



# EPI BRIEFING PAPER

ECONOMIC POLICY INSTITUTE • OCTOBER 9, 2012 • BRIEFING PAPER #349

## COUNTING UP TO GREEN

### Assessing the green economy and its implications for growth and equity

BY ETHAN POLLACK

**W**hat is a green job? We tend to think of a green job as one that benefits the environment, but illustrations tend to be limited to fossil fuels vs. renewable energy. In fact, whether to categorize a specific occupation as a green job is not always straightforward: what about bus drivers, or software engineers who help design smart-grid technologies, or commercial construction workers? The economy is made up of more than coal miners and solar panel installers, and many occupations have significant roles to play along the spectrum between the fossil fuel economy and a “clean” economy. Without a definition of what green jobs are it is difficult to count them, much less determine what role green jobs and industries play in the economy today and going forward.

The Brookings Institution and the Pew Center on the States have both attempted to answer these questions, releasing reports that categorize green jobs on a detailed industry and occupational level. And in March 2012, the Bureau of Labor Statistics (BLS) weighed in on this debate with a detailed survey of the green economy that

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defines green jobs, identifies the establishments producing green goods and services, and estimates the number of jobs involved (BLS 2012c). Surprisingly, this survey has received little attention aside from the occasional partisan attack. But the data itself are fascinating, providing a starting point for evaluating the green economy. Moreover, matching these data with existing BLS data on employment trends yields several intriguing findings:

- *Greener industries grow faster than the overall economy.* For every percentage-point increase in an industry's green intensity (the share of employment in green jobs), annual employment growth was 0.034 percentage points higher. Projections for the next 10 years suggest continued jobs benefits from green intensity.
- *States with greater green intensity have generally fared better in the current economic downturn.*
- *Green jobs are accessible to workers without a college degree.* For every one percentage-point increase in green intensity in a given industry, there was a corresponding 0.28 percentage-point increase in the share of jobs in that industry held by workers without a four-year college degree.
- *Manufacturing plays a strong role in the green economy.* Although it represents only 10.8 percent of total private employment, manufacturing accounts for 20.4 percent of green jobs.
- *Green jobs go beyond the renewable energy industry.* For example, nearly 50 percent of jobs in the water industry are green jobs, and the sector has opportunity to grow not just overall but in green intensity.

These findings suggest that investments in the green economy could accomplish multiple goals beyond simply creating a more sustainable economy. First, the strong economic performance of green industries suggests that green investments could play an important role in a broader short- and long-term job creation strategy. Second, investments in green jobs could promote economic mobility by opening up the labor market to more

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workers without a college degree. And finally, the investment opportunities for going green are vast throughout nearly all industries.

This report is divided into three sections. The first provides background on the data and definitional issues surrounding green jobs, explores some of the limitations of the BLS definition, and compares it to green job definitions used by other organizations. The second section explores the data from the BLS Green Goods and Services Survey by sector and state. The final section merges the detailed industry and state data with other BLS data on job growth and educational attainment to assess the quantitative and qualitative opportunities of green investment.

## What color is your job?

The Bureau of Labor Statistics is one of the federal government's foremost statistical agencies. In fiscal year 2010, Congress appropriated \$7.8 million to BLS to develop an analytically valid definition of green jobs and to collect information about these jobs: the number and trend of green jobs over time; the industrial, occupational, and geographic distribution of the jobs; and the wages of the workers in these jobs.

Developing a definition of green jobs was the necessary first step. After reviewing a range of studies, BLS solicited comments on a draft definition and, consistent with that definition, a list of industry sectors (drawn from the North American Industrial Classification System, or NAICS) in which green goods or services are produced. After incorporating that feedback—the largest number of comments came from business and industry associations—BLS released its final definition and list of green goods and services industries in September 2010 (BLS 2012a).

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According to the BLS definition, green jobs are either:

- jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources, or
- jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or ensuring that they use fewer natural resources.

These two approaches to measuring green jobs combine an output approach (the first definition) and a process approach (the second definition). In the output approach, jobs are green to the extent that they are in businesses that produce green goods or services and fall into one or more of five categories:

1. Energy from renewable sources.
2. Energy-efficiency equipment, appliances, buildings and vehicles, and goods and services that improve the energy efficiency of buildings and the efficiency of energy storage and distribution.
3. Pollution reduction and removal, greenhouse gas reduction, and recycling and reuse.
4. Organic agriculture; sustainable forestry; and soil, water, and wildlife conservation.
5. Government and regulatory administration; and education, training, and advocacy related to green technologies and practices.

Green employment data corresponding to these definitions are derived from surveying a sample of approximately 120,000 worksites of businesses classified by BLS among industry sectors producing green goods or providing green services (i.e., industries meeting the output approach). The final list of industries that produce green goods or services includes 333 of the 1,193 industries classified in the NAICS.<sup>1</sup> It does not include industries in which businesses generally receive less than half of their revenue from green goods or services. Therefore, BLS did not include businesses in these industries in its survey, and

green jobs in those industries are not included in the total count of 3.1 million green jobs.

In the process approach, green jobs can be identified in any firm, regardless of the goods and services it produces and the industry sector in which it's classified. Workers in these jobs research, develop, maintain, or use technologies and practices that impact their establishment's ability to make progress in one or more of the first four categories identified above (energy from renewable sources, etc.).

The output approach data were released in March 2012, while the process approach data were released in late June 2012. This paper analyzes the dataset related to the output approach because its industry breakdown is more relevant to the issues of green intensity, employment growth, and education than the process approach dataset's occupational breakdown.

### ***Limitations of the BLS definitions and measures***

Despite the sizable number of green jobs reported by BLS, the output approach employment data (which this paper uses) do not represent the total number of green jobs in the U.S. economy. First, the scope of the survey covers only a portion of the nation's total employment; the BLS did not survey areas of the economy where it expected there to be few green jobs. Second, these data do not include a count of jobs involving *processes* that make a business greener, regardless of whether that firm provides green goods or services; as mentioned above, those data are contained in the separate survey released in June.

The BLS industry list also illustrates some of the limitations of the existing industrial classification system. Although NAICS was updated in 2012 to keep pace with the rapid growth of certain industries in the green economy, the green jobs data are based on the earlier 2007 NAICS classification, making measurement of the green economy a significant challenge.

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For example, jobs in the solar photovoltaic sector grew by 10.7 percent and jobs in the solar thermal sector grew by 18.4 percent between 2003 and 2010, according to the Brookings Institution (Muro, Rothwell, and Saha 2011). Unfortunately, that can't be verified with BLS data because the 2007 NAICS classification lumps solar into the same category with wind, geothermal, biomass, and other energy sources (the 2012 NAICS classification has since disaggregated these industries). Similarly, installation jobs for solar photovoltaics will be picked up by existing construction sectors (e.g., NAICS #238211, Residential Electrical Contractors, or #236200, Commercial Building Contractors).

The same typological confusion plays out in NAICS's failure to classify wind turbine manufacturers. The manufacture in the United States of wind turbine towers, blades, and component parts has grown dramatically over the last several years; the domestic content of U.S. wind turbines increased from just 25 percent (in value) prior to 2005 to 60 percent today. Correspondingly, the U.S.-based supply chain of manufacturers now consists of 400 facilities spread across 44 different states (American Wind Energy Association 2012). However, wind turbine manufacturing is not included as one of the several hundred manufacturing subsectors that receive NAICS classifications.

