



Analysis

Environmental Jobs and Growth in the United States

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ABSTRACT

Green growth is increasingly being seen as a means of simultaneously meeting current and future climate change obligations and reducing unemployment. This paper uses detailed industry-level data from the Bureau of Labor Statistic's Green Goods and Services survey to examine how the provision of so-called green goods and services has affected various aspects of the US economy. Our descriptive results reveal that those states and industries that were relatively green in 2010 became even greener in 2011. To investigate further we include green goods and services in a production function. The results show that between 2010 and 2011 industries that have increased their share of green employment have reduced their productivity although this negative correlation was only for the manufacture of green goods and not for the supply of green services. In further analysis we investigate skill-technology complementarities in the production of green goods and services and show that industries that increased their provision of green goods and services grew more slowly, reduced their expenditure on technology inputs and increased their demand for medium educated workers, whilst simultaneously reducing their demand for lower skilled workers.

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1. Introduction

Green growth is increasingly being seen by policymakers as the solution to problems of high unemployment and as a way to boost economic growth following the sluggish recovery from the 2007 financial crisis.¹ Green growth has the added benefit that it provides a means for governments to meet current and future climate change obligations. Such optimism comes from the widespread belief among academics and policymakers that the greening of the economy, coupled with technological innovation, can be a long-term driver of sustainable economic growth. As a result, governments around the world are attempting to implement policies to encourage a green recovery supported by institutions such as the OECD (2011) who argue that there is significant job creation potential from investment in green activities. Examples of pro-green growth policies for the US include the 2007 United States Green Jobs Act that pledged \$125 million to establish job training programs to promote growth in green industries and the 2009 American Recovery and Reinvestment Act

(ARRA) that included provisions for new jobs in key renewable energy industries with a focus on energy efficiency and more environmentally friendly practices. The commitment of the US government in demonstrated by the pledge by President Obama in his recent election campaign to invest \$15 billion a year in renewable energy over the next decade with the aim of "...creating five million new green jobs that pay well, can't be outsourced and help end our dependence of foreign oil". Pollin et al. (2008) argue that a \$100bn US fiscal stimulus spent on renewable energy related strategies could create two million jobs in directly and indirectly affected sectors. According to the Bureau of Labor Statistics (BLS), green employment accounted for 3.1 million jobs or 2.4% of total employment in 2010 and 3.4 million jobs or 2.6% of total US employment in 2011.²

The motivation of this paper is to provide an insight into the potential impact on US growth from the creation of new so-called green jobs sectorally and geographically such that our results may inform the debate on the use of future green stimulus plans. Our analysis uses a unique

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¹ We acknowledge that our use of the terms "green growth", "green jobs" and "greening of the economy" could be considered part of the green rhetoric used in mainstream economics. In reality there is considerable debate surrounding the legitimacy of these concepts especially among ecological economists. For example, Czech (2008, 2013) discuss the relationship between economic growth and the environment using principles of ecology such as competitive exclusion and trophic levels. Czech (2013, pg. 196) states that "Green growth" is one of the slipperiest shibboleths in recent memory. It's an oxymoron to rival "jumbo shrimp" and "old news".

² Key initiatives related to the greening of the economy at both the state and federal level are derived from energy policy and energy efficiency (International Labour Organization, 2011). In recent years the US government has made considerable investment in renewables (wind, solar, bio-fuels and thermal) and the energy efficiency sector (green construction and public transport). The Green Jobs Act of 2007 was "... to help address job shortages that are impairing growth in green industries, such as energy efficient buildings and construction, renewable electric power, energy efficient vehicles, and bio-fuels development." The Green Jobs Act was later extended by the ARRA. Appendix A provides a brief summary of recent US environmental policy. In Europe, the European Commission (2007) pointed to a change in energy policy stating in its "An energy policy for Europe" communication that "combating climate change, limiting the EU's external vulnerability to imported hydrocarbons, and promoting growth and jobs".

dataset collected by the Bureau of Labor Statistics (2012a, 2012b) which surveys industries thought to contain workers that produce green goods and services. Using this data we examine how changes in the provision of green goods and services across US states and industries influenced key aspects of the US economy. An important element of the survey is the care taken to accurately define what constitutes a job that provides green goods and services.³

More specifically, the contribution of this paper is three-fold. First, we consider recent changes in worker and capital inputs for industries that have a relatively high share of green goods and service provision. Second, we estimate a production function to examine whether productivity growth differs according to the relative greenness of an industry. Third, we use cost share equations to examine potential skill-technology complementarities in production in order to get a better understanding of the skill level of labor that is required to maximise economic growth from future investment in green technologies. It should be noted that 2010 and 2011 represent a period of sluggish growth and high unemployment in the US although this time also marks the beginnings of a nascent recovery in the housing and construction industry (following the official end of the recession in June 2009). Our results, although they have a causal dimension, should really be considered to be correlations as it is difficult to draw rigorous inference from the results given the limited time dimension.⁴

To briefly summarise our results, we find that between 2010 and 2011 relatively green intensive industries become even greener. The research closest to our own in this regard is Pollack (2012) who shows that relatively green industries grew faster between 2000 and 2010 and had a larger increase in the share of workers without a college degree. However, as we show later, these results were largely driven by a limited number of relatively small industries. Including data for 2011 also allows us consider some rudimentary dynamics. When we included green goods and services into a production function we find that within industries there is a negative correlation between productivity growth and green employment intensity. We also find that industries that increased their technology inputs and grew relatively faster overall, have at the same time grown more slowly in terms of their production of green goods and services. Our findings broadly support the results of Becker and Shadbegian (2008, 2009) who examine environmental product manufactures (EPMs) and find that EPM establishments did not perform differently in terms of wage, employment, output and exports than non-EPM plants.⁵ Finally, we find industries that were green intensive in 2010 increased the quantity of workers demanded from the middle of the skill distribution at the same time as they reduced the quantity demanded for lower skilled workers which also supports the results of Becker and Shadbegian (2008) who find that the one significant difference between EPM and non-EPM plants is fewer production workers (but not higher wages for those remaining).

