CALIFORNIA'S GREEN ECONOMY TRENDS

RELATIONSHIPS BETWEEN FIRMS AND THEIR EMPLOYMENT OUTCOMES

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Abstract

The purpose of this study was to analyze whether there were relationships between California firms that create green products or services and three employment outcomes: net job gain, net job loss, and no net change. An ordered logit regression model was used to test for evidence of relationships between private sector firms represented in the 2010 California Green Economy Survey and the following variables: age of firm, type of firm, size of the firm, and industry sector. The model included data from 622,466 private sector firms and predicted the likelihood of each of the employment outcomes from January 2008 through January 2010.

The size and industry sector of the firm were the strongest predictors of net job gains during the study period. The results also showed no discernible difference in the likelihood that a green or non-green firm would experience a net job gain.

Keywords: California Green Economy Survey, green economy, ordered logit regression, gross job flows

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1. Introduction

The green economy is often touted as an emerging component of the U.S. economy that has the potential to create sustainable wage jobs, address the nation's energy dependence on fossil fuels, and jump start an economy still reeling from the effects of the Great Recession (December 2007-June 2009). President Obama remarked during his 2011 State of the Union address that investments in clean energy technology will "strengthen our security, protect our planet, and create countless new jobs for our people" (Obama, 2011). With the U.S. economy slowly recovering from the 5.4 percent decline in total nonfarm employment that occurred during the 2007-2009 recession, public discourse on the green economy has shifted to questioning the validity of job creation claims and the justification for federally subsidizing clean technology firms.[1] Critics of federal subsidies and the green economy's job performance argued "the green jobs segment of the federal stimulus was not an efficient instrument for job creation and clean energy industries are too small to create millions of jobs that are needed right away" (Romney for President, 2011).

This polarizing issue raises the following research questions: Were firms that created green products or services more or less likely to add jobs to their respective workforces than firms that did not create green products or services? Does the likelihood of these employment outcomes change based upon the firm's age, size, or industry sector? This study hypothesizes that there is a discernible difference in a firm's ability to experience net job gains based upon the following characteristics: age (months in business), industry sector, size (total employment at work site), and type (green or non-green).

Over the past few years, researchers have used different methods for estimating the job growth potential of green firms. Information Handling Services Global Insight (IHS Global Insight) developed a scenario based forecast that estimates the net generation of jobs resulting from an increase in renewable energy capacity, the retrofitting of residential and commercial buildings, and consumers shifting to renewable energy sources (IHS Global Insight, 2008).[2] The study used coefficients to measure relationships between the performance of industry sectors and the number of jobs they create. The IHS predicted that by 2038, the U.S. economy could generate 4.2 million green jobs.[3] Researchers at the Pew Charitable Trust (2009) cross-referenced micro-level firm and venture capital data to identify clean energy firms and estimate employment growth.[4] They found clean energy jobs—a mix of white and blue collar positions, from scientists and engineers to electricians, machinists and teachers—grew by 9.1 percent; while total jobs in the United States grew by only 3.7 percent (Pew Charitable Trusts, 2009) between 1998 and 2007. Findings such as these presented a strong case for subsidizing the expansion of clean technologies.[5]

However, other researchers have argued that green job creation claims had been overstated due to fundamental errors in research methodologies. Bogart, Dorchak, Meiners, and Morriss (2009) contended that green job forecasts were flawed because they were based upon overly-optimistic growth rates for a relatively small base number of jobs. Bogart et al. (2009) further argued that public industry sector jobs that do not produce a final output should not be factored into green job forecasts because they are costs derived from spending programs that consequently reduce the true number of green jobs created over time. Gürcan Gülen (2011) suggested that the lack of a standardized definition of what a green job is has produced inflated employment estimates, since most occupations encompass at least some green activity.[6] For example, electricians that work at both carbon emission refineries and geothermal facilities during different parts of the workday are added to clean technology job estimates regardless of the contrast in their daily responsibilities (Gülen, 2011). Finally, Bogart et al. (2009) and Gülen (2011) charged that green job forecasts were inaccurate since they did not account for job losses attributed to industries changing their processes to adhere to clean technology standards.

Literature on the employment effects of green firms is relatively sparse, leaving room for additional research. Green economy research that explores employment trends over time are most often presented as scenario-based forecasts. These forecasts estimate job growth from a base year to a future point in time, but do not focus on trends specific to states' economies. Furthermore, the literature did not account for the loss of jobs over time at green firms (Gülen, 2011).

The literature review for this study found a lack of research associated with the characteristics (e.g., age, size, industry sector) of firms within the green economy. Gross job flow research provided the foundation for this study, since the findings analyze employment outcomes (e.g., net job gain, net job loss, no net change) by firm age and size at the work site employment level. Due to the scarcity of literature specific to the green economy, empirical evidence from these studies was reviewed to validate the use of key variables in this study: age of the firm and size of the firm. This research study is pertinent because it examines whether or not relationships exist between employment outcomes and the characteristics of firms, and in particular, those that contained a share of workers that created green products or provide green services between January 2008 and January 2010.