Despite such categorical limitations, most of the jobs associated with wind manufacturing were likely counted in the BLS survey as part of existing manufacturing sectors that are not labeled as such (e.g., NAICS # 333611, Turbine and Turbine Generator Set Units Manufacturing, or #333612, Speed Changer, Drive, and Gear manufacturing), as long as they produce specialized component parts for wind turbines and are in one of the BLS identified industry sectors.

Another reality of the green economy presents methodological challenges for researchers: The same business or worker can provide both green goods or services and goods or services that are decidedly not green. For example, a construction company and its workers can in

one month retrofit a hospital to make it more energy efficient and in the next month build a strip mall that meets no green building or energy efficiency standard. Is that construction company a green business? Analogously, is a manufacturer that produces parts for both pollution control scrubbers and weapons systems a green business?

BLS addresses the measurement challenge presented by such businesses by apportioning employment at firms producing both green and non-green outputs based on the share of revenue generated by those different economic activities.<sup>2</sup> In this manner, BLS avoids an either/or approach to measuring the green economy.

### ***Other definitions of green jobs***

The BLS definition is broadly consistent with a number of other definitions of green jobs and the green economy developed by researchers studying the green labor market and job trends at a national level. Differences in labeling this economy and the jobs within it can easily cause confusion. One analyst's "green" economy is another analyst's "clean energy" or simply "clean" economy. And yet, despite the variety in branding, the definitions used are broadly similar:

A clean energy economy generates jobs, businesses, and investments while expanding clean energy production, increasing energy efficiency, reducing greenhouse gas emissions, waste, and pollution, and conserving water and other natural resources. (Pew Charitable Trusts 2009)

The green economy encompasses the economic activity related to reducing the use of fossil fuels, decreasing pollution and greenhouse gas emissions, increasing the efficiency of energy usage, recycling materials, and developing and adopting renewable sources of energy. (National Center for O\*NET Development 2009)

The clean economy is economic activity—measured in terms of establishments and the

jobs associated with them—that produces green goods and services with an environmental benefit or adds value to such products using skills or technologies that are uniquely applied to those products. (Muro, Rothwell, and Saha 2011)

Differences in definitions do exist, however, most notably on the question of whether to count “process” jobs that make a business greener regardless of whether its output is green. The Brookings Institution researchers did not include such jobs in their definition, whereas BLS did. And yet, because this report only looks at the BLS data on “output” jobs, it corresponds very closely to the methodology used by Brookings in its analysis.

Because any definition of the green economy cuts across multiple industry sectors and many different kinds of economic activity, it is perhaps inevitable that disagreements remain about which sectors or subsectors are included or excluded. From our standpoint, BLS is if anything too conservative about which sectors it includes in its analysis. To cite one example, the BLS definition and industry list needlessly excludes a number of manufacturing sectors that are integral to value chains for renewable energy, energy efficiency, recycled products, and green chemistry. In sum, however, the choices made and methodology used by BLS in meeting the not-inconsiderable challenges of measuring the fast-emerging and dynamic green economy are fundamentally sound and consistent with mainstream economic analysis.

## The green jobs and industries of today

From the results of its first Green Goods and Services Survey BLS reported that in 2010 3.1 million jobs in the United States were associated with the production of green goods and services in businesses defined as producing goods or delivering services that benefit the environment or conserve natural resources.

## Private vs. public

The 3.1 million green jobs include 2.3 million jobs (73 percent) in the private sector, 157,000 jobs (5 percent) in the federal government, 227,000 jobs (7 percent) in state governments, and 476,000 jobs (15 percent) in local governments (see **Figure A**).

Generally, government jobs have a higher green intensity (share of jobs that are classified as green) than jobs in the private economy. While only 2.1 percent of private jobs are green, 5.3 percent of federal jobs, 4.9 percent of state jobs, and 3.4 percent of local jobs are classified as green (**Figure B**).

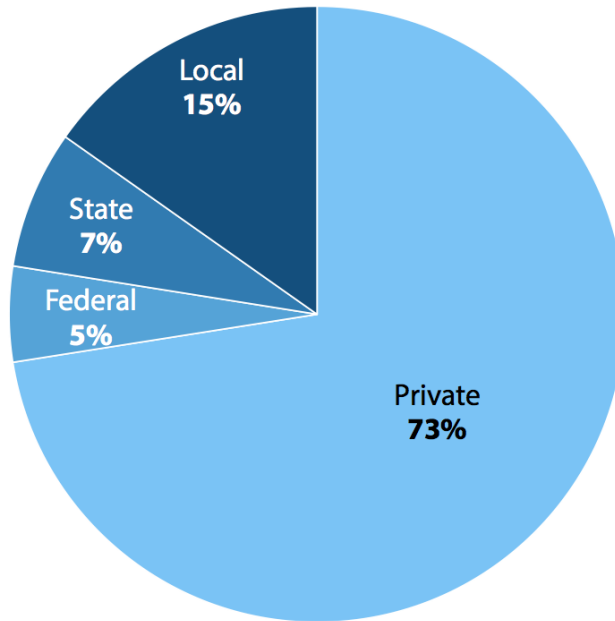
It is difficult to determine exactly what accounts for the differences in green intensity because much of the green jobs data by industry within the public sector are not available due to BLS disclosure standards (likely because the small sample sizes lead to overly large margins of error). Nonetheless, the information that is available suggests a few possible explanations.

The federal government’s 5.3 percent green intensity—over twice the green intensity of the private economy—appears to be driven by two factors. First, 82 percent of federal jobs are in public administration, which is three times as green as the private economy. Second, despite the fact that employment in utilities represents a smaller share of jobs in the federal government compared to the private sector, federal utilities jobs are nonetheless significantly greener: 74 percent green compared to 12 percent green for private utilities. This is likely due to the federal government’s significant role in hydropower—and to a lesser extent, nuclear—through its public utilities in the Pacific Northwest and the Tennessee Valley.

State government’s 4.9 percent green intensity also appears to be driven by its high share of public administration jobs, which represent over half of all state jobs. State jobs in the transportation and warehousing industry also play a role, being over six times as green as transportation and warehousing jobs in the private sector.

FIGURE A

Private- and public-sector share of total green jobs, 2010



Source: Author's analysis of Bureau of Labor Statistics Green Goods and Services Survey (BLS 2012c)

Overall, local government jobs are not as green as federal and state jobs, though still greener than the private sector. In contrast to the above examples, public administration jobs do not play a role in this: unlike their federal and state counterparts, local public administration jobs actually have a lower green intensity than the private economy average. The data are even spottier for local jobs than for federal and state jobs, but they suggest that administrative/waste services and transportation and warehousing jobs—both of which are significantly greener on the local level than they are in the private sector—contribute to local government's slightly higher overall green intensity than the private economy.

