THE INFLUENCE OF OUTDOOR AIR POLLUTION ON HUMAN HEALTH: ESTIMATIONS OF ECONOMIC DAMAGES

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Human health depends on the state of the environment. According to the World Health Organization (WHO, 1994): "Environmental health comprises those aspects of human health, including quality of life, that are determined by physical, biological, social and psychological factors in the environment". It encompasses the assessment and control of those environmental factors that can potentially affect health. It is targeted towards preventing disease and creating health-supportive environments. This definition excludes behaviour not related to environment, as well as behaviour related to the social and cultural environment, and genetics. In general environmental health is related to the theory and practice of adverse factors influence minimization.

Factors that determine human health are very diverse. However several papers (Bilyavsky, 2004, etc.) reveal that health quality is on 50% determined by the way life (nutrition, work and household condition, sports etc.); 20% are attributed to the quality of the environment and climate factors; 20% are due the genetic endowments and the rest 10% are attributed to the quality of healthcare system. In other words, all but genetic endowments are directly or indirectly related to economic factors.

Melnik (2006) described the influence of environmental degradation on efficiency of economic system. The environmental degradation causes loses in agricultural and forest industries; causes corrosion of industrial equipment; stipulates loses related to the worsening of workers health status, and higher mortality rates. Overall bad environmental quality stipulates such expenditures as:

- Additional expenditures on conditioners, filters in order to protect people from dangerous chemical substances

- Additional expenses to protect equipment, (the use of anticorrosion metals); selection of more resistible agricultural plants. The last factor includes costs on R&D due to the fact that more "stable" agricultural plants are associated with genetic engineering

- Additional cost to compensate for the reduction in productivity (costs of labor flow, medical insurance, the use of mineral fertilizers, etc.).

It is also necessary to mention that opportunity costs are rarely taken into consideration. Due to degradation of the environment some sensitive production should be reduced (usually agricultural products and some manufacturing products). In fact, the highest opportunity costs arise due to closing of such industries as recreation and tourism.

There are several problems in analyzing the influence of outdoor air pollution on health. First of all, it is difficult to state real cause-effect of the relationships. Additionally, placing monetary values on those effects, either health or productivity is often not easy work and special approaches have to be used.

The theoretical relationships in environmental health model could be represented by general health production function (Naveen, 2012):

$$H = H\ (Q,\ M,\ A;\ E) \qquad\qquad (1)$$

Where, *H* - indicates the health status measured in level of illness per 1000 of population; *Q* - Level of air (radioactive) pollution; *M* - Refers to mitigating activities number and visits to doctors, laboratory tests, etc.; *A* - is averting activities extra miles traveled per day to avoid polluted areas in the city, living in parks or near sea zones, etc; *E* - is a vector of economic parameters.

In order to find *direct economic damage* from pollution (the illness costs) it is needed to multiple numbers of pollution caused diseases on average illness duration in days (every specific illness has different duration) and on average cost per day (different for different illness). The *indirect damage* could be calculated as not produced regional product. There are also alternative ways to estimate the health effect, for example, Disability- adjusted life years (DALYs). The last is widely used by WHO and measured as present value of life-time lost due to ill-health, disability or early death. One DALY can be thought of as one lost year of "healthy" life. The sum of these DALYs across the population, or the burden of disease, can be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability. One of the positive sides of DALYs is that mortality and morbidity are combined into a single measure.

The proper estimations of economic damages related to outdoor air pollution have a significant policy direction in terms of placing monetary values for pollution. Pollution as a negative externality could be internalized by setting Pigovian taxes. The last are properly levied through estimation of all economic damages (including health damages) related to negative externality.

References:

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