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Duke NICHOLAS INSTITUTE FOR ENVIRONMENTAL POLICY SOLUTIONS

Estimating the Employment Impacts of Energy and Environmental Policies and Programs

Workshop Summary Report

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On October 8, 2010, some sixty economists, policy advisors, government agency heads, and industry and NGO leaders gathered for a one-day workshop examining how to best estimate and convey the employment impacts that may result from enactment of energy and environmental policy. The workshop, organized by the Nicholas Institute for Environmental Policy Solutions at Duke University, was born of a desire among stakeholders to improve not only the specific modeling approaches used to predict employment impacts, but also the ways in which results from these studies are presented, understood, and used by policymakers, the media, and the public.[2] The need for additional clarity has been made abundantly clear at a time when legislation to cap greenhouse gases (GHGs) to mitigate the threat of climate change has been intensely debated at the federal and state levels in the United States. Current estimates for employment impacts resulting from enactment of climate and energy policy range widely, from positive (net job gains) to negative (job loss). Different models are used to generate these estimates, and there are no widely accepted standard practices for how to conduct these studies or transparently report key underlying assumptions and results. The effect has been confusion on the part of policymakers and the public at a time when greater clarity is needed in assessing the tradeoffs such legislation presents.

This workshop outcomes paper is structured in two parts: the first part summarizes key points that were made about current issues in modeling employment impacts from policy actions, and the second part suggests ways of moving forward.

Current Issues in Estimating Employment Impacts from Energy and Environmental Policy

Does a focus on jobs miss the larger picture?

Employment impacts are what economists sometimes refer to as indirect effects—that is, they arise from policies whose primary purpose is to correct a specific perceived problem in the economy that is unrelated to employment levels. In the case of market-based climate policy, such as a cap-and-trade program, the objective is to induce reductions in GHGs (notably carbon in the form of CO_2) that create climate risks, thereby causing a change in the relative prices of fuels with varying carbon intensities, and substitution to lower-carbon sources and technologies. These indirect effects can be difficult to model, and are typically accompanied by a high degree of uncertainty. Moreover, many of the workshop participants expressed concern that a "myopic" focus on employment impacts of the kind we see dominating the current debate on climate and energy policy fails to reveal whether the net social benefits of a policy make it worth pursuing.

That said, with current U.S. employment rates hovering around 10%, and most economic forecasters predicting a slow recovery, demand for policy-induced employment estimates will continue. The focus for those in the modeling community should be on filling that demand with studies that exhibit as much analytical rigor and transparency as possible. One speaker, after noting the reluctance with which many modelers approach the modeling and reporting of jobs-impact estimates in the context of energy and environmental legislation, argued that while there are important outcomes not captured in jobs impacts—environmental protection being at the top of the list—jobs are an important indicator of welfare. Economists should therefore be concerned with providing as clear and rigorously developed information on employment impacts as possible with available models,

1 Schneck and Murray are, respectively, Research Associate and Director for Economic Analysis at the Nicholas Institute for Environmental Policy Solutions; Gumerman is Co-Director of the Nicholas Institute's Climate Change Policy Partnership; and Tegen is a Senior Energy Analyst at the National Renewable Energy Laboratory.

2 The workshop was developed under the direction of Brian Murray, Etan Gumerman, and Josh Schneck of the Nicholas Institute, with guidance from a committee of experts, which included Suzanne Tegen of the National Renewable Energy Laboratory, Reid Harvey of the U.S. Environmental Protection Agency, Joseph Kile of the Congressional Budget Office, Dominick Mancini of the White House Office of Management and Budget, and Edward Chu of the White House Council on Environmental Quality. Additional information about the event, speakers, and studies discussed can be found at http://nicholasinstitute.duke.edu/envenergy.

while communicating the caveats and limitations of these estimates.

Do policies "create," "destroy," or shift jobs?