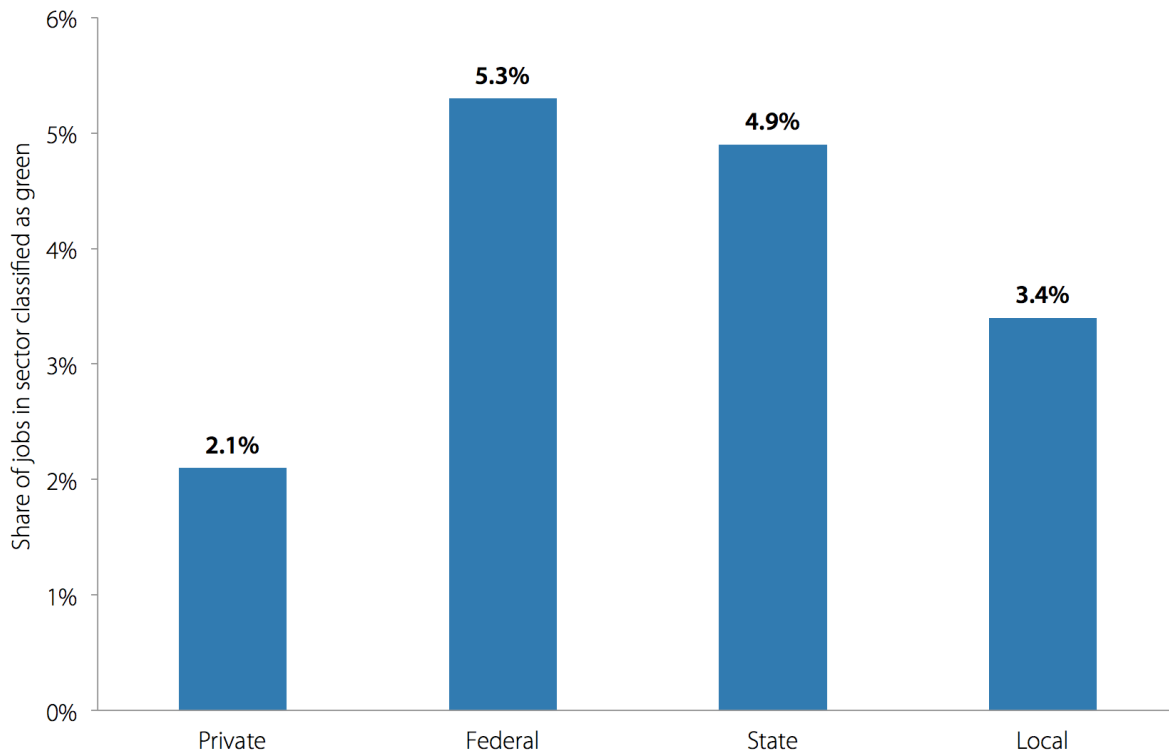
**Private sectors and industries—national analysis**

For the public sector, data on green jobs by industry are spotty and limited to large sectors like construction, utilities, and manufacturing, but the private sector data are much more comprehensive and detailed. This allows us to examine with much greater detail the types of green jobs in the private economy.

The manufacturing sector is the largest source of green jobs in the private economy, with 461,847 green jobs (Figure C). Following manufacturing is the construction sector with 372,077 green jobs; professional, scientific, and technical services with 349,024 green jobs; administrative and waste services with 319,915 green jobs; transportation and warehousing with 245,057 green jobs; and trade with 202,370 green jobs. Together, these sectors

FIGURE B

## Private and public green intensity, by sector, 2010



Source: Author's analysis of Bureau of Labor Statistics Green Goods and Services Survey (BLS 2012c)

comprise 86 percent of the private economy's green jobs (Figure D).

Manufacturing may be the largest source of green jobs for the private economy, but at 4 percent green jobs it has only the sixth-highest green intensity out of 14 private sectors. By contrast, 11.9 percent of the utilities sector, 6.8 percent of the construction sector, 6.2 percent of the transportation and warehousing sector, 4.7 percent of the professional, scientific, and technical services sector, and 4.3 percent of the administrative and waste services sector are green jobs (Figure E).

Comparing the raw green jobs numbers and green intensity (what share of a sector's total jobs are green) reveals interesting information about various sectors. Some sectors are both green intensive and large enough to provide a significant amount of green jobs to the economy; these sectors include construction; professional, scientific, and

technical services; administrative and waste services; and manufacturing. Other sectors are highly green intensive but relatively small, such as utilities and transportation and warehousing. The trade sector is unique in both being one of the larger sectors and having a low green intensity.

### Private sectors and industries—state analysis

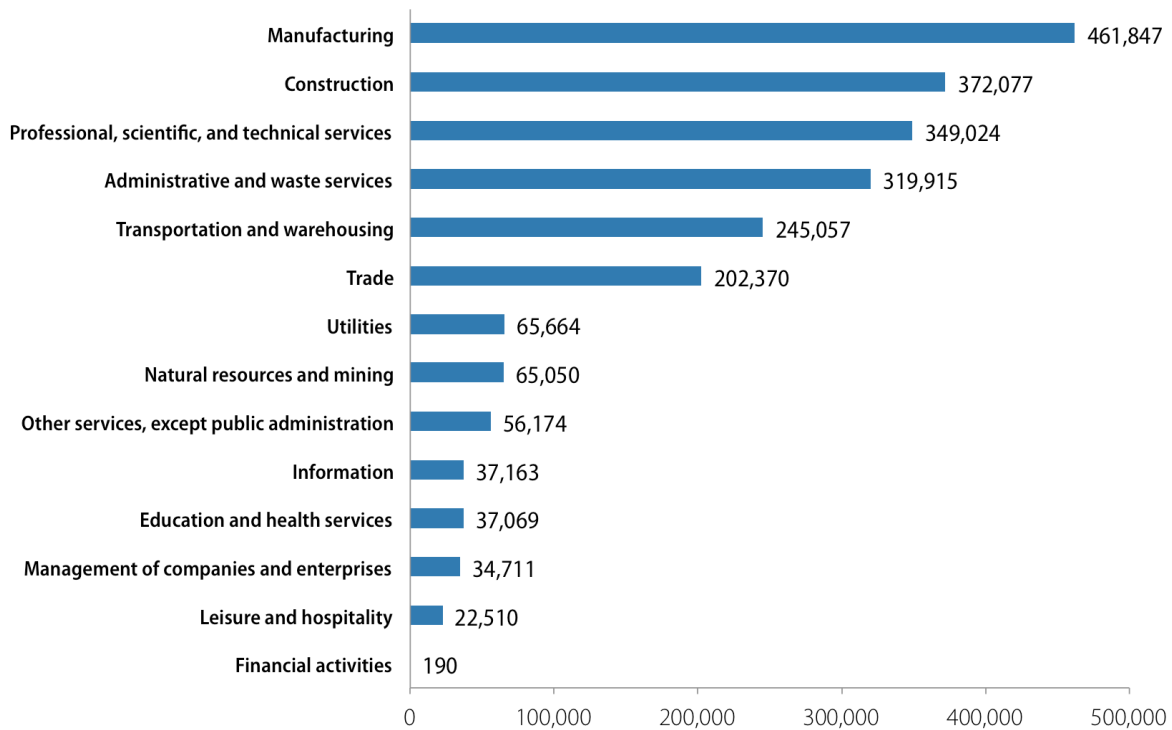
Nationally, 2.1 percent of private-sector jobs are considered green, but there is substantial variation across states. Fourteen states (including the District of Columbia) are above 2.5 percent, 14 states are below 2 percent, and the other 23 states fall between 2 percent and 2.5 percent (Figure F).

Vermont has the highest green intensity of any state, with 3.9 percent of its jobs considered green. Pennsylvania



FIGURE C

Private-economy green jobs, by sector, 2010



Source: Author's analysis of Bureau of Labor Statistics Green Goods and Services Survey (BLS 2012c)

is a distant second at 3.1 percent green intensity, and Colorado (3.0 percent), Washington State (3.0 percent), and Oregon (2.9 percent) round out the top five. The least green-intensive states are Nevada (1.3 percent), Florida (1.4 percent), Oklahoma (1.4 percent), West Virginia (1.5 percent), and Arizona (1.5 percent). The top four states have over twice the green intensity of the bottom five states.

