

Growing a Green Job: Essays on Social Movements and the Emergence of a New Occupation

By

Ryan Alan Hammond

B.S. Industrial and Labor Relations, Cornell University, 2000

M.S. Industrial and Labor Relations, Cornell University, 2002

Submitted to the Sloan School of Management
in partial fulfillment of the requirements for the degree of

ARCHIVES

Doctor of Philosophy in Management

at the

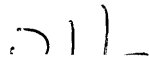
Massachusetts Institute of Technology

September 2012

© 2012 Ryan Hammond. All Rights Reserved

The author hereby grants to MIT permission to reproduce and distribute publicly paper and electronic copies of this dissertation in whole or in part.

Signature of Author: _____



Ryan Hammond

MIT Sloan School of Management

August 2012

Certified by: _____



Thomas A. Kochan

George M. Bunker Professor of Management

Thesis Supervisor

Accepted by: _____



Ezra Zuckerman Sivan, Chair, Doctoral Program

Sloan School of Management

Growing a Green Job: Essays on Social Movements and the Emergence of a New Occupation

By

Ryan Alan Hammond

Submitted to the Sloan School of Management August 8th, 2012 in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Management

Abstract:

Professions and occupations play a central role in shaping institutional arrangements, organizational forms, and individual organizations. I argue the emergence and development of new occupations should be among the central concerns of scholars interested in the development of new fields and market activities. To develop this argument the thesis uses the case of residential energy auditing as an emerging occupation to demonstrate how old and new forms of environmental activism have shaped key processes in the development of the occupation.

The first piece of empirical work employs historical field analysis to show that three core processes of occupation formation – the creation of new practices and abstract knowledge, task bundling and shaping of favorable market demand – were directly linked to the efforts of social movement activists and organizations over a 40-year period. I conclude that social movements can provide one means by which new, institutionally weak occupations can successfully carve out a space within the division of labor.

The second empirical chapter investigates the impact of recent green job activism in the geographic diffusion of voluntary worker certification in the field. Using longitudinal individual certification data, I find that specific social movement mobilization efforts did not lead directly to increased voluntary certifications in a state. However, higher rates of voluntary certification are positively associated with states containing higher levels of individual support for environmental values aligned with environmentalist frames and stronger environmental policies.

In the third empirical chapter, I study whether the framing of residential energy auditing as a green job is affecting the dynamics of participation in the new occupational communities arising during the American Recovery and Reinvestment Act. I find evidence that framing the job as a green job has substantially impacted entry into the occupation and that those with stronger environmental values are participating more actively in the newly forming occupational communities in part due to an increased normative commitment to the occupation.

Thesis Committee:

Thomas Kochan (Chair) - *George Maverick Bunker Professor of Management, Professor of Work and Employment Research*

Emilio Castilla - *W. Maurice Young (1961) Career Development Professor of Management, Associate Professor of Work and Employment Research*

Paul Osterman - *Nanyang Technological University Professor, Professor of Human Resources and Management*

TABLE OF CONTENTS

Acknowledgements.....10

Chapter 1: Emerging Occupations – Introduction to the Case of Residential Energy Auditors12

Introduction and Motivation.....13

New Occupations: An Opportunity for Creating Jobs and Shaping Job Quality..... 13

Social Movements, Occupations and Market Transformation.....16

Organization of the Dissertation.....18

Residential Energy Auditing: A Description.....21

Demographic and Job Characteristics of Energy Auditing.....26

Data Collection and Sample Frame.....27

Demographics of Energy Auditors.....31

Job Characteristics of Residential Energy Auditing.....34

Conclusion.....37

References.....39

Chapter 2- Planting the Seeds of an Occupational Mandate: The Environmental Movement and Residential Energy Auditing.....41

Introduction.....41

Literature Review.....42

Theory.....45

Creation of Abstract Knowledge and New Practices.....45

<i>Task Bundling</i>	47
<i>Shaping Labor Demand</i>	48
Data and Methods	50
Field Analysis	52
<i>Field Frame 1: 1950s to 1973 – Growth Through Energy</i>	
<i>Consumption and Passive Regulation</i>	57
<i>Field Frame 2: 1973-1985: From Growth Through Consumption</i>	
<i>To Conservation and Active Regulation</i>	61
<i>Field Frame 3: 1985-2006 – Demand-side Management,</i>	
<i>Deregulation and Low-Income Programs</i>	69
<i>Field Frame 4: 2006-2012 – Green Jobs and Solving Market</i>	
<i>Failures</i>	78
Discussion	90
References	93