Haltiwanger, Jarmin, and Miranda (2010), Sutton (1996), and Davis and Haltiwanger (1993) argued that because there is no systematic relationship between the size of a firm and net employment outcomes over time, any claims that small businesses will drive employment growth are misleading and a misinterpretation of the data. Moscarini and Postel-Vinay (2009) disputed their claim that there is no systematic relationship by providing evidence that large employers destroyed proportionally more jobs than small employers during and after recessions and created proportionally more jobs late in expansions, both in gross and net terms. Their research suggested that workers quit mostly small, less productive, low-paying firms, and accepted jobs within large, higher-paying firms during expansion periods (Moscarini et al., 2009).

2. Definitions

A common critique of green economy studies is that what constitutes a “green job” or “green firm” is ambiguously defined and differs from study to study, “making green job claims or comparisons fruitless” (Bogart et al., 2009). The California Employment Development Department’s (EDD) broad “green” definition provides for flexibility in comparative studies. The EDD reviewed over 130 studies conducted by researchers and government entities to compose a working definition that encompasses the components of the green economy shared in most studies. Green jobs were defined as those jobs held by persons who worked any of their time during the workday to produce a product or service within one of the following **G**.**R**.**E**.**E**.**N**. categories:

- **G**enerating and storing renewable energy;
- **R**ecycling existing materials;
- **E**nergy efficient product manufacturing, distribution, construction, installation and maintenance;
- **E**ducation, compliance, and awareness;
- **N**atural and sustainable product manufacturing.

Firms with a share of their workforce conducting any of the preceding G.R.E.E.N. work activities were identified as green firms. [7] Firms without employees devoting any of their work time to green activities were identified as non-green firms. In this study, any firm that had at least a 25 percent share of its workforce involved in green production or green services provision was identified as green.

To clarify the unit of analysis (e.g., firm) and variables, the operational definitions for this study are as follows:

> Firm: A business organization or entity consisting of one domestic establishment (location) or more under common ownership or control. All establishments of subsidiary firms are included as part of the owning or controlling firm.
>
> Net Job Gain: A firm experienced a net job gain if its monthly employment total in January 2010 was higher than the employment level in January 2008.
>
> Net Job Loss: A firm experienced a net job loss if its monthly employment total in January 2008 was higher than the employment level in January 2010.
>
> No Net Change: A firm experienced no net change if its monthly employment totals remained the same in January 2008 and January 2010.
>
> Size of the firm: Firms were classified by sized based upon their 2008:Q1 average employment in the Quarterly Census of Employment and Wages (QCEW).[8] Certainty units and large firms are separated because firms identified as certainty units represent a significant portion of the economic activity in an industry or geographic area. Size classes are as follows:
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> - Size Class 0 (1-19 employees)
> - Size Class 1 (20-99 employees)
> - Size Class 2 (100-249 employees)
> - Size Class 3 (250+ employees; certainty units)[9]
>
> Age of the firm: A tally of the number of months a firm reported employment between January 2000 and January 2008 according to the QCEW.
>
> Type of Firm: If survey respondents to the California Green Economy Survey reported a share of its employees working any of their time in one of the G.R.E.E.N.[10] categories, they were identified as a green firm. In this study, firms that had at least a 25 percent share of its workforce creating green products or providing green services were identified as green firms.
>
> Industry Sector: The industry sector assigned to each firm is based upon its North American Industry Classification System (NAICS) classification in the QCEW.

3. Data and Measurement

3.1 Data

The data used in this study were drawn from self-reported firm responses to the EDD's California Green Economy Survey and monthly employment data contained in the QCEW database.

The California Green Economy Survey collected data from public and private firms representing all industries, sizes, and counties in California to obtain an estimate of the current number of green jobs, pinpoint the current and changing business practices of producers and users of green or sustainable energy, and identify emerging clean technology occupations (EDD, 2010). The survey's responses were linked to the QCEW data on industry sector employment to weight firm responses and estimate statewide employment.[11]

The survey responses used in this study were representative of 622,466 privately owned firms that operated in the State of California during the study period (between January 2008 and January 2010), but were not inclusive of all the weighted firm responses (710,016 firms) featured in the findings of the California Green Economy Survey. If monthly QCEW data were not available for any given firm for the months of January 2008 and January 2010, that firm's information was not included in this study. Table 2 (page 17) illustrates the results of this process.

The Bureau of Labor Statistics' QCEW program publishes a quarterly count of Unemployment Insurance (UI) covered employment and wages supplied by the employer, which covers approximately 98 percent of all the U.S. jobs. These data are available at county, state, and national aggregations; as well as various levels of industry detail according to the North America Industry Classification System (NAICS). California mandates that all businesses that pay into the UI fund must report their monthly employment and wage information for the subject quarter for statistical and other authorized purposes. The employment totals reported by the QCEW are the number of workers who received pay during the firm's specific payroll period that includes the 12th day of that month (e.g., monthly, bi-weekly) for each account or Reporting Unit (RU) – a single business or each branch, outlet, store, etc. in the case of a multiple worksite reporter. For this study, each unique QCEW or RU location was used to determine its employment outcome (e.g., net job gain, net job loss, no net change), number of months it conducted business in the state (age of firm), and number of employees (size of firm).