In the context of these data, there are two factors that determine a state's green intensity. First is the state's mix of industries. As seen in the national analysis, there is significant variation among industries with regard to green intensity, with utilities, construction, and transportation/warehousing ranking high and education/health, leisure/hospitality, and financial services ranking low. In other words, if a state has a high green intensity, perhaps it is because its industry mix favors industries that are naturally greener.

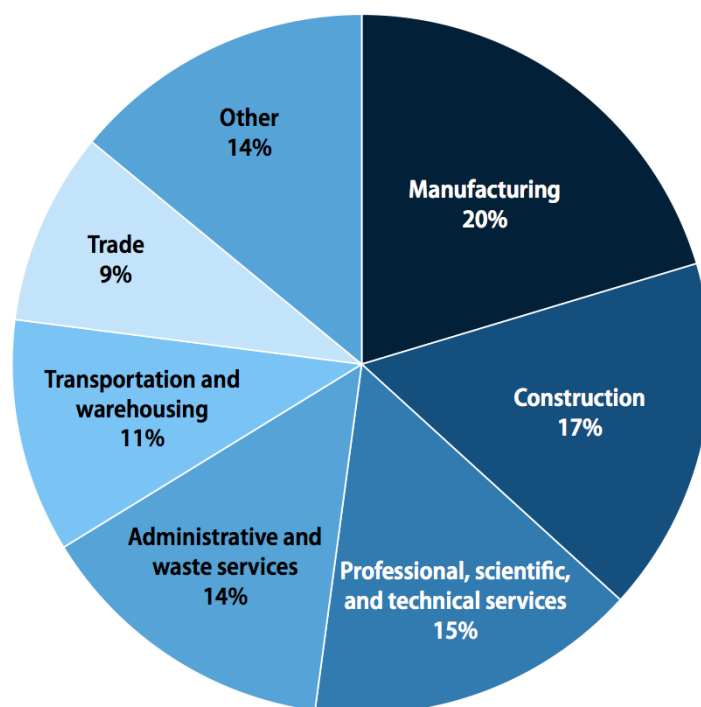
Second, there is variation within industries. For example, while the national average for utilities is 12 percent, in states like Massachusetts, Maine, South Carolina, Connecticut, and New Hampshire upwards of 40-50 percent of utilities jobs are categorized as green (largely due to the state's emphasis on hydropower and nuclear over coal). In other words, perhaps a state is green not because its economy does different things, but because it does the same things but in a greener way.

Figure G plots each state based on these two factors. The two axes estimate how many more (or fewer) green jobs the state currently has relative to the amount of green jobs it would have (1) if each of its industries' green intensities matched that industry's national average (x-axis) and (2) if the state's industry mix matched the national industry mix. For example, the previous graph shows that Nevada is the least green-intensive state. Nevada's position in the bottom left quadrant of the graph indicates that this is



FIGURE D

Share of total private green jobs, by sector, 2010



Source: Author's analysis of Bureau of Labor Statistics Green Goods and Services Survey (BLS 2012c)

because it suffers from both a less-green (dirtier) industry mix and also because it has a smaller share of green jobs in those industries than those industries have on average nationwide.

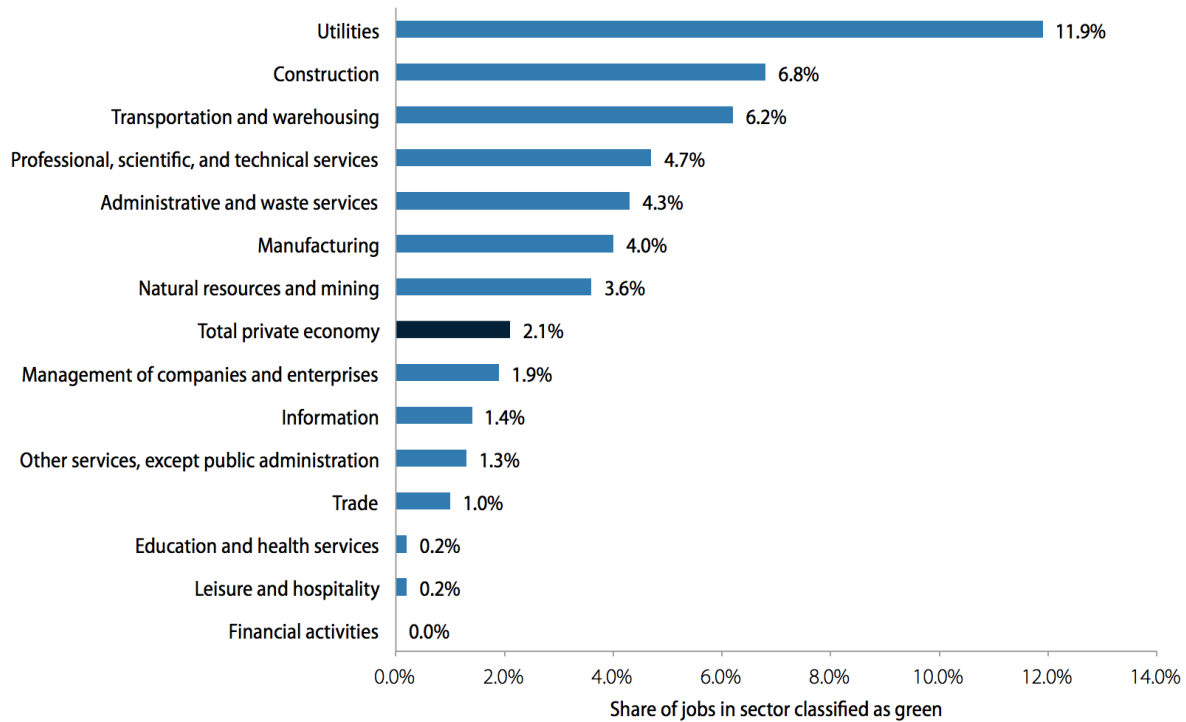
Vermont, on the other hand, is the greenest state. But that has very little to do with its industry mix: like Nevada, the mix of industries in Vermont would suggest that its economy would have a below-average green intensity. Instead it has the highest green intensity in the country because practically every industry in Vermont is a greener version of that industry's national counterpart. For example, nearly 8 percent of the jobs in Vermont's manufacturing industry are classified as green, compared to only 4 percent of manufacturing jobs nationally. Vermont's construction, transportation/warehousing, professional/scientific/technical services, and natural resources/mining industries are all more green intensive than their national averages, in some

cases significantly greener. This effect boosts Vermont's green job levels by roughly 50 percent.

Comparing states based on these two dimensions hints at the role that state policy plays in a state economy's green intensity. State policy is less likely to influence its economy's industry mix and more likely to influence each industry's green intensity because a state's industry mix is more likely than each industry's green intensity to be based on underlying factors such as workforce skills, geography, natural resources, etc. Therefore, if a state deviates more from the national average along the x-axis, then that suggests state policy is a greater factor in driving the effect. If a state deviates from the national average more along the y-axis, then state policy is less likely to be as significant a factor.

FIGURE E

Green intensity of private-economy jobs, by sector, 2010



Source: Author's analysis of Bureau of Labor Statistics Green Goods and Services Survey (BLS 2012c)

## Where green is going

### Greener industries grow faster

The main thrust of the green jobs concept argues that the transition from a fossil-fuel-based economy to a green economy need not cost net jobs. That is, there will be fewer jobs in oil drilling and coal refineries, but there will be an offsetting gain in green jobs as the economy adapts to more sustainable development. But the BLS data on green jobs suggest that greener also means *faster* growth.