A key issue raised at the workshop was the ease with which jobs-impact numbers may be mischaracterized. A simple estimate of jobs "created," "destroyed," or "lost" may fail to capture labor movements within the economy that are spurred by the policy. For instance, a carbon-pricing policy that imposes costs on "high-carbon" or energy-intensive sectors could, under some circumstances, reduce employment in those sectors but increase employment in "low-carbon" sectors, such as renewable energy and energy efficiency goods and services, and the supply chains that support them. Purposefully or not, studies often only examine part of the story by focusing on the subset of sectors where employment increases can be expected (gainers) or those where employment losses will be expected (losers).

Most of the workshop participants agreed that whatever the short- and mid-term employment impacts from energy and environmental policy may be, the economy can be expected to return to full employment in the long term. In other words, these kinds of policies do not exert much influence over long-term employment levels (macroeconomic factors such as monetary, fiscal, tax, and labor policies all are more significant drivers). Participants differed, however, in their estimations of near-term employment impacts[3] driven in part by differences in the speed at which they assume wages are able to adjust to changes in worker productivity that are tied to real increases in the cost of energy,[4] and the level of clean energy investment spending expected to be triggered in response to climate and energy policy. Additionally, while there was consensus among panelists and many participants that employment impacts from energy and environmental policy are sensitive to where we assume the economy to be in terms of full employment, modelers differed on the extent to which they incorporated recent projections of near- and mid-term employment levels in their modeling.

It should be noted that, relative to total employment, most studies predicting employment impacts from energy and environmental policy show very modest changes in employment levels; in some cases, these changes are imperceptible because of the inherent uncertainties in modeling assumptions. At the same time, some participants raised the issue that while the nation's overall employment numbers do not vary much under different scenarios, differences in the types of jobs found in regional and local economies can lead to disproportionate policy impacts that need to be considered and accounted for.

Challenges with defining appropriate jobs measures

The term "jobs" may not adequately capture important features of employment, such as part-time work or changes in total wages. The benefits of looking at alternative measures such as job-hours or the wage bill, or reporting numbers as full-time equivalent jobs were put forth, along with the recommendation that more information on the kinds of jobs created or lost should be provided when possible. Participants also noted the confusion surrounding reporting of jobs numbers that fail to distinguish between net versus gross job creation or loss (see previous point). It was suggested that all parties in the information supply chain, from modelers to policymakers to advocacy groups and the media, could do a better job at helping clarify this critical difference.

"Green jobs" is an evocative term heard frequently in climate and energy debates, but the use of this term raises as many questions as it answers. One of the session speakers presented an overview of the current Bureau of Labor Statistics (BLS) initiative to measure employment in the green economy, highlighting some of the difficulties encountered in attempting to characterize indirect and induced jobs that are linked to clean energy investments and activities but which are not commonly thought of as "green" jobs. Among workshop participants there was broad agreement that many of the jobs created in a transition to a clean energy economy will be in occupations and sectors familiar to workers today, such as in the construction and service industries. Therefore, the real benefit of measuring green jobs may be in judging the progress towards transitioning to a clean-energy economy, rather than in any attempt to characterize and estimate the number of jobs generated by energy and environmental policy.

3 Cross-study comparisons of studies, including those presented by the panelists, can be problematic, stemming from the fact that existing studies rarely assess the same policy instrument. As an indication of the range of employment impacts discussed at the workshop, a study by the consulting firm Charles River Associates, looking at the American Clean Energy and Security Act of 2009, predicted a net loss of 1.5 million jobs in 2015, increasing to 2.2 million in 2030. A study by the Peterson Institute for International Economics assessing the American Power Act predicted an average annual net gain of 203,000 jobs in the first decade of the policy, after which employment returns to a business-as-usual trajectory. All of the studies presented can be accessed at http://nicholasinstitute.duke.edu/envenergy.

4 Traditional measures of worker productivity exclude environmental externalities, such as the production of GHGs. While addressing environmental market failures is of course the objective of energy and environmental policy, because environmental quality is not paid for in traditional markets (meaning improvements in environmental quality are unrewarded), the traditional measure of worker productivity will be what affects employment numbers in the near term.

Modeling employment effects – What is state of the art?

