Comments on
Current Issues in China's Environmental Policy

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The papers in this session raise an important question regarding the design of environmental policy: should environmental standards be set at the national or at the local level? Professor Chow suggests that pollution standards should be set locally. Indeed, he suggests individual communities should determine the stock of pollution permits that are sold to firms: People who are affected by pollution will thus have a say in determining environmental quality. [1] Professor Zhang, however, points to dangers in allowing local leaders to be in charge of pollution control. He notes that local leaders may be guided more by desires to promote economic growth than to improve environmental quality, and hence may ignore the views of citizens in the communities they serve.

A possible solution to this dilemma is to set and enforce environmental standards at the national level, but to allow environmental standards to vary from one area to another. The idea that environmental standards should vary geographically follows naturally from the fact that the benefits and costs of pollution control are likely to vary geographically. In the case of air pollution, the benefits of pollution control will vary with population density and with the income of the population. The costs of pollution control may also vary with population, depending on the source of air pollution (e.g., transport or industry).

Studies have found that the benefits of air pollution control vary significantly from one region of China to another, suggesting that the stringency of air pollution control should vary regionally as well. The remainder of these comments illustrates this point by examining estimates of the damages associated with particulate air pollution in China in 2003, by state, as well as the benefits of installing scrubbers on coal-fired power plants—a policy instituted during the 11th five-year plan.

A recent SEPA-World Bank study (2007) computes the health damages from 2003 PM10 levels in Chinese cities compared to three baselines—pristine air quality (15 μg/m3), the Chinese Class II Standard (40 μg/m3) and the WHO interim standard for developing countries (70 μg/m3).[2] In 2003 58% of the urban population of China was exposed to annual average PM10 levels greater than or equal to 100 μg/m3—approximately 4 times the annual average level in Washington, DC. Approximately 12% of the urban population was exposed to annual average PM10 greater than or equal to 150 μg/m3. The study estimates the number of deaths associated with 2003 PM10 levels compared to each baseline, which represents the mortality that would be avoided by reducing air pollution to the baseline level.

The health impacts of air pollution in urban areas vary significantly by province. Figure 1 shows the estimated deaths associated with 2003 pollution levels compared to pristine air quality (15 μg/m3). Darker colors correspond to greater total deaths, while the vertical bars indicate the percent of urban deaths in each province attributable to air pollution. The provinces with the greatest number of excess deaths are Shandong,

[1] Specifically, he suggests that the views of residents in rural areas would be conveyed to the State Environmental Administration through village heads and the views of urban resident through their elected representatives.

[2] The figures reported below come from a revised version of the study and were computed by the author.

Jiangsu and Guangdong. These are provinces with the largest number of people exposed to high air pollution levels.

The monetary value of health damages also varies significantly by province. In China, the official approach to valuing the deaths in Figure 1 is the Adjusted Human Capital approach: Each death is valued using the present value of per capita GDP over the individual's remaining lifetime.[3] Using this approach, the average value per life lost is about RMB 300,000; however, the value varies greatly among provinces, in proportion to per capita GDP. Figure 2 displays the total health costs associated with PM10 by province, as well as the per capita health costs.[4]

The provinces with the greatest total damages from air pollution are Shandong, Jiangsu and Guangdong. (Shanghai, Beijing and Tianjin have the highest per capita damages, reflecting both the high per capita GDP and high PM10 levels in those cities.) From the perspective of evaluating the net benefits of pollution control strategies, the provinces with the highest total health damages are likely to have the highest net benefits associated with a given reduction in ambient PM_{10} concentrations, as long as the per person costs of the strategy are roughly the same in all provinces.[5]

The variation in pollution control benefits is borne out in a study by Partridge and Gamkhar (2010) which evaluates the net benefits of installing scrubbers on coal-fired power plants in China. The authors examine the health benefits of installing a scrubber on a 1200 MW supercritical plant, as a function of plant location, using dose-response functions similar to those in the SEPA-World Bank study. Avoided mortality is, however, valued using the Value of a Statistical Life (RMB 1.3 million) rather than the Adjusted Human Capital approach. The authors' results are summarized in Table 1. The health benefits of installing a scrubber exceed the costs in all power grid regions except the Northeast and the Northwest—areas that are much more sparsely populated and where fewer people are, therefore, exposed to emissions.