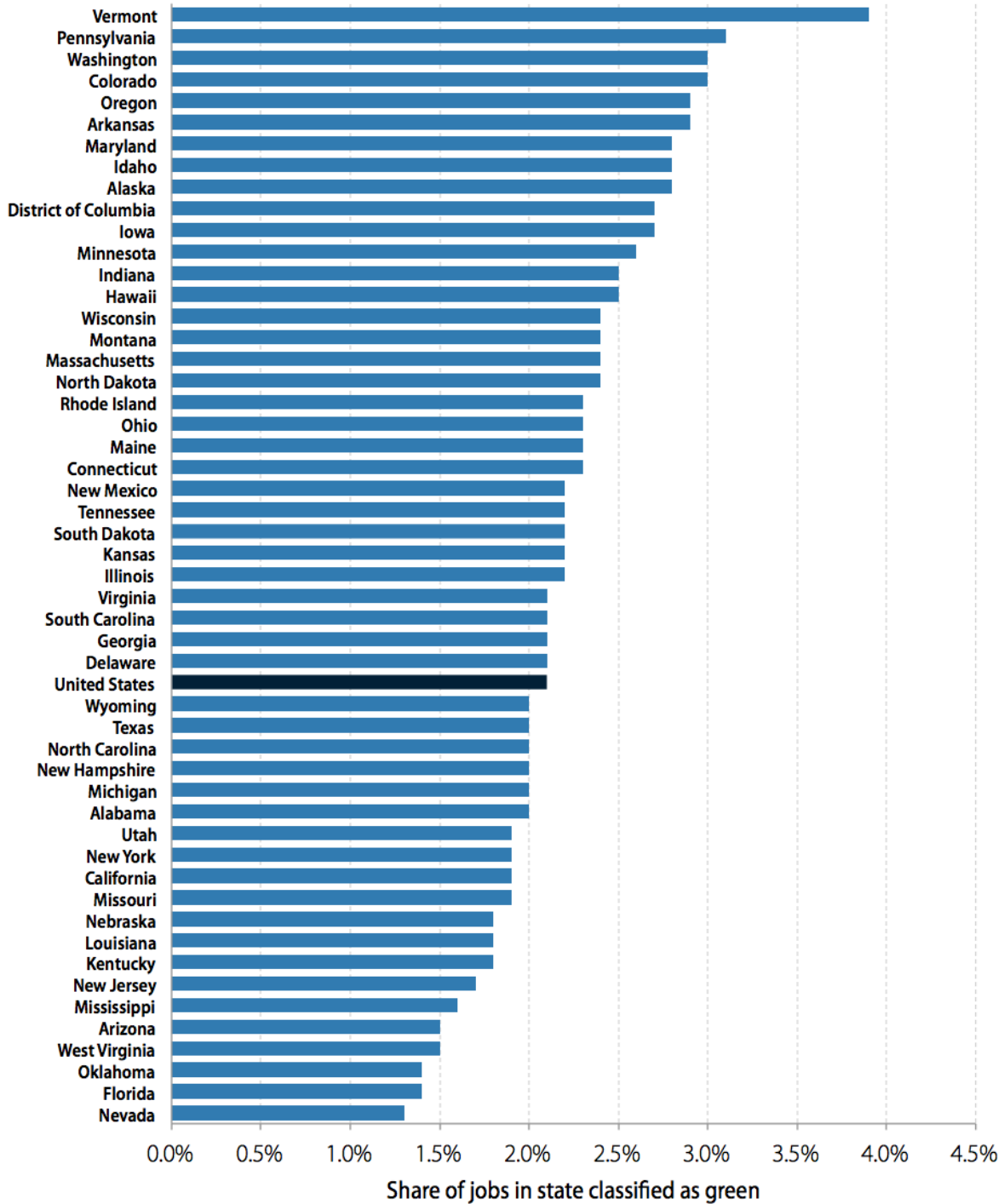
In February 2012, the BLS released employment growth data for occupations and industries over the past decade along with projections for the next decade (BLS 2012b). By matching up the industry data in this survey to the Green Goods and Services Survey, it can be determined whether there is a relationship between an industry's green intensity and its past growth and future growth prospects.

Figure H plots industries (four-digit NAICS codes) by green intensity and employment growth over the last 10 years.<sup>3</sup> It shows that there has been a positive relationship between the two: the greener the industry, the higher the job growth rate over the last decade. This relationship is largely a function of transit, water and sewage systems, and waste management services, which are both green and fast growing, and manufacturing, which has less green intensity than the other four-digit industries measured (though it is still significantly greener than the overall private economy) and has declined in employment over the last decade.

Statistical analysis allows us to calculate the specific relationship between green intensity and the growth in jobs. For every percentage-point increase in the green intensity of the industry there is an associated 0.034 percentage-point increase in the annual employment growth in the industry over the last decade (95 percent significance).

FIGURE F

Green intensity of private-sector jobs, by state, 2010



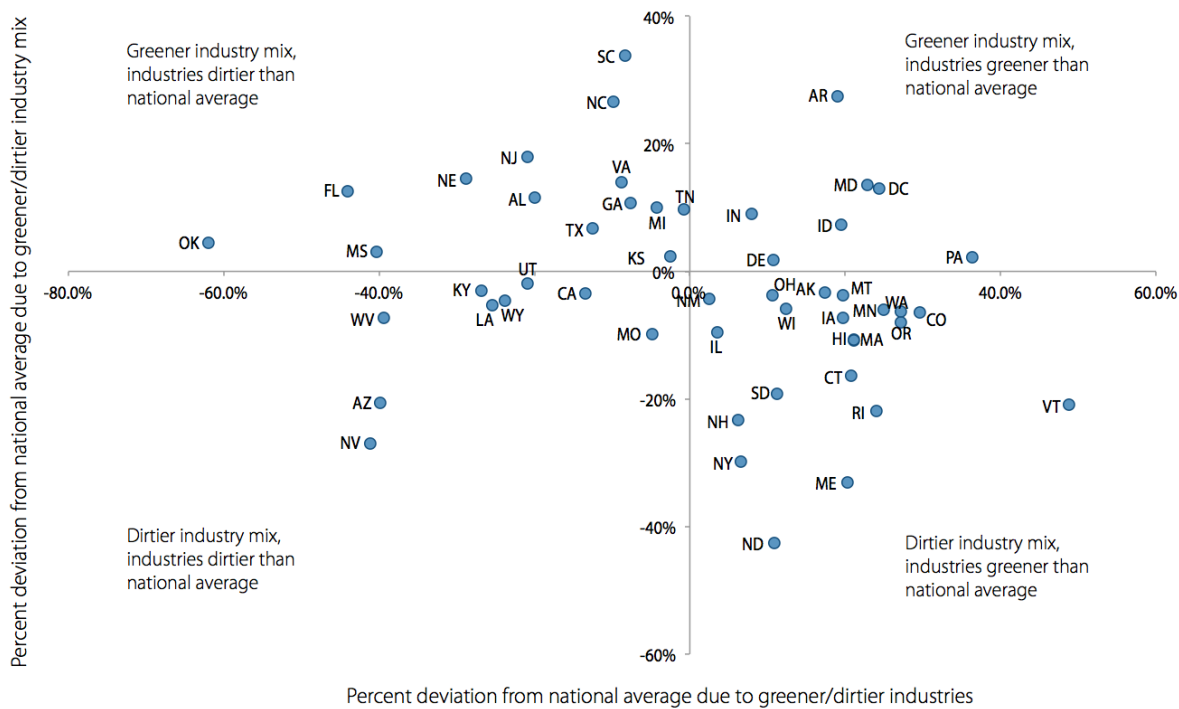
Source: Author's analysis of Bureau of Labor Statistics Green Goods and Services Survey (BLS 2012c)

Figure I plots industries by green intensity and employment growth over the next 10 years as projected by the BLS. It shows a similarly strong relationship, suggesting

that the association between green intensity and job growth will continue through the next decade. Like the previous analysis, this relationship is largely driven by

FIGURE G

### What makes some states more green than others?



Source: Author's analysis of Bureau of Labor Statistics Green Goods and Services Survey (BLS 2012c)

transit, water and sewage systems, and waste management services, though unlike the previous analysis it is also driven by green manufacturing industries (which perform significantly better than less green manufacturing industries).