3.2 Measurement

Employment Outcomes

Employment totals for the months of January 2008 and January 2010 were acquired by linking the UI identification number and reporting unit of each California Green Economy Survey respondent to their respective QCEW records. Firms for which data were available in both January 2008 and January 2010 were included in this study. A deletion method was used to remove firms with incomplete information from the analysis. If data from one or both of the months were not available for a firm, it was deleted from the study (see Table 2). To measure gross job flows (e.g., job creation rate, job destruction rate) a straightforward method similar to that employed by Klein, Schuh, and Triest (2001) was used to calculate the net difference in employment and make employment outcome determinations. This calculation is illustrated as follows:

$$\Delta L_{eit} = L_{eit}\ (\text{Jan. } 2010) - L_{eit}\ (\text{Jan. } 2008)\ (1),$$

where L_{eit} is defined as the level of monthly employment (L) in a particular firm (e), industry (i), and time period (t) (Klein, et al., 2001). A firm experienced a net job gain if its employment total for January 2010 was higher than its total in January 2008. A net job loss occurred if the employment total for January 2008 was greater than the total for January 2010. A firm experienced no net change if monthly employment totals in January 2008 and January 2010 remained the same. While this method does not account for month-to-month fluctuations in a firm's employment level over the study period, it does provide evidence of shifts in employment between the two distinct periods of time.

Age of the Firm

A monthly employment time series was created from the QCEW data to calculate the age of the firm, which was defined as the number of months each firm operated in California between January 2000 and January 2008. January 2000 was selected as the base year due to QCEW data limitations. Prior to January 2000, only annual average NAICS data were available for individual firms. Firms initial and end dates of the UI liability were reviewed to assist in the development of this variable.[12] The end date was used to discern a business closure from the simple omission of data.

Monthly firm employment totals were compiled by linking the UI identification number and the RU of each firm to the QCEW records. For example, if employment estimates were only available for the months of January 2007 through July 2007; the age of the firm was calculated as seven months. If any zeroes were reported between these two months, the firm was still considered to be in business and its age was tallied at seven months.[13] The age of firms in this study ranged from 3 to 99 months.

Size of the Firm

The size classification of firms included in the EDD's California Green Economy Survey was determined using the QCEW employment totals for the first quarter of 2008. The size classifications were as follows: size class 0 (1-19 employees); 1 (20-99 employees); 2 (100-249 employees); and 3 certainty unit (250+ employees). Dummy variables were used to represent each of the size classes and test for differences between the classifications. Size class 0 (1-19 employees) was chosen as the reference group, because it represents the largest share of firms included in this study. Table 3 (page 17) reports the distribution of firms by size classification.

Type of Firm

The following method that was used to categorize the type of firm (e.g., green or non-green firm). Firm responses from the California Green Economy Survey were used to estimate the share of employees working at specific work site locations and producing G.R.E.E.N. goods or provide G.R.E.E.N. services.[14] If the percent share of a firm's total workforce included 25 percent or more G.R.E.E.N. employees, that firm was categorized as green. As referenced in the California Green Economy survey methodology, the estimates were based on employer self-identification and, as with all surveys, the results should be viewed with caution (EDD, 2010).

Dummy variables were used to identify differences in employment outcomes between green and non-green firms. Non-green firms were chosen as the reference group because they made up a majority of the firm responses in the California Green Economy Survey. Table 3 (page 17) outlines the total number of green and non-green firm responses used in this study, by size of firm.

Industry Sector

The January 2008-January 2010 time period of this study was one of the most tumultuous economic periods in our nation's history, occurring during the Great Recession which officially lasted from June 2007 through December 2009. Testing the model coefficients for each industry sector provided evidence that the Great Recession impacted industry sectors differently. The dummy variables in the model represent each of the 20 NAICS industry sectors. The professional, scientific, and technical services industry sector was chosen as the reference group because it represented the largest share of firms in the California Green Economy Survey. Table 4 (page 18) provides an industry sector breakdown of the firms analyzed.

4. Methodology

The empirical technique used for this study was an ordered logit regression model, of the form:

$$\ln(\theta_j) = \alpha_j - \beta X \quad (2),$$

where ln(θj) represents the log of the odds than an event (e.g., employment outcome) occurs, j ranges from 1 to the number of categories minus 1, αj is the threshold value, X represents a predictor variable (e.g., X_1 = age of firm), and β is the regression coefficient, the value of which determines the strength of the relationship between X (independent variables) and the log of the odds of the employment outcome (Hilbe, 2009; Norušis, 2012).

The predicted probabilities for each of the employment outcomes were calculated to illustrate the relationship between the variables and employment outcomes on a statewide and industry sector level. The probability calculation was as follows:

$$\text{Probability (employment outcome)} = 1/(1 + e^{-(\alpha j - \beta x)})(3),$$

where α*j* is the threshold value, *X* represents a predictor variable, and β is the regression coefficient. Tables 6 through 9 (pages 20-23) contain the complete results of these calculations.

