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Environmental Policy, Fuel Prices and the Switching to Natural Gas in Santiago, Chile

Author: Jessica Coria

Air pollution in urban areas of developing countries is an issue of growing concern. In many of the large cities, concentrations of air pollutants far exceed the WHO guidelines, causing lots of human mortality and morbidity. Santiago, Chile, has been one of the more polluted large cities of the developing world.

In fact, Santiago was officially declared in 1996 a non-attainment zone by several atmospheric pollutants. However, during the late 1990s, there was a major improvement due to the switching to natural gas by stationary sources. The switching allowed point sources to reduce the emissions of particulate matter, the pollutant producing the worst health effects, by about 67%. What did policy makers do to reduce air pollution in Santiago? The switching to natural gas coincided with major new policy initiatives designed to improve air quality. A permit trading program that demanded large boilers to offset their emissions, an environmental contingencies program that demanded the dirtiest stationary sources to shut down during declared states of "environmental contingencies" of bad air quality, and a standard that demanded small stationary sources to reach a PM10' s concentration target were implement. But it also coincided with the increased availability and reduced price of natural gas, since this clean fuel started to be imported from Argentina in 1997 and after its introduction it became the cheapest clean fuel available.

What was responsible for switching to natural gas in Santiago: the environmental regulations or the market forces? In this study I analyze the drivers behind the pattern of switching to natural gas in Santiago. In order to do that I used a panel data set of stationary sources from 1995 to 2005, which allowed me to identify either the role of environmental policy as the impact of the energy, cost inducing the switching to this clean fuel.

Using a hazard model I conclude that most of the adoption of natural gas was induced by the lower cost of this fuel, showing that sources were more sensitive to the cost of energy than to the environmental regulation. In fact, the lower cost of natural gas increased the switching probability by about 26%, while being included in tradable permit program or the environmental contingencies program did not affect the likelihood of switching statistically.

Why did the environmental contingencies program not work? As in many developing countries, the environmental policies were poorly enforced. Given the fiscal and technical resources constraints, just a small sample of stationary sources was actually monitored to verify regulation compliance. And the monitoring efforts were focused mostly into the industrial boilers. The results show a positive but small impact of the contingencies system explaining the switching of industrial boilers, the group in which the monitoring resources were focused. Hence, the lack monitoring and enforcement seem to explain the poor performance of the environmental contingencies program.

With regards to tradable permit program, besides the monitoring and enforcement issues, the lack of expertise to implement the trading program prevented the development of the emission permits market. Since regulated sources were relatively small for the purpose of implementing sophisticated monitoring process, the program was not designed on the basis of actual sources' emissions but rather on a proxy variable equal to the maximum emissions that a source could emit in a given period of time. From the beginning of the program the emission permits have doubled the sources' requirements, producing a very significant excess of supply in spite of regulatory changes that have reduced their stock. This excess of supply should have produced a permit price of equilibrium close to zero, making the benefits coming from reducing the use of emission permits insignificant.

What do we learn from Santiago's experience? The results suggest that the institutional context is actually a key element explaining differences in the output of the environmental regulation between developed and emerging countries. In fact, the lack of experience of the regulatory institutions and the lack of resources to enforce policies were major constraints impeding the cost effectiveness of the policy instruments applied.

But in spite of that, there is room for the use of economic instruments, as environmental fees. To some extent, the lower price of natural gas worked as an economic instrument increasing the relative price of pollution. However it did not suffer from the design deficiencies and monitoring and enforcement constraints that are typically observed in developing countries. The results suggest that pollution sources were sensitive to changes in the relative price of pollution. Thereby, if the institutional issues were solved, environmental authority could encourage the adoption process of other environmentally friendly technologies by using fees to increase pollution's relative price.

Jessica Coria is a Chilean Economist currently working at Universidad Diego Portales. Her research project was supervised by Dr. Allen Blackman, Resources for the Future.

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