The results of both studies suggest that the net benefits of air pollution control vary geographically in China. This implies that environmental regulations should also vary geographically in their stringency, but does not necessarily imply that they should be set at the local (i.e., community) level. The analysis of scrubber benefits, for example, incorporates spillover effects: the population that benefits from scrubber extends far beyond the area immediately surrounding the power plant, and local communities might not take this into account. In the case of air pollution, spillovers suggest that the national level is the appropriate level at which to determine regulatory stringency, although benefit-cost considerations suggest that stringency need not be geographically uniform.

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[3] Per capita GDP in each province was expected to grow at a rate of 7% per year and was discounted using an interest rate of 8%. It was assumed that, on average, 18 life years were lost due to air pollution.

[4] These figures include the cost of cases of chronic bronchitis and respiratory and cardiovascular hospital admissions. Premature mortality accounts for 71% and chronic bronchitis 27% of the health costs of air pollution. Each case of chronic bronchitis is valued at 40% of the value of a premature death.

[5] This also assumes that the relationship between ambient PM10 concentrations and each health effect is approximately linear.

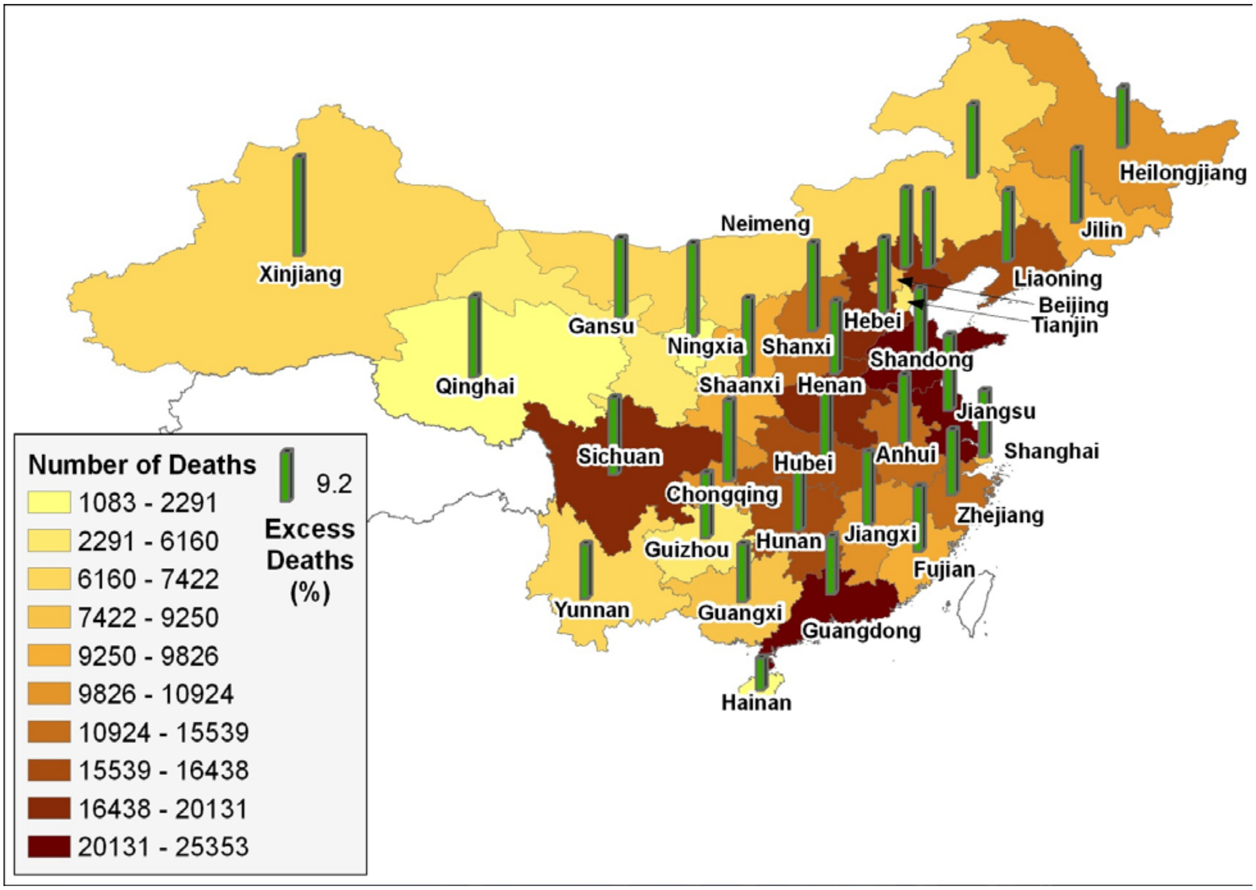

Figure 1. Estimated Deaths Attributed to 2003 PM10 Levels Compared to 15 µg/m3.

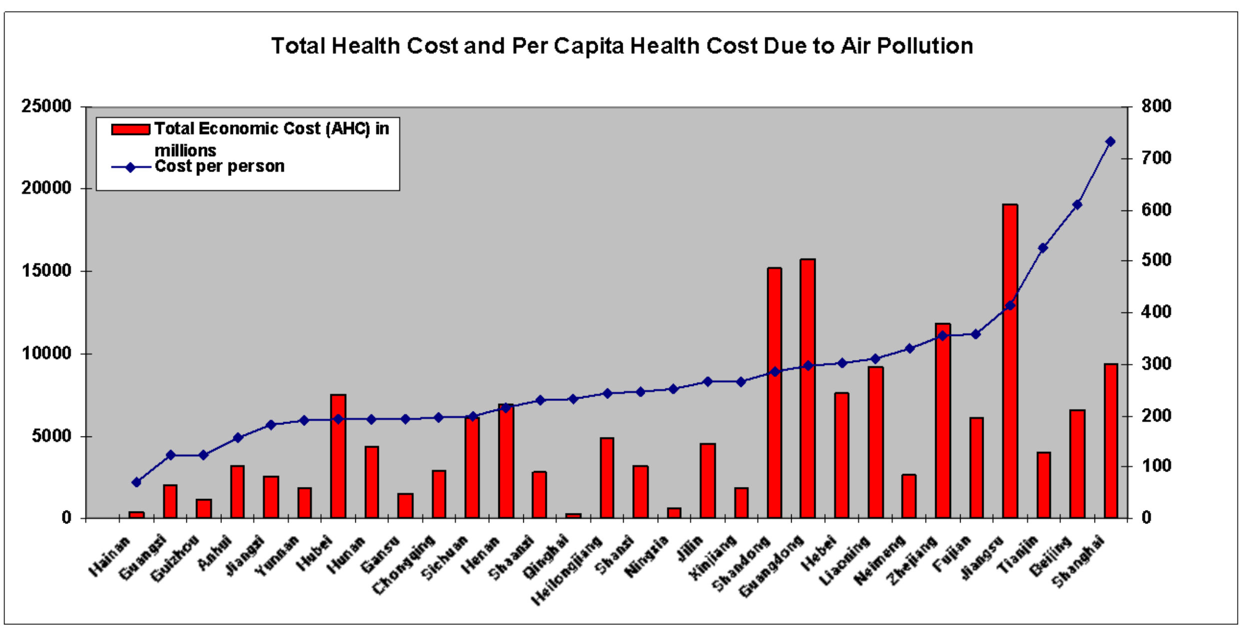

Figure 2. Total Health Costs and Per Capita Health Costs Due to 2003PM10 Levels.

Power Grid Regions	**Locations Examined**	**Population (millions)**	**Benefit/Cost Ratio**
Central	**6**	**367**	**3.4**
East	**5**	**242**	**2.1**
North	**6**	**249**	**2.8**
Northeast	**2**	**109**	**0.3**
Northwest	**4**	**96**	**0.8**
South	**6**	**225**	**1.4**

Table 1. Benefit-Cost Ratios for Installing a Scrubber on a 1200 MW Coal-Fired Power Plant, by Power Grid Region.

References

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