5. Results

Table 6 (page 20) presents the results calculated from equation (2). The Odds Ratios (OR) in Table 5 (page 19) displays the probability that a firm would experience a net job gain when controlling for contributing factors (e.g., age, size, type of firm). Inverse Odds Ratios (IOR) were calculated for variables with negative coefficients to make the results easier to interpret. The ordered logit regression model used in this study was fit to the net job gain employment outcome. Variables (e.g., type of firm) with positive coefficients indicate that as the values of the variables increased, the odds that net job gains occurred over the study period also increased. Dummy variables were used because the following variables contain subgroups: type of firm (non-green firm; control group); size class (size class 0; control group); and industry sector (professional, scientific, and technical services sector; control group). These dummy variables were used to discern whether there were differences between the control and treatment groups within each of the aforementioned variables.

The model estimated positive coefficients for the size class and 16 industry sectors. The Odds Ratio results were statistically significant and suggest that firms with 20 or more employees [size class 1 ($\beta = .733$, $p < .0001$, OR = 2.08)]; [size class 2 ($\beta = .700$, $p < .0001$, OR = 2.01)]; and [size class 3 ($\beta = .929$, $p < .0001$, OR = 2.53)] were twice as likely to have experienced a net job gain with respect to firms with fewer than 20 employees. Agriculture, forestry, fishing, and hunting ($\beta = .452$, $p < .0001$, OR = 1.57), educational services (private) ($\beta = .753$, $p < .0001$, OR = 2.12), and management of companies and enterprises ($\beta = .441$, $p < .0001$, OR = 1.55) sectors had the highest odds of experiencing a net job gain relative to the professional, scientific, and technical services sector (control group).

The model estimated negative coefficients for the following variables: type of firm; age of firm; utilities sector; and real estate and rental and leasing sector. The type of firm ($\beta = -.010$, $p < .3630$, IOR = 1.01) coefficient implies that non-green firms were 1.01 times more likely to experience a net job gain than green firms. However, these results were not statistically significant and the results may be due to chance rather than reflective of a pattern. The age of firm coefficient ($\beta = -.003$, $p < .0001$, IOR = 1.00) was statistically significant and suggests that firms in business for shorter time periods, young firms, were more likely to experience a net job gain over the study period than older firms that had been in business for long periods of time. The real estate and rental and leasing ($\beta = -.271$, $p < .0001$, IOR = 1.31) and the Utilities ($\beta = -.444$, $p < .0001$, IOR = 1.56) sectors' IOR were statistically significant, suggesting that firms within these industries were the industry sectors most likely to experience no net change or a net loss when compared to the control group.

Tables 6 through 9 (pages 20-23) provide the predicted probabilities of the three employment outcomes when the variable coefficients are included in the ordered logit regression model. The results for equation (3) in Table 7 (page 21) show only slight differences in the predicted probabilities of net job gains based on the type of firm when controlling for all other variables. In general, both green and non-green firms were most likely to experience no net change in employment over the study period.

Tables 8 and 9 (pages 22 and 23) highlight the results of testing for changes in predicted probabilities due to the inclusion industry sector dummy variable in equation (3). The agriculture, forestry, fishing, and hunting sector's green and non-green firms predicted probabilities for net employment gains ranged from .28 to .59, controlling for all variables (see Table 8; page 22).

The predicted probability of net job losses for agriculture firms in size class 3 ranged from .09 to .21 for green and non-green firms, controlling for all other variables. Manufacturing sector green and non-green firms that were in business for at least 99 months tended to have higher probabilities for no net change in the employment over the study period, controlling for all variables (see Table 9; page 23). Generally, manufacturing firms in business for three months tended to have higher probabilities for net job gains with results ranged from .29 to .51. Size class 0 firms in the real estate and rental and leasing sector had the highest probabilities for net job losses (.35 to .44) compared to firms in the remaining size classes (.18 to .28). Tables 7 through 9 were calculated from equation (3).

6. Discussion

6.1 Key Findings

The analysis found no discernible difference in the likelihood of green and non-green firms for experiencing net job gains based upon the coefficients produced by the ordered logit model. Moreover, the type of firm coefficient was not statistically significant, meaning its results may be due to chance, rather than different trends among green and non-green firms.

The age of firm coefficient produced by the model was statistically significant and implied that younger firms were more likely than older firms to experience a net job gain, over the study period. The small negative coefficient also suggests the effect of smaller size on employment outcomes were not great. This suggests that there was little or no discernible difference in outcomes when age is taken into account. All firms struggled to produce net job gains during this study period, which occurred during the Great Recession, regardless of how long they were in business.

The size class coefficients suggest that, generally speaking, the likelihood of a firm experiencing a net job gain increased with its size during the study period. Firms with 250 or more employees at their work site were the most likely to experience a net job gains with respect to the control group of firms with fewer than 20 employees. The results were statistically significant and suggest that there is a distinguishable difference in the likelihood that smaller and larger firms will create jobs.