Several workshop participants spoke of a profound disconnect between the kinds of predictions and estimations that policymakers and the public are most interested in—namely, short- to mid-term and localized employment effects in absolute numbers—and what existing models are well equipped to provide. As one speaker noted, "One thing that emerges from the discussion today is that we just don't understand short-run dynamics very well. That's not an indictment of the studies presented today. Economics doesn't understand short-run dynamics; we don't have a good theory for transitions. That's especially true for very complex issues and policy like what we're dealing with here. So thinking about this transition is an important challenge that needs to be addressed going forward."

Estimates of employment impacts can be generated by input-output (IO), or "multiplier," models, which simulate the output and employment effects of a shock to the economy. Often focused on local or regional economies, such a shock might be from external factors, such as the decision to locate a new plant or infrastructure within the region. These models can be built on very detailed accounting of cross-sector economic flows, which allows one to trace output and employment effects "rippling" through the economy. This can provide a sense of how wide-ranging such impacts can be. However, these estimates are often based on fixed multiplier effects; for instance, 1 million dollars of expenditure will create X amount of output and Y amount of employment. Such a static characterization can fail to capture important dynamics such as price and wage adjustments in output and labor markets and the distinction between short-term employment (e.g., construction of a wind farm) and long-term employment (operating the wind farm). This can lead to over- or under-estimates of actual employment effects if jobs are not expressed in job-years or full-time equivalents.

Another common modeling approach, computable general equilibrium (CGE), addresses these concerns by ensuring that all relevant markets (output and labor, capital, energy, and materials inputs) clear—meaning supply equals demand and prices adjust accordingly. This addresses some of the dynamic feedback effects missing in many multiplier models, but often does so by highly aggregating sectors and regions to make the models more manageable. So theoretic consistency may come at the cost of less model detail. Following are areas where it was suggested that CGE modeling approaches can be improved:

- Incorporating enough detail in the energy sector to accurately capture the change in investment flows that may be triggered by energy and environmental policy
- Capturing the effects of job dislocations and regional shifts in employment
- Accounting for market failures, particularly in the area of energy efficiency, where it has been suggested that investments in energy efficiency may free up capital for more productive uses elsewhere in the economy
- Capturing the extent to which energy and environmental legislation may change the long-term trade account position of the U.S. through both a decrease in oil imports (usually captured in current models) and an increase in clean energy exports (usually excluded from current models)
- Capturing the potential for positive innovation externalities
- Capturing economic ramifications of climate change impacts (via connection to global circulation and biophysical process models) and other pollution impacts as well
- Adding the ability to represent the economy in times of relatively high unemployment (not full employment)

Certain CGE models already capture some of these features or could modify assumptions (such as exogenous improvements in energy efficiency) in order to do so.

Use of models and results

It was suggested that both modelers and their audiences (stakeholders and policymakers) have been guilty of expressing false confidence in the reporting and use of jobs estimates. Uncertainties are frequently downplayed or ignored, and key assumptions are often hidden or presented in a way that fails to explain the degree of influence these assumptions have on modeling output. Many of the modelers and economists at the workshop emphasized that the real benefit in doing modeling of environmental and energy policy is to identify least-cost policy paths, and not to predict absolute effects on economic output or employment levels. As one participant noted, "These models are like a compass, not a GPS system. However, people mistakenly try to use them like a GPS."

One area of widespread agreement among workshop participants was on the issue of baselines, which are themselves predictions of economic activity and subject to a level of uncertainty that is both difficult to ascertain and frequently ignored. Employment impacts are typically measured in reference to a baseline, and therefore the choice of a baseline and how it is presented within a study is critical to how those impacts are understood.

Moreover, most of the baselines used in employment-impact modeling fail to incorporate climate change impacts or the future presence of EPA regulations on GHG emissions.

