Green Jobs and Lost Jobs:
Implications of the Renewable Energy Transition for U.S. Workers

E. Mark Curtis (Wake Forest University)
Ioana Marinescu (University of Pennsylvania, NBER)

The paper we propose is part of a larger project which seeks to first, estimate the jobs multiplier of renewable energy projects and second, understand the distributional effects of these projects across workers of different regions and backgrounds. Our initial efforts to answer these questions have uncovered new facts about green and renewable jobs in the United States that we believe merit a separate and more descriptive paper. The mostly descriptive analysis we propose sheds light on key questions that policy makers must navigate as the United States transitions to a future of renewable energy. Specifically, we ask the following: how many jobs in the US economy are tied to renewable energy? What are the characteristics of these renewable energy jobs? Where are these jobs located and what skills do they require? Will workers affected by recent declines in manufacturing and other "dirty" industries be able to benefit from new jobs in renewable sector?

The importance of this topic to current policy debates is difficult to overstate. Communities and the politicians that represent them will not support climate change policies unless it can be clearly demonstrated that renewable jobs exist and can benefit their communities. Our paper will allow policy makers to understand who will win and who will lose under the transition to a greener economy and how legislation can be written to support vulnerable communities. Research on these questions is extremely limited and has struggled to precisely identify new jobs in the renewable sector. Most research has focused on effects of job losses in regulated sectors of the economy rather than the effects of job gains in the growing renewable sector.[1] We will provide some of the first estimates of the winners of this transition and demonstrate which communities and workers are poised to gain and which may be left behind.

To answer these questions, we obtain detailed microdata from Burning Glass, which provides the near-universe of online job postings in the United States. By performing word searches on every online job posting since 2010, we are able to identify jobs as being "renewable" or "green"

[1] See Greenstone (2002) and Walker (2013) for examples.

based on the tasks that the worker is expected to perform as well as the job title.[2] Previous efforts to identify green and renewable jobs have been hampered by reliance on publicly available employment data whose industry and occupation definitions lack sufficient detail to identify jobs that are directly tied to renewable energy. The data allows to document a dramatic increase in the prevalence of renewable energy jobs across a wide range of occupations, industries and regions.

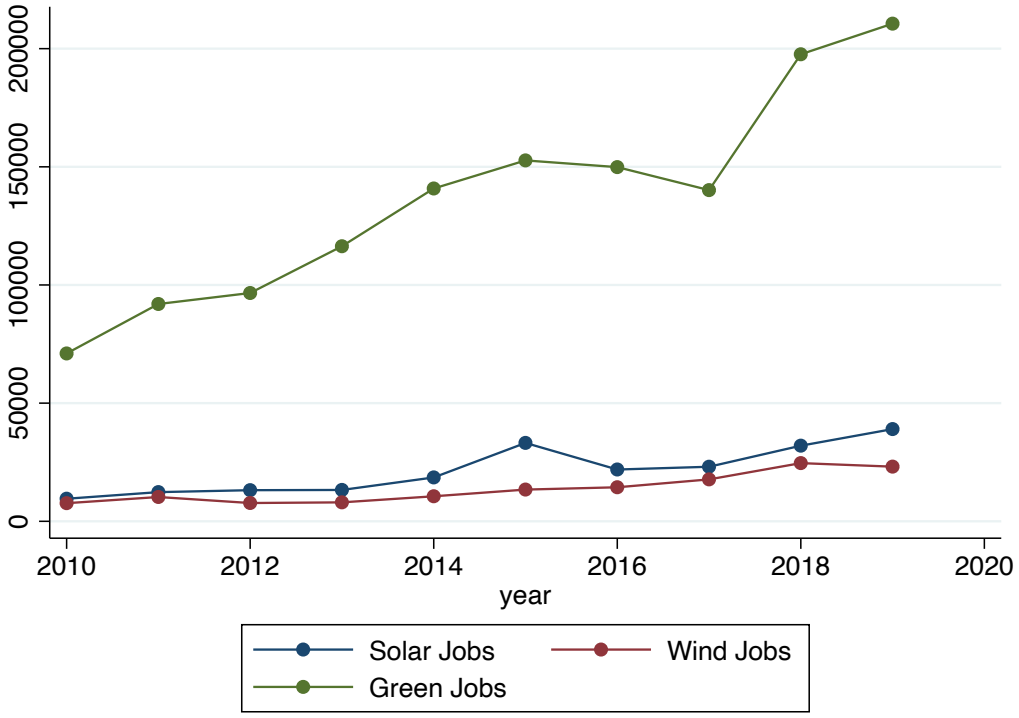
The primary results of the paper are as follows. As mentioned above, we first document a dramatic increase in the number of jobs tied to the renewable sector. Figure 1 below presents increases in solar, wind and a broader category we define as "green" that includes all renewable jobs. While renewable job growth is occurring across regions and occupations, that growth is not uniform. Contrary to what many have hoped, we show that workers in declining regions and industries are not currently well-situated to benefit from these new jobs. Renewable jobs in solar, for example, are primarily located in regions suitable for renewable energy production such as the south and southwest. The rust belt, on the other hand, has seen very little exposure to renewable jobs. This is observed in Figure 2 which plots the correlation between a commuting zone's manufacturing employment share in 2000 and the log of their 2010-2019 renewable job share. After identifying renewable jobs, we can then observe the skill requirements listed in these job vacancies. With some exceptions, we find only modest overlap between renewable job skills and those in manufacturing and other traditionally "dirty" industries such as fossil fuel extraction. Renewable jobs are shown to require higher levels of education and are spread among a wider variety of occupations than are present in the manufacturing and fossil fuel sectors.

