

## **PROPOSAL: HOW SUITABLE IS MARKET-BASED ENVIRONMENTAL REGULATION FOR MERCURY POLLUTION?**

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Methyl mercury has been linked to a variety of human health effects – most importantly neurological damage and long-term cognitive impairment in young children. Mercury pollution has gained prominence in recent years with the prevalence of warnings against eating fish and shellfish, some species of which have been found to have high concentrations of the neurotoxin.

The largest human-caused source of mercury emissions in the United States is coal-fired electric power plants. As a result, the current Bush Administration has proposed regulating mercury emissions through a system of tradable pollution allowances. This legislation is the centerpiece of the Bush Administration's so-called "Clear Skies" legislation, which is currently being shaped and promoted. Under a system of tradable allowances – also known as "cap and trade" – total emissions are capped, but individual polluters can buy and sell "allowances," corresponding to tons of pollution, among themselves. This approach has been a resounding success for the control of sulfur dioxide from electric power plants in the U.S.

The attractiveness of a tradable allowances system is that it can achieve a given emissions target at least total cost: firms that can abate pollution at low cost have an incentive to reduce their pollution and sell the resulting credits to firms with higher control costs. The suitability of tradable pollution permits for any given pollutant, however, depends crucially on how widely dispersed the pollutant is. For example, carbon dioxide emissions provide a perfect case for a large-scale market in pollution permits, because the effects of a given ton of CO<sub>2</sub> emissions do not depend on where it is emitted. In the economist's lexicon, carbon dioxide is a "uniformly mixed" pollutant. On the other hand, pollutants that accumulate near to their source may be ill-suited to market-based approaches, because the market places no restrictions on the emissions from any particular source.

This research project aims to use existing data on power plant operations, emissions, and atmospheric transport of mercury to build an econometric model of a mercury emissions trading system. The critical question at the heart of the research is whether mercury is a suitable pollutant for a market-based approach to environmental regulation.

This is a very active area of work at the Environmental Protection Agency, which has recently made public a great deal of data.

The research assistant's tasks will include researching pollution control technologies for mercury; gathering information on the health effects of mercury exposure; downloading, manipulating, and processing large data sets; and perhaps running simple regression analyses to link mercury emissions from power plants with mercury concentrations in the environment.

### **SUMMARY**

**Linda Shen, Class of 2006**

**Description, findings:**

This research project dealt with the question of whether mercury is a suitable pollutant for a market-based approach to environmental regulation. A large part of answering this question hinges on how mercury spreads within the environment, and whether it tends to accumulate close to the emission source. Using data on both mercury concentrations as well as coal purchases and consumption, the goal was to get a sense of the correlation between the coal that power plants burn and the mercury concentrations around those power plants. From the initial regressions, there does seem to be a correlation between coal characteristics and the mercury concentrations in nearby waters.

**Responsibilities:**

My responsibilities for this project included collecting and organizing mercury concentration data, figuring out apparent inconsistencies between the coal purchase and consumption data through background research, and writing short reports on the most recent publications that addressed the costs and benefits of existent and hypothetical mercury regulations. In working with the data, I used Excel, Stata, and Perl. I used Excel mainly for downloading and manipulating the mercury concentration data. I used Stata to investigate patterns in coal characteristics and to test for coal-blending/coal-cleaning at the power plant. I also ran a Perl program to consolidate typographical errors in the names of coal mines in the raw data to make available more detailed information about where the coal of individual power plants was coming from.

**What I Learned:**

Throughout the ROME project, I gained a great deal of technical experience using statistical software, especially with programming and keeping command logs and do-files in Stata. I also gained exposure to cost-benefit frameworks that are used in public policy, and learned a lot about mercury policy in particular. In general, I learned that the research process is much more complicated and nuanced than what I originally thought. Many of the problems I encountered throughout the research process involved problems with figuring out the raw data. For instance, my research started with the problem of why the coal that power plants purchased had different characteristics (such as sulfur content) than the coal that power plants reported as consuming. To solve this problem, I needed to test certain hypotheses, such as the likelihood that the power plants were cleaning their coal on site and therefore altering the characteristics of the coal they originally purchase. In preparing summaries of recent academic literature on mercury pollution, I also gained a sense of the richness of research that can be done in one policy area, the breadth of arguments that could be made for or against a certain public policy, and what a “good” research paper should look like.

**Opinion of ROME:**

ROME was an excellent opportunity for me to see what the research process is really like and to understand the kinds of obstacles that researchers face while carrying out their projects. Working on this project taught me to become a more constructive problem solver because I

learned from the way my ROME mentor was able to get around deficiencies or inconsistencies in the raw data. My ROME mentor also gave me an incredible variety of research tasks, which allowed me to get a feel for what research is like at every stage, from the literature review to the economic theory to the econometric analysis to the final conclusions that a research paper tries to draw. Overall, it was a great experience to be part of an ongoing research project, and I would highly recommend it to any student who is interested in economics research or who plans to do a senior essay.