The remainder of the paper is organized as follows. Section 2 provides a brief background to the broader green jobs literature. Section 3 describes the BLS Green Goods and Services Survey data and explains how we merged these data with data on employment and productivity growth to permit an examination of correlations in the raw data which are presented in Section 4. Sections 5 and 6 provide estimates for

industry level production functions and potential skill-technology complementarities, respectively. The final section concludes.

2. Literature Review

There is considerable debate on the effectiveness of green growth policies. In this section we briefly outline the key arguments and discuss the main issues of contention with the existing literature that this paper contributes. Note that although important, our review abstracts from the wider debate on the conflict between economic growth and environmental protection with a simplistic view of technical progress often being highlighted as the way to reconcile economic growth and biodiversity conservation (Weizsäcker et al., 1997).⁶

Hence, abstracting from the caveat raised above, at a general level there is a growing literature that considers the employment consequences of expanding the proportion of renewables in the energy mix. For example, Kammen et al. (2004) finds that the renewable energy sector generates more jobs than the fossil fuel-based energy sector due, in part, to the fact that the renewable energy sector is more labor intensive. Wei et al. (2010) review a number of studies that estimate employment effects from the promotion of various green technology policies and finds generally positive results. The German Ministry of the Environment (2006) concludes that the net job effect of investments in renewables in Germany was a clear and sustainable positive employment stimulus. There have also been a limited number of studies on the job creation effect of green policies in developing countries. For example, Barbier (2009) studies South Korea, Schwartz et al. (2009) examine various Latin American countries, Rutovitz (2010) looks at South Africa whilst Upadhyay and Pahuja (2010) examine the case for India. Fankhauser et al. (2008) discusses the green jobs debate within the context of time horizons (also conceptualised by Deschenes, 2013) and argues that in the short term jobs may be lost in adversely affected sectors, in the medium term there will be jobs created and destroyed and in the long-term learning-by-doing should increase labor productivity from the promotion of green technologies.⁷

Other notable studies include Bowen (2012) who provides a detailed survey of the empirical literature and Bowen and Stern (2010) who discuss environmental policy in the context of the current economic downturn. Perhaps one of the more interesting recent studies is Becker and Shadbegian (2008, 2009) who examine the characteristics and economic performance of green industries using establishment level data and look at the performance of environmental product manufactures (EPMs). For this study they use the 1995 Survey of Environmental Products and Services linked to the Annual Survey of Manufactures and the Census of Manufactures. Interestingly, Becker and Shadbegian (2009) do not find any evidence that EPMs performed any better than the average non-EPM in

³ Research of this type was most recently encouraged by Deschenes (2013) who suggests that “More careful and detailed empirical research is needed to assess the job creation potential of green policies.”

⁴ Unfortunately, the data mean we are not been able to identify whether relative changes in output and employment are a result of predominantly supply-side or demand-side factors (e.g. technological and regulatory changes would be expected to change supply whilst fiscal stimulus on green goods and services would be expected to increase their price).

⁵ Environmental product manufactures in the context of this paper is defined by a US government in their 1995 Survey of Environmental Products and Services (SEPS). As quoted in Becker and Shadbegian (2009) the environmental sector is defined as “the manufacture of products, performance of services and the construction of projects used, or that potentially could be used, for measuring, preventing, limiting, of correcting damage to air, water or soil.”

⁶ For a discussion of the linguistics of use terms used in the ecological literature see Czech (2008). For example, “reconcile” suggests that technological progress can “maybe lessen” the impact of economic growth on biodiversity but not reverse it (with the use of the word maybe to allow for the uncertainty). Moreover, Czech (2013) suggests replacing the word “green” in the context of this paper with “brown” so instead of “green growth” we have “brown bloating”.

⁷ Berek and Hoffmann (2002) assess the employment impacts of environmental and natural resource policy and suggest five basic approaches to evaluating the effect of a policy action on employment. A related literature examines the employment effects of environmental regulation/protection where some studies find job losses (Henderson, 1996, Kahn, 1997, Greenstone, 2002), others find virtually no employment effects (Berman and Bui, 2001; Morgenstern et al., 2002 and Cole and Elliott, 2007) while Bezdek et al. (2008) look at six states in the US and find a large positive jobs effects of environmental protection. More recently, Gray et al. (2011) examine whether EPA regulations affect labor demand in the pulp and paper industry whilst Walker (2012) examines how environmental regulations impact labor reallocation. A further strand of the literature considers compositional labor market effects. Bird (2009) and Bird and Lawton (2009) in a UK study identify the occupations that are likely to grow as a consequence of the transition to a low carbon economy based on a detailed list of job titles that are predicted to grow in the “emerging low carbon” and “renewable energy” sectors defined by Innovas Solutions Ltd. (2009). From this they define 15 industries that are then regrouped into five key growth sectors: Utilities; Construction; Manufacturing; Retail and Wholesale; and Business and Financial Services. They then use the 2008 Labour Force Survey (LFS) to analyse the pay, gender, occupational and qualification structure of these sectors.

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