Workshop Recommendations Going Forward

With the aim of improving the estimation, reporting, and use of employment impacts from climate and energy policy, we submit the following modeling recommendations going forward, based on contributions from all workshop participants:

- Highlight key assumptions, uncertainties, and caveats upfront and in a way that clearly explains to reader the significance of these assumptions on modeling output, including through the use of sensitivity analysis.
- Where baselines are used to estimate employment impacts, highlight assumptions and uncertainties and limitations. In particular, clarify whether the model assumes full employment or sustained unemployment, or stays silent on this issue.
- Always state whether results are in net or gross impacts, and if using a jobs metric, how jobs are defined.
- Provide context on the relative scale of effects, and when possible, guidance on the proper usage of modeling output.
- Qualitative conclusions are a valuable but often downplayed component of jobs-impact analyses. As one speaker noted, "If we think the best estimate of this policy on net GDP is zero, let's say it, and make it a top-line point."
- Highlight whether a complete policy proposal is being modeled or if key provisions, such as revenue recycling or cost mitigation tools, are left out.
- Studies that provide insight into how a policy may be improved, as opposed to offering only an overall evaluation, are more useful from a policymaker's perspective.
- Challenge colleagues and other researchers to more thoroughly explain their results and justify their assumptions.
- There is a need to develop tools and theory that do a better job at capturing short- and mid-term job dynamics than what current models are able to provide.

Workshop Attendees

Joe Aldy, Executive Office of the President
Ignatius Anyanwu, U.S. Department of Energy
Bruce Arnold, Congressional Budget Office
Paul Baer, Georgia Institute of Technology
Alex Barron, Energy and Commerce Committee
Trent Bauserman, Office of Senator Shaheen
Joel Beauvais, House Energy and Commerce Committee
Jonathan Black, Senate Committee on Energy and Natural Resources
Jason Bordoff, White House Council on Environmental Quality
Suzanne Brookes, Environmental Defense Fund
Neil Brown, Office of Senator Lugar
Dallas Burtraw, Resources for the Future
Richard Clayton, Bureau of Labor Statistics
Jared Creason, U.S. Environmental Protection Agency
Francisco de la Chesnaye, Electric Power Research Institute
Terry Dinan, Congressional Budget Office
Neal Elliot, American Council for an Energy-Efficient Economy
Ron Evans, U.S. Environmental Protection Agency
Allen Fawcett, U.S. Environmental Protection Agency
Ann Ferris, White House Council on Environmental Quality
Kathleen Frangione, Office of Senator Kerry
Alexander Golub, Environmental Defense Fund
Less Goudarzi, OnLocation, Inc.
Howard Gruenspecht, Energy Information Administration
Etan Gumerman, Nicholas Institute
Daniel Hall, U.S. Department of the Treasury
Reid Harvey, U.S. Environmental Protection Agency
Stephen Hendrickson, U.S. Department of Energy
Brendan Hill, Pew Charitable Trusts
Mun Ho, Resources for the Future
Sam Hodas, Third Way
Trevor Housor, Peterson Institute for International Economics
Nancy Kelly, Nicholas Institute
Kevin Kennedy, California Air Resources Board
Nat Keohane, Environmental Defense Fund
Joseph Kile, Congressional Budget Office
Alan Krupnick, Resources for the Future
Kevin Leahy, Duke Energy
Amanda Lee, White House Office of Management and Budget
Linda Levine, Congressional Research Service
Arik Levinson, White House Council of Economic Advisers
Laura Lightbody, Pew Charitable Trusts
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Jeremy Mark, U.S. Department of Energy
Alex Martin, U.S. Environmental Protection Agency
Bryan Mignone, U.S. Department of Energy
Beth Moore, U.S. Department of Energy
Adele Morris, Brookings Institution
Brian Murray, Nicholas Institute
Phil Ovitt, NRG Energy
Shana Patadia, Nicholas School of the Environment, Duke University
Robert Pollin, University of Massachusetts–Amherst
Tim Profeta, Nicholas Institute
Matthew Rensler, U.S. Department of Energy
Jackie Roberts, Environmental Defense Fund
Martin Ross, RTI International
Josh Schneck, Nicholas Institute
Amber Sharick, National Renewable Energy Laboratory
Michael Shelby, U.S. Environmental Protection Agency
Anne Smith, Charles River Associates
Suzanne Tegen, National Renewable Energy Laboratory
Alison Williams, U.S. Department of Energy
Ann Wolverton, U.S. Environmental Protection Agency

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