'Reduction in local ozone levels in urban São Paulo due to a shift from ethanol to gasoline use' by Alberto Salvo Nature Geoscience

A ground-breaking study by A/P Alberto Salvo (Department of Economics) & Professor Franz Geiger (Northwestern University) revealed surprisingly lower levels of ozone pollution in Sao Paulo when drivers switched from ethanol to gasoline.

Economist Alberto Salvo teamed up with chemist Franz Geiger to discover that when fuel prices drove residents of São Paulo, Brazil, to mostly switch from ethanol to gasoline in their flexible-fuel vehicles, local ozone levels dropped 20 percent. Ethanol-based vehicles are usually thought to generate less pollution than gasoline-based vehicles, because ethanol emissions contain lower concentrations of mono-nitrogen oxide than those from gasoline emissions, and nitrogen oxides are important precursors to ozone. However, as the study demonstrates, under certain atmospheric conditions lower ozone levels may result from higher nitrogen oxide emissions associated with gasoline. The four-year study is the first real-world trial looking at the effects of human behavior at the pump on urban air pollution. This empirical analysis of atmospheric pollutants, traffic congestion, consumer choice of fuel and meteorological conditions provides an important tool for studying other large cities, such as Chicago, New York, London and Beijing. Previous studies mainly have consisted of computer simulations of atmospheric chemical reactions based on tailpipe emissions studies. "Individuals often don't realize it, but in the aggregate, you can have a real impact on the environment," said Salvo, "In São Paulo, there were more than a million cars switching from ethanol to gasoline in the same season, and we found that ozone levels went down. We didn't expect this, but it is a precise result." Their study shows how pollution control requires a team that bridges atmospheric science and engineering, economics and statistics to study the whole air quality picture. In a commentary that accompanies the publication, Sasha Madronich at the US National Center for Atmospheric Research opines that "(t)he empirical analysis presented by Salvo and Geiger should be viewed as a gold standard for the type of analysis needed to evaluate the reliability of atmospheric chemistry models designed to simulate the effects of the transportation sector on air quality."

Salvo, A. & Geiger, F.M. (2014) Reduction in local ozone levels in urban São Paulo due to a shift from ethanol to gasoline use Nature Geoscience doi:10.1038/ngeo2144