Using the same analysis, for every percentage-point increase in the green intensity of the industry there is an associated 0.019 percentage-point increase in the annual employment growth in the industry over the last decade (95 percent significance). Both findings are consistent even when controlling for industry size.

These findings are consistent with past green jobs studies. For example, the Pew Center on the States found in its June 2009 report, *The Clean Energy Economy: Repowering Jobs, Businesses, and Investments Across America*, that clean energy jobs grew nearly two-and-a-half times as fast as jobs in the overall economy (Pew Charitable Trusts 2009).

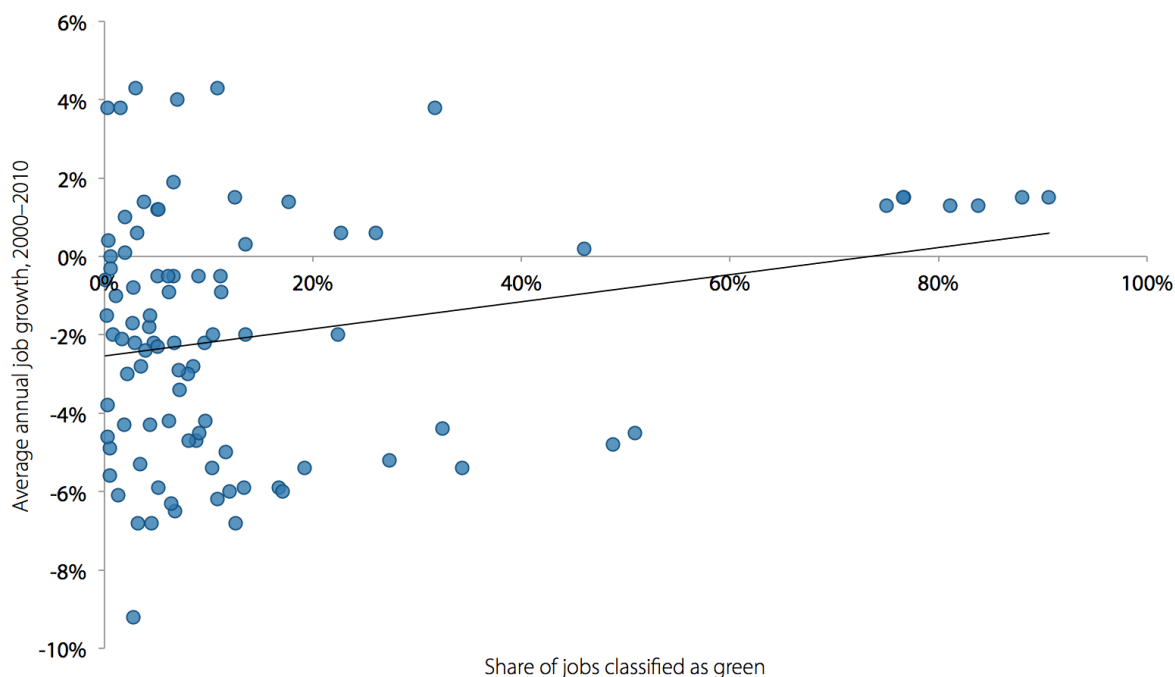
### Green states have fared better in the economic downturn

While practically all states are still struggling through the aftereffects of the Great Recession, some have fared better than others. There are many factors that determine the strength of a state's recovery, such as the extent of its housing bubble, recoverable oil and gas reserves, and exposure to federal stimulus (or in the mid-Atlantic states' case, the stabilizing presence of the federal government), among others.

There is also, however, a slightly positive relationship between a state's green intensity and how well it has been able to recover from the recent recession. **Figure J** plots these variables, showing that, generally, the greener the state's economy, the better it has fared in the recession (85 percent significance). This analysis, however, is slightly complicated by the fact that the American Recovery and

FIGURE H

### Green intensity of an industry and its 2000–2010 employment growth



**Note:** Industries are four-digit North American Industry Classification System (NAICS) codes.

**Source:** Author's analysis of Bureau of Labor Statistics Green Goods and Services Survey (BLS 2012c) and Bureau of Labor Statistics Employment Projections (BLS 2012b)

Reinvestment Act invested heavily in green infrastructure during this period (Walsh, Bivens, and Pollack 2011).

Like the previous finding, this is consistent with past reports on green jobs. For example, Muro, Rothwell, and Saha (2011) found that, while green jobs were particularly hammered by the recession, they have outperformed the broader economy in the recovery.

### **Green jobs are accessible to workers across the spectrum of education**

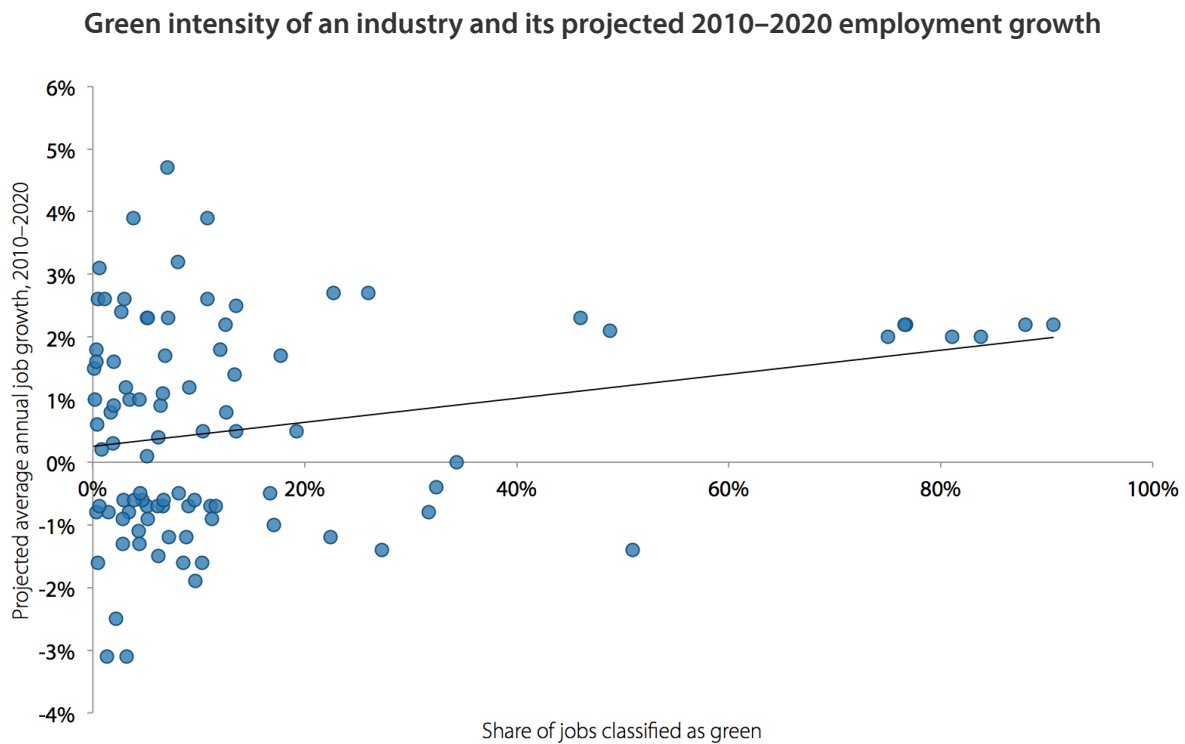
For the first few decades of the postwar era, economic growth was strong across the income distribution, with low-income, medium-income, and high-income workers all sharing in the prosperity derived from a strong and growing economy. But starting in the late 1970s, income growth began to diverge among these groups, with more and more of the nation's income accruing to the highest-

income workers. Between 1979 and 2008, national income grew by an average \$10,400 per person, but the entirety of those income gains went to the top 10 percent. The income of the bottom 90 percent actually fell.