The agriculture, forestry, fishing, and hunting (OR = 1.57); educational services (OR = 2.12); and management of companies and enterprises (OR = 1.55) firms were the most likely to experience a net gain in employment during the study period, when compared to the professional, scientific, and technical services sector (control group).

The utilities (IOR = 1.56) and the real estate and rental and leasing (IOR = 1.31) sectors had the highest likelihood of experiencing a net job loss or no net change in employment levels during the study period. Overall, a majority of the NAICS industry sectors had a higher likelihood of creating jobs than the control group. This suggests that the differences in the likelihood that a firm added jobs were related to industry sector.

In summary, the study provided evidence that suggests a firm's size class and industry sector are statistically significant characteristics that distinguish one firm from another in terms of how likely they were to experience net job gains. Although the age of firm variable was statistically significant, its coefficient did not show a discernible difference between the likelihood of younger and older firms to experience job gains. Finally, the results revealed no discernible evidence that green firms were more likely to create jobs than non-green firms over the study period.

6.2 Limitations

As with all studies derived from survey data, the internal validity of this study is potentially compromised due to various sources of statistical bias. Measurement bias may have occurred because all of the California Green Economy Survey responses were self-reported. Consequently, the type of firm variable may be biased. A deletion method was used to omit firms that completed the EDD California Green Economy Survey for whom employment data were not available during the time period studied (between January 2008 and January 2010). This method potentially introduced omission bias in the study. Studies that analyze survey data are often subjected to some form of response or procedural bias during the data collection period. To reduce these sources of bias, the EDD implemented data refinement measures that screened submitted surveys for completeness. If a submitted survey did not meet specific standards, follow up calls were conducted with firms to confirm the accuracy of their responses.

Endogeneity bias was reduced due to the inclusion of the industry sector variable. Including this variable was necessary to account for differences in the actual constructs of the industries themselves. For example, shares of green firms and the impact of the Great Recession tended to vary by industry sector during study's time period. Testing by industry sector was necessary to make inferences based upon the model coefficients and reduce the impact of unobserved variables commonly found in observational data.

The threat to the validity of the employment outcomes and remaining independent variables was lessened by the use of the QCEW data that captures employment covering 98 percent of the U.S. jobs by industry. The results of this study can be generalized with other studies that examine the differences in job flows by age and size of the firm.

6.3 Implications of Findings

This study contributes to ongoing research associated with the state's green economy and gross job flow studies. In terms of job creation, the results indicated there was no clear difference between California's green and non-green firms, regardless of firm age, size, or industry sector. Most green economy research points to the differences between green and non-green firms in regards to their ability to create jobs. The results of this study suggest a future direction for this research that should focus on examining economic traits commonly held by all firms that create jobs in economic upswings and downturns; regardless of the goods and services they produce.

Table 1. Independent and Dependent Variables		
Variable	**Variable Type**	**Variable Description**
Employment Outcomes	Dependent	1 = Net gain of jobs; 2 = No Change in job total 3 = Net loss of jobs;
Type of Firm	Independent	Dummy variable (1,0) used. Firms with at least a 25 percent of their respective workforce working any of their time creating green products or services (1). The reference group (0) is made up of establishments that do not have any employees working any of their time during a typical work day creation a green product or providing a green service.
Size of the Firm	Independent	Dummy variables (1,0) used. Size Class 0 (1-19 employees, control group (0)); Size Class 1 (20-99 employees) (1); Size Class 2 (100-249 employees) (1); Size Class 3 (>250 employees) (1).
Industry Sector	Independent	Dummy variable (1,0) used. North American Industry Classification System (NAICS) Industry Sectors (1); Professional, Scientific, and Technical Services industry sector is the control group (0).
Age of the Firm	Independent	Tally of the number of months an establishment was in business between January 2000 and January 2008. Source: Quarterly Census of Employment and Wages data from January 2000-January 2008.

Table 2. Descriptive Statistics					
	CA Green Economy Survey Firm Responses			Firm Observations Used in the Study	
Size Classes	**Firms**	**% of Total**		**Firms**	**% of Total**
0	598,638	84.3%		526,534	84.6%
1	94,559	13.3%		82,867	13.3%
2	11,299	1.6%		8,900	1.4%
3	5,520	0.8%		4,165	0.8%
Total	710,016	100.0%		622,466	100.0%

Note: The size class categories are as follows: Size class 0 (0-19 employees), size class 1 (20-99 employees), size class 2 (100-249 employees), size class 3 (>250 employees).