Chapter 3 – Green Thumbs: Institutional and Market Effects in the

Diffusion of Voluntary Worker Certification in Residential Energy

Efficiency	98
-------------------------	-----------

Introduction	98
---------------------------	-----------

Voluntary Worker Certification and Early Institutionalization

<i>Of Occupations in Nascent Markets</i>	100
--	-----

Market and Institutional Forces Driving Worker Certification

In Residential Retrofits.....103

Hypotheses.....110

Data.....112

Model and Results.....121

Discussion and Conclusion.....129

Limitations and Future Research.....130

References.....133

Chapter 4 – Social Movements and the Construction of Occupational

Communities: Green Jobs and the Emerging Occupation of Home Energy Auditor...136

Introduction.....136

**The Development of Residential Energy Auditing and the Framing
of a Green Job**.....141

Residential Energy Auditing as an Emerging Occupation..... 141

The Creation of the Green Jobs Frame and Residential Energy

Auditing.....143

Methods and Data.....149

**Social Movements, Resource Mobilization and Frame Alignment in an
Emerging Occupation**.....152

Frame Bridging.....156

<i>Frame Amplification</i>	158
<i>Frame Extension and Frame Transformation</i>	159
Hypotheses	162
<i>Frame Alignment and Occupational Commitment</i>	163
<i>Alignment with Social Movement Framing, SMO Membership and Participation in Occupational Communities</i>	170
Data and Results	174
Discussion	199
Limitations and Future Research	202
References	204
Chapter 5 – Signs of Spring: Conclusions and New Directions	208
References	216

Acknowledgements

This page in any dissertation is the most important. As anyone who has been through the process of writing a dissertation is acutely aware, it does not happen without the generous support of a community of scholars. To my committee Tom Kochan, Paul Osterman and Emilio Castilla I owe a debt of gratitude I can never fully repay for shepherding me from an ambitious but very green graduate student to a tired, realist with a completed dissertation. I want express special thanks to Tom for the many generous hours he put in advising, giving feedback and consoling throughout the process. He was also especially understanding and supportive of the challenges facing a graduate student with a large family in tow. I could not have asked for a better chair.

Also deserving special mention are my fellow Sloan BPS survivors, friends and now colleagues – Phil Anderson, Joelle Evans, Eun-Suk Lee, Roman Galperin, Seth Pipkin, Oliver Hahl, Kate Parrot, Jae Ha, Alan Benson and many others. Your encouragement, insight and friendship simply cannot be valued highly enough.

I would also like to thank some friends outside my program, evidence that it is possible to have a life outside of graduate school. To the Walthers, Dionnes, Gillespies, Freese-Whites, Theobalds, the Ola community and so many others you helped make Cambridge more than just a stop on our way to somewhere else. You made it our home.

Next, I want to thank my parents not only for raising me to seek out challenges, but for being supportive of our crazy, bohemian, ivory-tower meanderings of their oldest son. To my children Daegan, Finnian, Esme and Linnet, you were the best reasons ever to take 6 years to finish my degree. Hopefully, this experience hasn't scared you off of school for good! I do not regret a single moment I spent playing soccer, camping, swimming, laughing, reading and just being with you. I feel so fortunate to have been able to spend so much time with you at ages when many parents do not have the flexibility to do so. I hope you remember these days as fondly as I will.

Finally, to my best friend Elizabeth, the person who sacrificed the most to make this possible, I owe you a debt that I can never, never repay. This accomplishment is as much yours as mine, and I wouldn't have it any other way. Here is to many more crazy adventures together. You get to choose the next one.

Chapter 1: Emerging Occupations – Introduction to the Case of Residential Energy Auditors