The assertion by many economists that education is the sole driver of inequality over the last few decades is not supported by the data. For example, roughly 60 percent of the growth in overall wage inequality has occurred *within* the group of workers with college degrees rather than between them and everyone else. In fact, overall compensation for college graduates has been flat over the last 10 years, even as income inequality has reached new heights (Mishel 2011).

Nevertheless, education has played a role in the increasingly divided economy. For example, in 1979 wages for workers with a college degree were 40 percent higher than

FIGURE I



**Note:** Industries are four-digit North American Industry Classification System (NAICS) codes.

**Source:** Author's analysis of Bureau of Labor Statistics Green Goods and Services Survey (BLS 2012c) and Bureau of Labor Statistics Employment Projections (BLS 2012b)

the wages for those with only a high school degree. By 2011, this pay disparity had risen to 76 percent (Mishel et al. 2012). If we want economic policy to work for the nearly 70 percent of American workers without a four-year college degree (U.S. Census Bureau 2012), green investments offer an option.

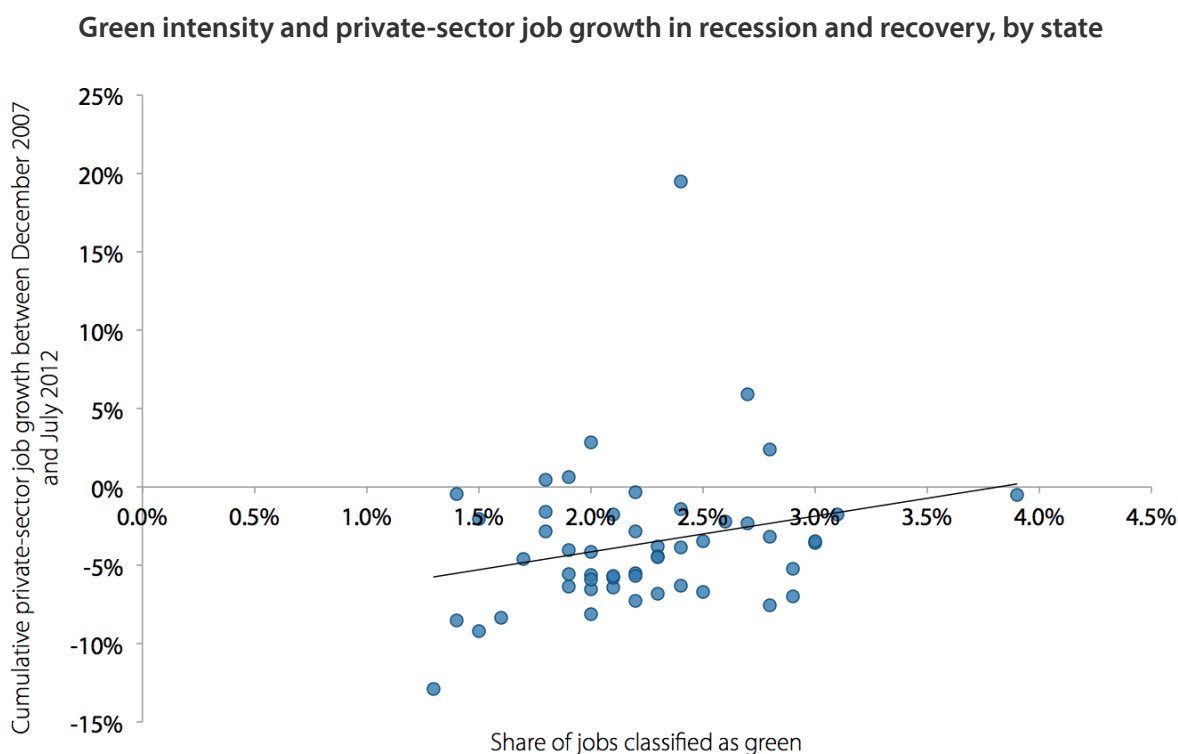
**Figure K** uses data from the U.S. Census Bureau's Current Population Survey to plot industries by green intensity and the educational attainment of their workers. It shows that industries that are greener also tend to be more accessible for workers of lower educational attainment. For every one percentage-point increase in green intensity in a given industry, there is a corresponding 0.28 percentage-point increase in the share of jobs in that industry held by workers without a four-year college degree (95 percent significance).

### ***Manufacturing plays a strong role in the green economy***

The manufacturing sector, the largest single source of green jobs in the private economy, is central to the green economy. This is partly due to the size of the manufacturing sector itself, but also to its green intensity, nearly twice as green as the broader private economy. In total, although representing only 10.8 percent of total private employment, manufacturing accounts for 20.4 percent of green jobs.

Within manufacturing, particular sectors, due to their size or their green intensity or both, make outsize contributions to the green-jobs total. **Table 1** ranks four-digit manufacturing industries by weighting equally green employment and green intensity to create a list of the top 15 green manufacturing industries. The analysis reveals

FIGURE J



**Source:** Author's analysis of Bureau of Labor Statistics Green Goods and Services Survey (BLS 2012c) and Bureau of Labor Statistics Current Employment Statistics

that the activities that drive green manufacturing center on home energy efficiency, energy-efficient appliances, recycling, renewable energy generation, construction, and transportation.

The green components of the manufacturing sector are also vital to its overall growth. To determine all of the green industries in the manufacturing sector, this analysis focused on the 30 four-digit industries with green intensities greater than the average for the overall manufacturing sector (4 percent green intensity). In the aggregate, the output of these industries is projected by the BLS to grow 42 percent in real terms between 2010 and 2020, significantly faster than the 31 percent output growth that the BLS projects for the overall manufacturing sector.

