Final Progress Report
Sustainability Science Program
Term: September 1, 2013 – August 31, 2014

Name:
Janhavi Nilekani

Your field(s): Environmental Economics

Your degree program, institution and graduation date:
PhD in Public Policy, Harvard Graduate School of Arts and Sciences, Expected May 2016

Faculty host(s) at Harvard name and department:
Rohini Pande, Mohammed Kamal Professor of Public Policy, Harvard Kennedy School

Description of SSP-related research activity:

Evaluating Particulate Matter Control Policy Options in India

My SSP-related research is closely linked to the India Initiative's signature Emissions Trading Scheme (ETS) project. The ETS project is a joint effort between Jameel Poverty Action Lab South Asia (J-PAL SA) and the Indian government to design, implement and evaluate a pilot emissions trading scheme in three Indian states. As part of that project, a baseline survey of all participating firms will be collected. In this paper, coauthored with Michael Greenstone, Rohini Pande, Nicholas Ryan, and Anant Sudarshan, we use ETS baseline survey data to evaluate a variety of potential policies for regulation of industrial particulate matter pollution in India. Using survey data of 1,000 Indian industrial plants, we look at the outcomes under several potential policy scenarios. We study changes in the policy instrument as well as changes in the monitoring and enforcement protocols.

Abstract:
Using survey data of 1000 small and medium Indian industrial plants, we empirically estimate the pollution outcomes, aggregate costs, and cost distributions under several policy scenarios for particulate matter (PM) regulation. We create a static model that treats the firm as a risk-neutral cost-minimizing agent that selects abatement technologies and operating practices in order to minimize expected abatement costs, subject to regulatory constraints. We estimate the aggregate outcomes given that each firm is minimizing costs, and estimate the potential welfare gains from policy shifts. We look at the overall impacts of varying the policy instrument, varying the stringency of regulation, and varying the likelihood of firm compliance.

Identification of the problem you address:
This research project addresses the problem of severe particulate matter pollution in India. Particulate matter has significant impacts on morbidity and mortality. While regulations exist in India, these are often poorly enforced.

Key question asked about the problem:
Given the status quo industrial particulate matter pollution regulations in India, what policy changes would have the largest expected welfare gains? We model the impacts of a variety of possible policy changes in order to identify the most valuable ones. We look at policy changes but also at changes in enforcement and monitoring protocols.

The methods by which you answered that question:
We estimate policy impacts by modelling how firms would behave under a variety of policy scenarios. We create a firm level constrained optimization model where each firm minimizes expected costs subject to the

regulatory constraints. We then evaluate the aggregate outcomes given that each firm is optimizing and given that policy changes will change the regulatory constraints.

Principle literature upon which the research drew:
We use environmental economics theory on how firms will behave and on potential pollution control policies. We use constrained optimization modelling tools to model outcomes.

Empirical data acquisition description:
As mentioned, this research is part of the much larger Emissions Trading Scheme project, which is about designing, implementing, and evaluating a pilot emissions trading scheme in three Indian states. As part of that larger endeavor, a baseline survey will be conducted of 1000 firms participating in the pilot. This research uses data from the ETS baseline survey. Additionally, we have been collecting lots of information on all the abatement methods firms can use to reduce particulate matter pollution, the costs of each method, how different methods interact, and so on. This data collection is being done primarily through interviews with air pollution control device manufacturers and consultants.

Geographical region studied:
Three states in India- Maharashtra, Gujarat, and Tamil Nadu.

Recommendations that might be relevant for your problem:
Our research is likely to indicate that there are significant gains to switching from the current concentration standard policy to an emissions trading scheme. We are also likely to recommend changes to the monitoring protocols.

A description of the final product(s) you have/are aiming to produce:
The final product will be a co-authored paper, but at this early stage we have not decided which journals will be appropriate. The paper will also be one of the three chapters for my dissertation thesis.

Description of major other intellectual or professional advancement activity(ies) over the past academic year:

During this academic year, aside from working on my SSP-related research as described above, I have been doing early stage dissertation research. Earlier in the year, this primarily involved brainstorming, doing literature reviews on my thesis topic, and writing a draft research proposal for one chapter of my 3-chapter dissertation. More recently, I have been working on two chapters.

My overall dissertation topic is tentatively titled “Essays on Indian Pollution Control Policies”. One chapter will be the SSP-related research, i.e. “Evaluating Particulate Matter Control Policy Options in India”. A second chapter will be on Indian transport sector pollution policies. Particularly, on whether the roll out of vehicle emission standards on tailpipe emissions from new vehicles and associated improvements in fuel quality impacted local urban air pollution levels. In recent months, I have been doing field research on this topic, including data collection, interviews, preliminary analysis, etc.

Lastly, I worked on a co-authored paper with the rest of the India Initiative on exposure to particulate matter pollution in India and potential life expectancy gains from reducing pollution to air quality standards. More details on this is below.

Please list citations for reports, papers, publications and presentations that built on your fellowship research:

Michael Greenstone, Janhavi Nilekani, Rohini Pande, Nicholas Ryan, Anant Sudarshan, and Anish Sugathan. "Lower Pollution, Longer Lives: Life Expectancy Gains if India Reduced Particulate Matter to Air-Quality Standards". Working Paper.

Abstract: India's population in urban and rural areas is exposed to dangerously high levels of air pollution. Using a combination of ground-level in-situ measurements and satellite-based remote sensing data, we calculate that over half of India's population (660 million people) live in areas that exceed the Indian National Ambient Air Quality Standard (NAAQS) for fine particulate (PM2.5) pollution. Reducing pollution in these areas to achieve the standard would, we estimate, increase life expectancy for these Indians by 3.2 years on average for a total of 2.1 billion life years. We outline potential policy responses to start achieving these gains.

Please describe any collaborative activities with other SSP Fellows that you are involved with.

My main SSP-related research will be a co-authored paper, together with Sustainability Science Program Fellows Anant Sudarshan and Nicholas Ryan, Faculty leader Rohini Pande and Co-Faculty leader Michael Greenstone, titled "Evaluating Particulate Matter Control Policy Options in India".

Aside from this, in collaboration with Sustainability Science Program Fellows Anant Sudarshan, Anish Sugathan, and Nicholas Ryan, Faculty leader Rohini Pande and Co-Faculty leader Michael Greenstone, we produced the working paper "Lower Pollution, Longer Lives: Life Expectancy Gains if India Reduced Particulate Matter to Air-Quality Standards" as described above.

Principal collaborators outside Harvard:

Michael Greenstone, 3M Professor of Environmental Economics, MIT is a coauthor on my primary SSP paper "Evaluating Particulate Matter Control Policy Options in India"as well as on "Lower Pollution, Longer Lives: Life Expectancy Gains if India Reduced Particulate Matter to Air-Quality Standards".