A MIDDLE-AGED WOMAN STANDS IN THE ENTRYWAY OF AN OLD CAPE COD STYLE HOME BUILT IN THE EARLY 1900S FIDDLING WITH A TACHOMETER. WEDGED IN THE DOOR IS A BLOWER DOOR, A CONTRAPTION MADE OF AN ALUMINUM FRAME AND SOME HEAVY CANVAS WITH A HOLE IN IT. IN THE HOLE IS A LARGE FAN. IN A FEW MOMENTS SHE WILL TURN IT ON TO DEPRESSURIZE THE HOME, BLOWING AIR OUT OF THE HOUSE SO THE HOME WILL SUCK MORE IN THROUGH ITS CRACKS AND PORES. AS THE FAN RUNS SHE WILL PROCEED TO WANDER THROUGH THE HOME SEARCHING FOR LEAKS, FEELING ALONG WINDOWSILLS AND FLOORBOARDS, POINTING AN INFRARED CAMERA AT CORNERS AND WALLS. SHE WILL INSPECT THE BOILER AND VENTILATION SYSTEM, CRAWL INTO THE ATTIC AND MAYBE UNDERNEATH THE FLOOR, EVALUATING INSULATION AND BUILDING TECHNIQUES. THE TOTAL PROCESS WILL TAKE ABOUT THREE HOURS. SHE WILL LEAVE AND FEED THE READINGS ALONG WITH THE CUSTOMER'S UTILITY BILLS INTO A COMPUTER PROGRAM AND MODEL THE HOUSE'S ENERGY USE. A FEW DAYS LATER SHE WILL CALL ON THE HOMEOWNER WITH A LIST OF "SPECS" – RECOMMENDED IMPROVEMENTS TO BE MADE IN THE HOME'S ENERGY EFFICIENCY ALONG WITH ESTIMATED COSTS AND SAVINGS. SHE WILL HAVE PERFORMED AN ENERGY AUDIT. THIS WOMAN HAS SPENT MOST OF HER WORK DAYS FOR THE LAST TWO YEARS PERFORMING SUCH AUDITS IN SERVICE OF A NEW UTILITY PROGRAM WHICH PAYS FOR THESE AUDITS FOR THEIR CUSTOMERS AND WILL EVEN SUBSIDIZE THE COST OF SOME OF THE WORK BASED ON HER RECOMMENDATIONS. ASKED HOW SHE WOULD DESCRIBE HER WORK SHE PROUDLY IDENTIFIES HERSELF AS A HOME ENERGY AUDITOR AND GREEN-COLLAR WORKER.

Introduction and Motivation

The forces that determine the shape of the division of labor are of acute interest to social scientist from the fields of economics, sociology and industrial relations. This dissertation is a study of the early social processes by which new occupations emerge within the division of labor. I take an approach rooted in sociology and industrial relations that preferences the role of institutions and institutional change agents in explaining the shape and consequences of the modern division of labor. Industrial relations scholarship has tended to focus on different labor market regulations' ability to broadly promote job quality and stability across many occupations (Osterman 1999; Kochan 2005; Osterman and Shulman 2011). Research rooted in sociology has demonstrated that variation in the social organization of individual occupations and their institutionalization in the division of labor can also play a key role in determining the stratification of occupations along such dimensions as its prestige, pay, and prospects for socioeconomic mobility (Abbott 1988; Weeden 2002). However, almost all of this scholarly work on occupations focuses on the competition for substantive and cultural resources between well-established occupations, particularly those occupations powerful enough to be considered professions. Nelson and Barley (1997) have called this the systematic "left-censoring" of the study of occupations.

New Occupations: An Opportunity for Creating Jobs and Shaping Job Quality

Today, the need to understand the processes associated with creation of new activities, jobs and occupations has taken on increased urgency. The United States and many other advanced industrial economies are facing large job deficits. In the United States, for example, 8.4 million jobs were lost between the financial and housing collapse in 2008 and the summer of 2010 (Department of Labor 2011). Even as a fragile recovery has begun, jobs have been slower

to bounce back than other aspects of the economy, a growing trend seen in the economic downturns and recoveries of the past two decades. This trend of increasingly jobless recoveries has led policy makers, academics, labor organizations and others closely involved in labor markets to recognize job creation as one of the country's most pressing social problems. Not surprisingly, job creation and unemployment will be one of the central issues, if not the central issue, in the 2012 presidential campaign. Where are new jobs going to come from, especially if typical cyclical market forces do not appear sufficient to spur enough rehiring of individuals? One partial answer is to spur the creation of new sectors and services and the new occupations that accompany them. My dissertation focuses on one such effort, the effort to create "green-collar jobs" through dramatically growing a new market-driven sector for residential energy retrofits.

The market for services to do comprehensive energy efficiency retrofits has long been hampered by a number of recognized market failures (Blumstein, Krieg et al. 1980; Jaffe and Stavins 1994; Golove and Eto 1996; Weber 1997). One of the key initiatives of the America Reinvestment and Recovery Act (ARRA), the most significant legislative effort to address the jobs crisis in the United States focused on an initial heavy investment in residential energy retrofits coupled with government-aided efforts to solve some of these significant market barriers to create a functioning, sustainable market going forward.