Table 3. Descriptive Statistics

CA Green Economy Survey Firm Responses

Size Classes	Green* Firms	Share of Size Total	Non-Green Firms	Share of Size Total	Size Total
0	42,406	7.1%	556,232	92.9%	598,638
1	9,087	9.6%	85,472	90.4%	94,559
2	1,595	14.1%	9,704	85.9%	11,299
3	1,156	20.9%	4,363	79.1%	5,520
Total	54,244	7.6%	655,771	92.4%	710,016

Firm Observations Used in the Study

Size Classes	Green* Firms	Share of Size Total	Non-Green Firms	Share of Size Total	Size Total
0	28,018	5.3%	498,516	94.7%	526,534
1	2,997	3.6%	79,870	96.4%	82,867
2	336	3.8%	8,564	96.2%	8,900
3	116	3.8%	4,049	97.2%	4,165
Total	31,467	5.1%	590,999	94.9%	622,466

* Firms with at least a 25 percent of their respective workforce working any of their time creating green products or services.

Table 4. Descriptive Statistics					
	CA Green Economy Survey Responses			**Observations used in Study**	
North American Industry Classification (NAICS) Sectors	**Firms**	**Share of Total**		**Firms**	**Share of Total**
Agri., Forestry, Fishing, and Hunting Sector	14,314	2.0%		13,212	2.1%
Mining, Quarrying, and Oil and Gas Extraction	371	0.1%		342	0.1%
Utilities	1,082	0.2%		547	0.1%
Construction	50,950	7.2%		42,197	6.8%
Manufacturing	31,971	4.5%		29,175	4.7%
Wholesale Trade	49,922	7.0%		46,237	7.4%
Retail Trade	87,153	12.3%		80,277	12.9%
Transportation and Warehousing	16,399	2.3%		14,548	2.3%
Information	13,994	2.0%		12,094	1.9%
Finance and Insurance	40,638	5.7%		37,225	6.0%
Real Estate and Rental and Leasing	35,203	5.0%		31,326	5.0%
Prof., Scientific, and Technical Services	90,000	12.7%		82,594	13.3%
Mgmt. of Companies and Enterprises	3,125	0.4%		2,784	0.4%
Admin. and Support and Waste Mgmt. Sector	35,728	5.0%		31,444	5.1%
Educational Services	20,295	2.9%		11,576	1.9%
Health Care and Social Assistance	81,491	11.5%		77,230	12.4%
Arts, Entertainment, and Recreation	10,952	1.5%		9,069	1.5%
Accommodation and Food Services	63,430	8.9%		57,543	9.2%
Other Services (except Public Administration)	47,983	6.8%		43,046	6.9%
Public Administration	7,808	1.1%		n/a	n/a
Unclassified	7,206	1.0%		n/a	n/a
Totals	**710,016**	**100.0%**		**622,466**	**100.0%**

Table 5. Logistic Regression Analysis of the Predictors of Employment Outcomes by SAS® Enterprise Guide (Version 4.2)

	β	SE β	Wald's x²	df	P Value	Odds Ratio	Inverse Odds Ratio
Type of Firm	-0.0101	0.0111	.8273	1	<.3630	0.990	1.010
Age of Firm	-0.0035	0.0001	2,352.2	1	<.0001	0.996	1.004
Size Class 1	0.7332	0.0000	10,395.4	1	<.0001	2.082	
Size Class 2	0.7000	0.0201	1,209.9	1	<.0001	2.014	
Size Class 3	0.9298	0.0295	992.9	1	<.0001	2.534	
Agri., Forestry, Fishing, and Hunting Sector	0.4522	0.0176	656.8	1	<.0001	1.572	
Mining Sector	0.1399	0.1009	1.92	1	0.1658	1.150	
Utilities Sector	-0.4440	0.0811	29.98	1	<.0001	0.641	1.560
Construction Sector	0.3079	0.0113	746.6	1	<.0001	1.361	
Manufacturing Sector	0.1368	0.0128	114.1	1	<.0001	1.147	
Wholesale Trade Sector	0.0655	0.0108	36.6	1	<.0001	1.068	
Retail Trade Sector	0.2200	0.0092	566.0	1	<.0001	1.246	
Transportation and Warehousing Sector	0.3113	0.0168	344.4	1	<.0001	1.365	
Information Sector	0.1130	0.0181	38.7	1	<.0001	1.120	
Finance and Insurance Sector	0.0938	0.0116	64.9	1	<.0001	1.098	
Real Estate and Rental and Leasing Sector	-0.2714	0.0124	476.7	1	<.0001	0.762	1.312
Mgmt. of Companies and Enterprises Sector	0.4419	0.0362	148.6	1	<.0001	1.556	
Admin. and Support and Waste Mgmt. Sector	0.1303	0.0124	111.0	1	<.0001	1.139	
Educational Services Sector	0.7531	0.0187	1,618.0	1	<.0001	2.124	
Health Care and Social Assistance Sector	0.1886	0.0093	407.9	1	<.0001	1.208	
Arts, Entertainment, and Recreation Sector	0.0633	0.0206	9.4	1	0.0021	1.065	
Accommodation and Food Services Sector	0.2776	0.0102	737.8	1	<.0001	1.320	
Other Services (except Public Admin.) Sector	0.0781	0.0111	49.8	1	<.0001	1.081	