### ***Green jobs go beyond renewable energy***

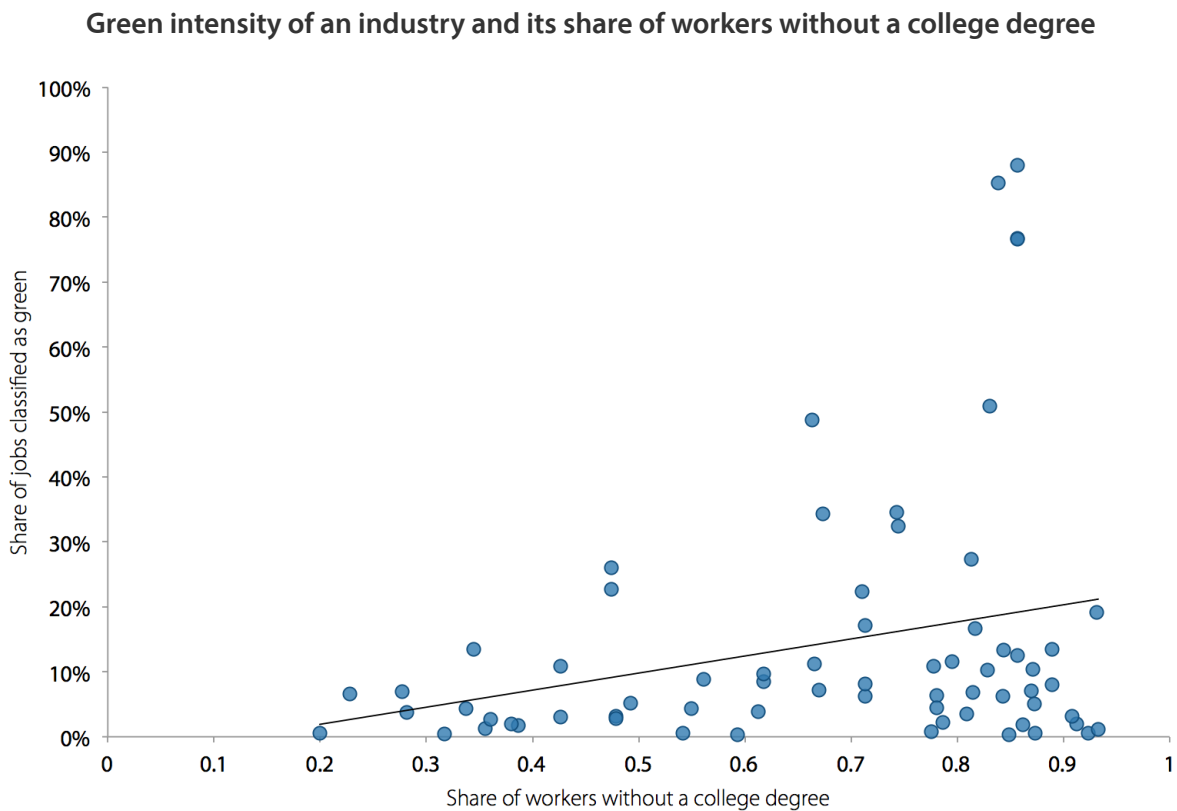
Much of the commentary surrounding green jobs has focused on jobs in the renewable energy industry, such as

solar panel installers or wind turbine manufacturers, but this misses just how pervasive green jobs are throughout the economy. It is true, for example, that utility jobs tend to be heavily green, over 50 percent more green intensive than any other sector. Furthermore, turbine manufacturing ranks as one of the most consequential green manufacturing industries in that it is both highly green and of significant size.

But some perspective is in order. Green utility jobs represent less than 3 percent of total private green jobs. While it is true that for every job in the utility industry there are roughly three jobs in supplier industries, only 6.9 percent of these jobs are in manufacturing, with the remaining scattered in general sectors that may not be as specific to utilities (BLS 2009). Even within the utility sector, renewable energy generation accounts for only 7.1 percent of its green jobs, with nearly 90 percent of green utility jobs in either nuclear energy generation (55 percent)



FIGURE K



**Note:** Industries are four-digit North American Industry Classification System (NAICS) codes. Workers are employed and 16 years old and older.

**Source:** Author's analysis of Bureau of Labor Statistics Green Goods and Services Survey (BLS 2012c) and Current Population Survey basic monthly microdata (U.S. Census Bureau 2012)

or water, sewage, and other systems (33 percent). Rather, as its technologies are far from mature (in contrast to nuclear energy, for example), renewable energy generation is important to the broader issue of green jobs not because it is already of significant size, but because of the tremendous growth potential it offers, not to mention its environmental benefits.

The water industry—including water supply and irrigation, sewage treatment facilities, and steam and air-conditioning supply—merits special attention. First, with 21,500 green jobs and a nearly 50 percent green intensity, it is undoubtedly significant to the broader green economy, yet it has room to grow. Second, the country's water infrastructure is outdated and overextended; reports by the Environmental Protection Agency, the Water Infra-

structure Network, and the Congressional Budget Office place the annual investment “needs gap” as high as \$59.4 billion (Copeland and Tiemann 2010). Finally, while the water industry is already very green, specific investments could make it significantly greener. A report released last fall by Green for All in collaboration with the Economic Policy Institute, the Pacific Institute, and American Rivers shows how local governments can dramatically green their water infrastructures through specific investments like green roofs and urban tree planting (Gordon, Hays, Pollock, Sanchez, and Walsh 2011).

## Conclusion

The best case for greater environmental protections and green investments isn't just about jobs, but rather about

TABLE 1

## Fifteen most significant manufacturing industries (by green intensity and size), 2010

Rank	Industry	Green jobs	Green intensity*
1	<i>Iron and steel mills and ferroalloy mfg.</i>	43,658	50.9%
2	<i>Ventilation, heating, AC, and commercial refrigeration equipment mfg.</i>	40,835	32.4
3	<i>Pulp, paper, and paperboard mills</i>	30,473	27.3
4	<i>Household appliance mfg.</i>	20,123	34.3
5	<i>Turbine and power transmission equipment mfg.</i>	20,360	22.4
6	<i>Railroad rolling stock mfg.</i>	8,978	48.8
7	<i>Other wood product mfg.</i>	25,939	13.4
8	<i>Textile furnishings mills</i>	12,141	21.2
9	<i>Architectural and structural metals mfg.</i>	22,843	7.1
10	<i>Alumina and aluminum production</i>	9,002	16.7
11	<i>Office furniture and fixtures mfg.</i>	11,561	12
12	<i>Electric lighting equipment mfg.</i>	7,765	17.1
13	<i>Cement and concrete product mfg.</i>	13,584	8
14	<i>Basic chemical mfg.</i>	11,970	8.5
15	<i>Semiconductor and electronic component mfg.</i>	19,287	5.2

\* Share of jobs that are green

**Source:** Bureau of Labor Statistics Green Goods and Services Survey (BLS 2012c)

equity and broader economic growth. The “dirty economy” model relies on allowing businesses to push a portion of their costs of production onto third parties without their consent, simultaneously causing harm to people who are disproportionately impoverished and lack political power, and distorting the market by causing an overproduction of pollution-intensive goods at the expense of cleaner goods.

Furthermore, this old economic model relies on depleting the economy’s environmental capital stock at an unsustainable rate, depriving future generations of a healthy and diverse environment and harming long-run economic growth (since much of the economy depends on a clean environment and ample stocks of natural resources). In sum, a dirty economy subsidizes the well-off by taxing the

poor and disenfranchised, distorts the market, and shortchanges future generations by leaving the world a worse place for them to live. For these reasons alone, the case for transitioning to a greener and more sustainable economy is well justified.

But the concept of green jobs does play an important role in illustrating a positive vision of a green economy. It reminds us that the seeds of a green transition are planted throughout the economy, that the fundamental structure of the economy will remain intact, and that this vision isn’t so radical but rather is already happening all around us. This report reinforces these points, and introduces new evidence that suggests a greener economy will also be more open, accessible, and resilient.

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## Endnotes

1. The survey of industries does not include businesses that don't pay unemployment insurance taxes; therefore, self-employed workers are not included in the green jobs count.
2. For nonprofits and government agencies, employment share is used as a substitute for revenue share.
3. Note that in some cases, data on projected job growth were not available by four-digit NAICS code, so in those cases data from the applicable three-digit NAICS code were used instead.

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