Within this reinforced sector of residential energy retrofits most of the jobs created have been and will be standard construction and mechanical installation jobs – putting in new windows, upgrading HVAC systems, installing insulation – organized primarily within existing occupations. However, one of the occupations, residential energy auditing, has been proposed as potentially central to the organization of work in a new, revamped market for retrofits (DOE

2011). Residential energy auditing emerged in the 1970s and began developing an occupational structure, an effort that stalled in the 1980s and 1990s. It has now re-emerged as a highly symbolic “green job” and begun to again develop the hallmarks of an occupation. The dissertation focuses on the social processes which have fostered, hindered and shaped this emerging occupation over time.

I have chosen to study early processes in the organization and emergence of this new occupation, which may help imprint and determine the form of the occupation, including substantive outcomes such as its wage profile, skill level and prospects for providing a career ladder with economic mobility.¹ In a fragmented industry sector such as residential contracting, more diffuse social processes are even more likely to play a major role. If broader labor regulations and traditional labor market institutions such as unions in the United States remain weak or even continue to weaken, the ability of occupations to manufacture occupation-specific control of labor supply and wage protections will continue to be even more important in the quest to create good jobs. As the time-limited federal incentives in ARRA run out, this fledgling occupation is faced with the challenge of driving demand for its services from other stakeholders (Weeden 2002). This requires building legitimacy and occupational mandate in the minds of consumers, organizations and the state from a place of collective weakness for its incumbents, a challenge shared by many newer occupations in less established industries (Hughes 1984; Nelsen and Barley 1997; Sherman 2010).

¹ I will present preliminary data on wages, benefits and other elements of job quality from data gathered during my research. The first data based on a nationally representative sample is scheduled to be released after the completion of the dissertation. This will leave any arguments as to the potential impacts about job quality untested and the subject of future research. However, I believe it is important to make these links throughout the dissertation as it is critical to the motivation for studying the more nascent periods of the occupations’ attempt at formation.

Social Movements, Occupations and Market Transformation

Embedded in this larger, longer-term motivation is the opportunity to add to the understanding of the dynamics social movements can bring to market formation. Currently, this is an academic discussion that has focused almost entirely on the formation of new organizational forms and entrepreneurial foundings while ignoring the consequences to the division of labor that underlies these organizations (Barley 1996; Barley 2008; Schneiberg and Lounsbury 2008).

This gap is surprising given the widely recognized role professions and occupations play in structuring markets. It has long been a core tenet of institutional theories that professions and occupations play a central role in both the reproduction (DiMaggio and Powell 1983; Strang and Sine 2002) and significant transformation of markets and institutions, and the organizational forms which populate them (Scott 2000; Greenwood, Suddaby et al. 2002; Rao, Monin et al. 2003; Lounsbury and Crumley 2007). Professional groups and occupational communities are important sites for doing the institutional work of theorizing, frame construction, and the creation and diffusion of new practices across organizations (DiMaggio and Powell 1983; Lounsbury and Kaghan 2001; Strang and Sine 2002; Lawrence and Suddaby 2006). Given the central role which professions and occupations play in shaping institutional arrangements, organizational forms, and specific organizations, their emergence and development should be among the central concerns of scholars interested in the development of new fields and market activities (Dimaggio, 1991; Weber, Heinz and DeSoucey, 2008, Nelson and Barley, 1997).

However, while there is a significant and growing body of work analyzing established professions as social-movement-like collective actors (Bucher and Strauss 1961; Zald and Berger 1978; Rao, Monin et al. 2003; Lounsbury and Crumley 2007; Schneiberg and Lounsbury 2008),

research which investigates the impact of social movements and their institutional entrepreneurship directly on the structure of emerging occupations in a new market is far less developed. This gap is embedded in a larger scarcity of work on cultural dynamics of occupational emergence (Nelsen and Barley 1997; Sherman 2010) and work which plies the boundaries of the sociology of occupations and sociology of organizations (Barley and Tolbert 1991; Barley and Tolbert 1997; Lounsbury and Kaghan 2001; Barley 2008).

Occupations and professions provide a distinct vector along which social movements may imprint their norms, practices, and values on market activity. Because their communities and social structures span not only organizations, but often different organizational forms, their influence may continue to shape market activities independently of entrepreneurial actions and intent. The dynamics of emerging occupations may be of special interest to those concerned with the emergence of new industries and organizational forms, as they can be key building blocks in what renders the new services or organizations unique and novel. This is true of residential energy auditing as an activity.