Table 6. Predicted Probability of Employment Outcomes

							Predicted Probability*			
Z Score	Type of Firm	Age of Firm	Size Class 0	Size Class 1	Size Class 2	Size Class 3	Net Gain	No Change	Net Loss	Probability Total
	β = -0.0101	β = -0.0035	β = 0	β = 0.7332	β = 0.7000	β = 0.9298	Y=1	Y=2	Y=3	
0.33640	1	99	0	-	-	-	0.20	**0.43**	0.37	1
-0.39660	1	99	-	1	-	-	0.35	**0.44**	0.22	1
-0.36360	1	99	-	-	1	-	0.34	**0.44**	0.22	1
-0.59340	1	99	-	-	-	1	0.39	**0.42**	0.19	1
0.34650	0	99	0	-	-	-	0.20	**0.43**	0.37	1
-0.38650	0	99	-	1	-	-	0.34	**0.44**	0.22	1
-0.35350	0	99	-	-	1	-	0.34	**0.44**	0.23	1
-0.58330	0	99	-	-	-	1	0.39	**0.42**	0.19	1
0.00040	1	3	0	-	-	-	0.26	**0.44**	0.29	1
-0.73260	1	3	-	1	-	-	**0.43**	0.41	0.17	1
-0.69960	1	3	-	-	1	-	**0.42**	0.41	0.17	1
-0.92940	1	3	-	-	-	1	**0.47**	0.38	0.14	1
0.01050	0	3	0	-	-	-	0.26	**0.44**	0.30	1
-0.72250	0	3	-	1	-	-	**0.42**	0.41	0.17	1
-0.68950	0	3	-	-	1	-	**0.42**	0.41	0.17	1
-0.91930	0	3	-	-	-	1	**0.47**	0.39	0.14	1

n = 622,466 firms

* Highest probabilities in bold.

Table 7. Predicted Probability of Employment Outcomes (Agri., Forestry, Fishing, and Hunting Sector)											
								Predicted Probability*			Probability Total
Z Score	Agr. Sector	Type of Firm	Age of Firm	Size Class 0	Size Class 1	Size Class 2	Size Class 3	Net Gain	No Change	Net Loss	
	β = .4522	β = -0.0101	β = -0.0035	β = 0	β = 0.7332	β = 0.7000	β = 0.9298	Y=1	Y=2	Y=3	
-0.1158	1	1	99	0	-	-	-	0.29	**0.44**	0.27	1
-0.8488	1	1	99	-	1	-	-	**0.45**	0.39	0.15	1
-0.8158	1	1	99	-	-	1	-	**0.45**	0.40	0.16	1
-1.0456	1	1	99	-	-	-	1	**0.50**	0.37	0.13	1
-0.1057	1	0	99	0	-	-	-	0.28	**0.44**	0.27	1
-0.8387	1	0	99	-	1	-	-	**0.45**	0.40	0.15	1
-0.8057	1	0	99	-	-	1	-	**0.44**	0.40	0.16	1
-1.0355	1	0	99	-	-	-	1	**0.50**	0.37	0.13	1
-0.4518	1	1	3	0	-	-	-	0.36	**0.43**	0.21	1
-1.1848	1	1	3	-	1	-	-	**0.54**	0.35	0.11	1
-1.1518	1	1	3	-	-	1	-	**0.53**	0.35	0.12	1
-1.3816	1	1	3	-	-	-	1	**0.59**	0.32	0.09	1
-0.4417	1	0	3	0	-	-	-	0.36	**0.43**	0.21	1
-1.1747	1	0	3	-	1	-	-	**0.54**	0.35	0.11	1
-1.1417	1	0	3	-	-	1	-	**0.53**	0.36	0.12	1
-1.3715	1	0	3	-	-	-	1	**0.58**	0.32	0.10	1

n = 13,212 Agriculture, Forestry, Fishing, and Hunting firms
* Highest probabilities in bold.

Table 8. Predicted Probability of Employment Outcomes (Manufacturing Sector)											
								Predicted Probability*			
Z Score	Manuf. Sector	Type of Firm	Age of Firm	Size Class 0	Size Class 1	Size Class 2	Size Class 3	Net Gain	No Change	Net Loss	Probability Total
	β = .1368	β = -0.0101	β = -0.0035	β = 0	β = 0.7332	β = 0.7000	β = 0.9298	Y=1	Y=2	Y=3	
0.1996	1	1	99	0	-	-	-	0.23	**0.44**	0.34	1
-0.5334	1	1	99	-	1	-	-	0.38	**0.43**	0.20	1
-0.5004	1	1	99	-	-	1	-	0.37	**0.43**	0.20	1
-0.7302	1	1	99	-	-	-	1	**0.43**	0.41	0.17	1
0.2097	1	0	99	0	-	-	-	0.22	**0.44**	0.34	1
-0.5233	1	0	99	-	1	-	-	0.38	**0.43**	0.20	1
-0.4903	1	0	99	-	-	1	-	0.37	**0.43**	0.20	1
-0.7201	1	0	99	-	-	-	1	**0.42**	0.41	0.17	1
-0.1364	1	1	3	0	-	-	-	0.29	**0.44**	0.27	1
-0.8694	1	1	3	-	1	-	-	**0.46**	0.39	0.15	1
-0.8364	1	1	3	-	-	1	-	**0.45**	0.40	0.15	1
-1.0662	1	1	3	-	-	-	1	**0.51**	0.37	0.13	1
-0.1263	1	0	3	0	-	-	-	0.29	**0.44**	0.27	1
-0.8593	1	0	3	-	1	-	-	**0.46**	0.39	0.15	1
-0.8263	1	0	3	-	-	1	-	**0.45**	0.40	0.15	1
-1.0561	1	0	3	-	-	-	1	**0.51**	0.37	0.13	1

n = 29,175 Manufacturing firms
* Highest probabilities in bold.

