Steering the Direction of Innovation with Supply versus Demand Policies

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Accelerating innovation in the energy sector and steering it toward clean technologies is one of today's most pressing challenges. Policymakers can implement a wide range of incentives for innovative activities, such as direct subsidies for R&D (supply-side technology-push policies) and pricing mechanisms (demand-side market-pull policies). But government resources are limited, so it is important to determine which interventions can achieve the greatest "bang for the buck."

In this paper, we examine how supply- and demand-side policies affect scientists' research topic choice and their innovation outputs. We focus on early-stage researchers (e.g., PhD students). This is motivated by the possibility that frictions in labor markets and educational institutions could lead different policy interventions to have different effects on the academic and professional careers of scientists, thereby leading to differences in the efficacy and cost-effectiveness of government policies in steering the direction of innovation due to path dependency. Our aim is to identify a setting in which both carbon pricing and direct subsidies for academic energy R&D co-exist, allowing us to use quasi-experimental methods to estimate comparable measures of the marginal effects of public spending. We will use data covering several decades of U.S. PhD dissertations and apply natural language processing methods to classify research topics as being related to clean or dirty energy. This will capture effects on the direction of innovation at the earliest stage of scientists' careers. Later, we hope to match scientists observed in the dissertation data to patent data to study innovation outputs over their careers.