The small amount of research on social movements which does directly address emerging occupations in new industries has been focused mostly on the actions and beliefs of the activists entering and trying to shape the occupation, or on the organizational level, studying the decisions of organizations to create new positions (Lounsbury 2001; Lounsbury and Kaghan 2001; Weber, Heinze et al. 2008). The need to focus on a broader range of actors is especially important during the critical moment in the development of any social-movement-fostered occupation when its legitimacy and access to resources become significant enough to attract the interest of more opportunistic actors who lack alignment with the social movement's norms, values, and goals (Lounsbury, Ventresca et al. 2003; Hiatt, Sine et al. 2009). It is also important to trace the full

history of these efforts, rather than analyze particular events or social movement initiatives at a single point in time. Taking a long historical look is critical to capturing the full struggle with, as we will see in this case, multiple failures before some successes are realized and sustained.

The case of residential energy retrofits and the emergence of energy auditing as a new and central occupation in the industry's organization provides a relatively unique opportunity to collect data and study a social-movement-impacted young occupation in situ. Each of the chapters will elaborate on different dimensions by which social movements specifically can come to effect occupation formation from shaping at the level of the field the opportunities for occupational emergence, to affecting how key early forms of occupation institutionalization in the form of voluntary certifications diffuse to psychological mechanisms of identity and commitment. This responds to the extant need both for multivariate research to augment the case study and historical approaches prevalent in the field and for research which better details the more micro-level mechanisms invoked by macro-level researchers to explain their findings (Powell and Colyvas 2008; Schneiberg and Lounsbury 2008). It can be informative in understanding not only other new green jobs but also other markets where social movements play a role in creating new products or services.

Organization of the Dissertation

I end this introductory chapter with a basic description of residential energy auditing as an emerging occupation. I first provide a brief description of the tasks and work routines that have come to define residential energy auditing. Next, using a unique survey of residential energy auditors who sought certification in 2010 through 2012, I provide the first basic demographic and job characteristics data for the occupation. In the remaining chapters, I detail

three specific social processes that help explain the development of the occupation and the role that social movement organizations and their framing of the occupation play in each. These are not meant to be exhaustive and I make no claims to some comprehensive model for occupational emergence. However, each of the processes detailed, I believe, can be informative for a broader category of occupations, especially those that emerge in the specific context of social movement activism within the market.

Chapter 2 uses a field analytic approach to follow the residential energy auditing from its origins in the 1970s through its fallow period in the 1980s to 1990s and then in its current reemergence as a green job. Examining the forces which shaped the regulatory, market and organizational environment across these periods and how they supported or inhibited the ability of residential energy auditors to establish themselves as a distinct occupation, this chapter lays a historical foundation.

Chapter 3 examines the dynamics of the diffusion of voluntary certifications related to residential energy auditing in the most recent period of emergence. Little research has studied voluntary certifications as a labor institution, partly I argue because in the past it had been seen as only a preliminary step to stronger forms of social closure such as state licensure. However, this belies the growing importance of voluntary certification as a growing labor institution in the modern economy as well as the potential imprinting effects of early institutionalization efforts. Using longitudinal, state-level data on individual certification by the Building Performance Institute (BPI) both before and after the green job mobilization in residential energy efficiency ARRA, I investigate the relationship between the rise of certification and different market and institutional forces.

Chapter 4 takes a more micro-look, studying the potential impact of environmental and union activists framing residential energy auditing as a “green job” on the social structure of the nascent occupational community. Using interviews and a unique survey of individuals who sought certification as building analysts, I test whether the attitudes and beliefs compatible with the green job framing are correlated with the forms of normative occupational commitment and moderate the amount of discretionary time and effort individuals spent in occupational community-building activities.