Table 9. Predicted Probability of Employment Outcomes (Real Estate and Rental and Leasing)											
								Predicted Probability*			Probability Total
Z Score	R.E. Sector	Type of Firm	Age of Firm	Size Class 0	Size Class 1	Size Class 2	Size Class 3	Net Gain	No Change	Net Loss	
	β = -.2714	β = -.0101	β = -0.0035	β = 0	β = 0.7332	β = 0.7000	β = 0.9298	Y=1	Y=2	Y=3	
0.6078	1	1	99	0	-	-	-	0.16	0.40	**0.43**	1
-0.1252	1	1	99	-	1	-	-	0.29	**0.44**	0.27	1
-0.0922	1	1	99	-	-	1	-	0.28	**0.44**	0.27	1
-0.3220	1	1	99	-	-	-	1	0.33	**0.44**	0.23	1
0.6179	1	0	99	0	-	-	-	0.16	0.40	**0.44**	1
-0.1151	1	0	99	-	1	-	-	0.29	**0.44**	0.27	1
-0.0821	1	0	99	-	-	1	-	0.28	**0.44**	0.28	1
-0.3119	1	0	99	-	-	-	1	0.33	**0.44**	0.23	1
0.2718	1	1	3	0	-	-	-	0.21	**0.43**	0.35	1
-0.4612	1	1	3	-	1	-	-	0.36	**0.43**	0.21	1
-0.4282	1	1	3	-	-	1	-	0.35	**0.43**	0.21	1
-0.6580	1	1	3	-	-	-	1	0.41	**0.42**	0.18	1
0.2819	1	0	3	0	-	-	-	0.21	**0.43**	0.36	1
-0.4511	1	0	3	-	1	-	-	0.36	**0.43**	0.21	1
-0.4181	1	0	3	-	-	1	-	0.35	**0.43**	0.21	1
-0.6479	1	0	3	-	-	-	1	0.41	**0.42**	0.18	1

n = 31,326 Real Estate and Rental and Leasing firms
* Highest Probabilities in bold.

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Notes

[1] See Goodman and Mance (2011): "Employment loss and the 2007-09 recession: an overview" in April 2011, Monthly Labor Review.

[2] The IHS is a global information company with world-class experts in the pivotal areas shaping today's business landscape: energy, economics, geopolitical risk, sustainability and supply chain management. Global Insight was acquired by the IHS in 2008. http://www.ihs.com/index.aspx

[3] See Global Insight (2008).

[4] See Pew Charitable Trusts (2009): "*The Clean Energy Economy"* for a detailed explanation of the methodology used to development employment estimates.

[5] There is no standard definition of clean technology. For the purpose of this study, we reference the definition provided by GreenBiz.com. Clean technologies are the many products and services that increase business efficiency while also bringing down expenses and other cost, such as environmental costs. http://www.greenbiz.com/topic/clean-tech

[6] See *Federal Register* 75:182 (2010) for information on the definition of a green job.

[7] See California Employment Development Department (2010): "*California's Green Economy: Summary of Results*" for a detailed overview of the G.R.E.E.N classification of workers.

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[8] The Quarterly Census of Employment and Wages (QCEW) program publishes a quarterly count of employment and wages reported by employers covering 98 percent of U.S. jobs, available at the county, metropolitan statistical area, state and national levels by industry. The Bureau of Labor Statistics provides a comprehensive explanation of the data structure and statistical assumptions of the QCEW. http://www.bls.gov/cew/

[9] The Bureau of Labor Statistics Office of Survey Methods Research identifies certainty units as business entities that contribute to state unemployment insurance programs and represent a significant portion of the economic activity in an industry or geographic area. http://www.bls.gov/osmr

[10] See California Employment Development Department (2010).

[11] See California Employment Development Department (2010).

[12] Firms are liable to pay State payroll taxes (e.g., Unemployment Insurance (UI)) upon paying wages over $100 in a calendar quarter to one or more employees. *California Unemployment Insurance Code, Article 3 (675)(2012)*.

[13] Zeroes in the months between January 2008 and July 2008 are added to the tally due, but not limited to the following reasons: administrative data not reported, but still in business, statistical estimate of employment was not created by the QCEW in response to a lack of reported data.

[14] See California Employment Development Department (2010). "*California's Green Economy: Summary of Results*" for a detailed overview of the survey questions.