Meghdad Rahimian

Ph.D. Candidate in Economics – The Western University

Thesis Abstract

"Environmental Regulations and Manufacturing Clean-up: The Role of Abatement Technologies"

(Job Market Paper) In the past 20 years, emissions from the Canadian manufacturing sector decreased by 40% despite a rise in real output. Our analysis attributes this decrease to reductions in sector emission intensity, mainly driven by adjustments in production methods within sectors. We formulate a model linking firm production choices to environmental regulations. Regulated firms choose from a list of heterogeneous abatement technologies in the sector, some of which can increase productivity. The model distinguishes between environmental tax adjustments ("direct regulation effect") and within-sector technological shifts ("indirect regulation effect"). We estimate the model parameters and analyze counterfactual scenarios using Canadian manufacturing production and emissions microdata from 2004 to 2021. The results indicate that modest environmental tax modifications largely explain manufacturing pollution reductions by encouraging firms to adopt efficient, low-emission technologies. This result holds significance in environmental policy debates. The ex-ante compliance costs of policies, which include output reductions and factor reallocation costs, are frequently overestimated. This overestimation arises as these projections often focus on existing technology choices, overlooking the technological shifts that can occur following policy changes.

"The effect of Public Climate Change Agreement on the US GHG Emissions"

The United States ranks prominently among the world's leading greenhouse gas (GHG) emitters. A robust scientific consensus asserts the linkage between these emissions and climate change. However, this scientific consensus does not uniformly resonate with the broader American public. Across different states and counties, a notable proportion remains skeptical about the existence of climate change or its potential implications for human welfare. This disparity in belief and understanding is termed the 'public climate change agreement gap.' We delve into the potential impacts of narrowing this agreement gap. Analyzing the correlation between increased public consensus on climate change and subsequent GHG emissions, we find a significant connection: greater public alignment correlates with diminished emissions. We employ short-term temperature anomalies as instrumental variables to infer causality. We gauge the elasticity of GHG emissions from major emitting facilities in the US relative to fluctuations in public climate change agreements at the county-year level. Our findings present a more precise picture by excluding other potential pathways through which temperature anomalies might influence emissions. Lastly, our study extrapolates the broader economic effects of bridging the public climate change agreement gap. Our analysis suggests that achieving a cohesive public understanding could unlock annual welfare benefits upwards of $500 billion.

"A Ten-Year Statistical Radar Analysis of an Operational Hail Suppression Program in Alberta" **- Published**

Hailstorms, particularly prevalent in Alberta, Canada, inflict substantial socioeconomic damages. While cloud seeding is a common strategy to mitigate these effects, its actual efficacy remains debated. This study analyzes a decade of hailstorm radar-based records (2011-2020) from Alberta. We employ a three-dimensional radar reflectivity method to assess 176 storm tracks lasting over an hour. To gauge hail damage potential, we utilized two radar-derived metrics: VILmax (Vertically Integrated Liquid from the storm's peak reflectivity profile) and average hail coverage area (areas with reflectivity exceeding 60 dBZ). Seeding involved releasing silver iodide aerosols from planes, with efficacy assessed by comparing storm characteristics pre- and post-seeding. Results indicated that cloud seeding reduced the damage potential metrics in about 60% of cases, had no effect in 8-20%, and increased them in 17-30% of cases. Notably, seeding impacts were more apparent 30 minutes post-initiation. Statistical tests confirmed these differences as significant, suggesting cloud seeding might reduce damage, especially in storms with high VILmax values.