subjects are asked to give their willingness-to-pay for alternative levels of different attributes. These methods are prone to various forms of strategic and recall bias and thus remain somewhat controversial.

A third method that has been used more recently is to use data from the many happiness or life satisfaction surveys that are now available, many of which ask questions about both household income and exposure to various forms of pollution, including noise. Although the use of life satisfaction data is quite a controversial subject in economics, in principle at least it should be possible to estimate the degree to which exposure to noise pollution lowers life satisfaction, and calculate the income transfer required to compensate for this impact. One study finds that exposure to significant levels of noise pollution lowers life satisfaction approximately as much as being disabled, and that noise alone can explain the differences in life satisfaction between urban and rural residents.

In sum, a growing body of evidence suggests that noise pollution is a serious problem that can significantly lower overall public welfare. However as noise is an externality and often not observable before purchasing or renting a home, the free market will not deliver an optimal solution. Instead, urban planners and policymakers should pay more attention to this issue and, when necessary, increase standards of acoustic building codes and/or the enforcement of local noise ordinances. As the world becomes increasingly urbanized, enhanced attention to noise control will ensure that the benefits of city living are more likely to be enjoyed by all.

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See also: Contingent Valuation; Externality; Hedonic Price Method

Further Reading

Cohen, Jeffrey P., and Cletus C. Coughlin. 2008. Spatial Hedonic Models of Airport Noise, Proximity, and Housing Prices. *Journal of Regional Science* 48(5): 859–878.

Nelson, Jon P. 2004. Meta-analysis of Airport Noise and Hedonic Property Values: Problems and Prospects. *Journal of Transport Economics and Policy* 38(1): 1–27.

van Praag, M. S. Bernard and Barbara E. Baarsma. 2005. Using Happiness Surveys to Value Intangibles: The Case of Airport Noise. *The Economic Journal* 115(500): 224–246.

Wardman, Mark, and Abigail Bristow. 2008. Valuations of Aircraft Noise: Experiments in Stated Preference. *Environmental and Resource Economics* 39(4): 459–480.

Weinhold, Diana. 2013. The Happiness Reducing Costs of Noise Pollution. *Journal of Regional Science* 53(2): 292–303.

Nonmarket Valuation

Nonmarket valuation refers to a collection of methods used by economists to put monetary values on environmental goods. They are called nonmarket because the goods being valued are not traded in a market. This includes goods like cleaner air, safer drinking water, the closure of beaches, more wetland acreage, and so forth. Economists regard these as goods that matter to people just like cars, candy, and a baseball game. Nonmarket goods simply have no marketplace where people go to buy and sell the good.

Nonmarket values are used in benefit–cost analysis to evaluate government policies and programs and in natural resource damage assessment cases for assessing damages under environmental laws that penalize parties responsible for harming the environment. An example of a benefit–cost analysis is an evaluation of an environmental regulation such as the Clean Air Act. An example of a natural resource damage assessment case is the Exxon *Valdez* oil spill.

Most people are comfortable with putting monetary values on market goods like shoes, bagels, a carnival ride, etc., but not always on nonmarket environmental goods. But, economic principles and good public policy call for measuring environmental goods and services in monetary terms and economists have developed a variety of approaches for doing so. Some of the theories and techniques have been in use for over 50 years.

The field of economics laying out the theoretical foundations for nonmarket and market valuation is called welfare economics. The theory holds that a person's economic value for a good (market or nonmarket) is his or her willingness to pay for that good. This stands to reason, because it reflects what a person is willing to give up in terms of purchasing power over other goods and services for the good in question. Willingness to accept payment is also theoretically acceptable as a measure of value but it has proven to be more difficult in application and so has seen less use.