Overall, the data suggest a limited ability of vulnerable workers to transition to and benefit from renewable jobs. However, we identify particular regions and occupations where declines in manufacturing and "dirty" jobs have been offset with increases in renewable jobs. We offer thoughts on the lessons policy makers can take from the successes of these areas that may assist future decision making on government subsidies to renewable energy.

[2] Our word search methodology follows closely that of Autor et al (2021) who use the same Burning Glass job posting data to identify jobs in artificial intelligence. Our preferred algorithm identifies renewable jobs according to the tasks the worker is expected to perform, the job title and the hiring firm. We continue to refine the specific set of words we use to identify these jobs but are confident in our initial results.

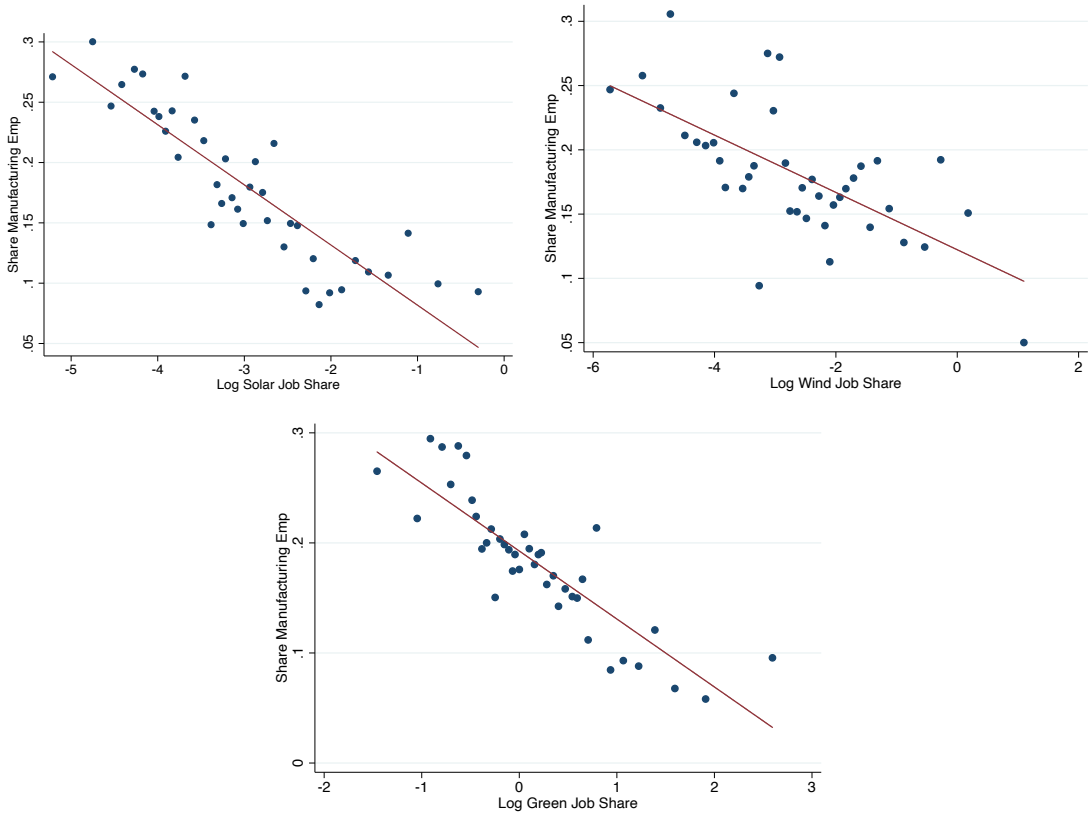
The primary contribution of our paper is to document the growth of renewable jobs, identify where they are located and the types of workers that are filling them. Our use of job posting microdata allows us to provide insights into renewable jobs and their characteristics that had not previously been possible to obtain. The results suggest that new renewable sector will offer many new job opportunities for US workers, but the benefits of these new jobs may not accrue to vulnerable communities affected by secular declines in the manufacturing and fossil fuel sectors.

Figure 1: Renewable Energy Jobs



Note: This blue and red lines plot the number of job postings which mention solar and wind terms in the job tasks. The "Green" category broadens the definition to include and renewable energy task and includes all wind and solar jobs. Each of these definitions will only capture jobs that list a solar, wind or renewable task and as such will undercount the number of jobs tied to renewable energy.

Figure 2: Renewable Job Share (2010-202) and 2000 Manufacturing Share



Note: Above are bin scatter plots demonstrating the correlation between a commuting zone's manufacturing employment share in 2000 and the log of the 2010-2020 renewable job share. There is a strong negative correlation between a commuting zone's number of renewable jobs and their historical manufacturing employment share.