The final chapter discusses what the research implies for the future of residential energy auditing as an occupation and its prospects for becoming a good job. It still faces many risks in continuing to build a separate and distinguishable occupation, in sustaining the jobs already created and in cultivating the characteristics of a high-quality job. The most severe of these is the collapse of federal monetary support for residential energy efficiency. Given the current political and fiscal environment, the continuation of federal incentives and subsidies is virtually non-existent. However, some utilities and states have filled some of the gap and the innovation -- primarily market and institutional innovations around finance, training and organizational forms -- leaves hope that a substantial and stable residential energy efficiency sector will survive. I propose that these conditions are likely to be met in states with strong environmental lobbies, thereby extending the influence that social movements have in structuring this occupation institutionally and culturally. Even so, the potential for energy auditing as an occupation to rebuff absorption into existing occupations and establish itself as a high-road, family-sustaining job will be limited unless energy auditors can successfully convince consumers of the validity and value of their services, and help develop and advocate for business models and organizational forms which accept the energy auditing profession’s occupational mandate.

Residential Energy Auditing: A Description

What does a residential energy auditor know and do? While the definition of what constitutes residential energy auditing as a bundle of tasks and thus an occupation is still in flux, a number of efforts to define its core elements have been underway. The most institutionally powerful and salient of these has been the definition developed by O*NET, currently the most detailed, official occupational classification system used by United States government.² In 2009, O*NET launched a major research effort to “investigate the impact of green economy activities and technologies on the occupational requirements in an effort to determine their impact on current O*NET-SOC occupations and to identify new and emerging (N&E) occupations that may be considered for inclusion into the O*NET-SOC system” (Deirdorf, et al., 2009, p. 3). Energy auditing was chosen by O*NET as one of the new and emerging green occupations. It describes the core of energy auditing as “conduct[ing] energy audits of buildings, building systems, and process systems [and] may also conduct investment grade audits of building and systems” (ONET, 2011).

The Department of Energy through the National Renewable Energy Lab (NREL) sponsored a separate task analysis to define the job of home energy auditor and defined it as follows:

“An Energy Auditor is a building scientist who evaluates the energy efficiency and health & safety of a building and identifies areas for savings by gathering empirical data, conducting tests and using energy modeling software, in order to reduce the energy

² O*NET replaced the long standing Dictionary of Occupational Titles in 1998. It provides more detailed breakdowns of the Standard Occupational Codes (SOC codes) with finer grained task definitions and job requirements.

consumption, improve the safety, and increase the lifespan of a building; while improving the quality of life and comfort for building occupants.” (2010, p.2)

Defining an energy auditor as a “building scientist” is significant. As will be detailed more fully in Chapter 2, building science is an applied field of physics dedicated to how the mechanical systems used for heating and cooling in a home interact with the home’s structural features including its design, materials and insulation (Kriger and Dorsi 2009). An appeal to the knowledge base of building science is one way in which energy auditors distinguish themselves from HVAC installers and trades involved in home construction (Segerstrom 2009).

A typical technical home energy audit takes about three to four hours and will employ a number of diagnostic tools such as a blower-doors, infrared cameras and “duct-blasters” as well as in-depth inspections of the home’s mechanical and structural elements. The goal of an energy audit is to measure the overall efficiency of a home’s energy usage and estimate the returns to various interventions to increasing its efficiency. Energy auditors are also increasingly taking on quality assurance roles in many programs which require evaluating the quality of installation efforts and often judging them against a varying set of codes and standards established by states and utility companies (Kriger and Dorsi 2009). Energy auditors tend to emphasize their place as an expert occupation which applies the theoretical understanding of building science to the idiosyncratic case of each home and deemphasize any role they play in actual installation.

The tasks now identified with energy auditing, as with any occupation, can be and are often done by individuals outside this occupation as well as those inside, even for well-established and well-defined occupations. Because of the rapidly growing and changing nature of the home energy retrofit field in the wake of ARRA, the bundling and sharing of tasks between

occupations associated with home retrofits was of considerable interest to industry analysts and researchers. At the request of Lawrence Berkley National Labs and BPI, I included a survey module given to individuals who took one of BPI's certification exams in July and August of 2011 on the frequency of different tasks they performed within the home retrofit industry. The survey was presented to each of the 1,684 individual before they took their exam, though they could choose to complete it after the exam as well. The task questions comprised one of four modules, each of which were randomly administered in one-fourth of the survey. Of the 411 individuals who had the opportunity to answer these task-related questions, 148 or roughly 36% responded. Of these 84 identified their primary job as home energy auditor (N=43) or as an HVAC/insulation installer or crew chief (N=41). While small, this unique data sample illustrates the basic contours of the variability that exists in how some of the basic tasks are bundled. Table 1 breaks down the frequency with which individuals who identified their primary job as home energy participated in four tasks and compares these same breakdowns against individuals who identified their primary job as installation workers (insulation or HVAC) or as crew chiefs.

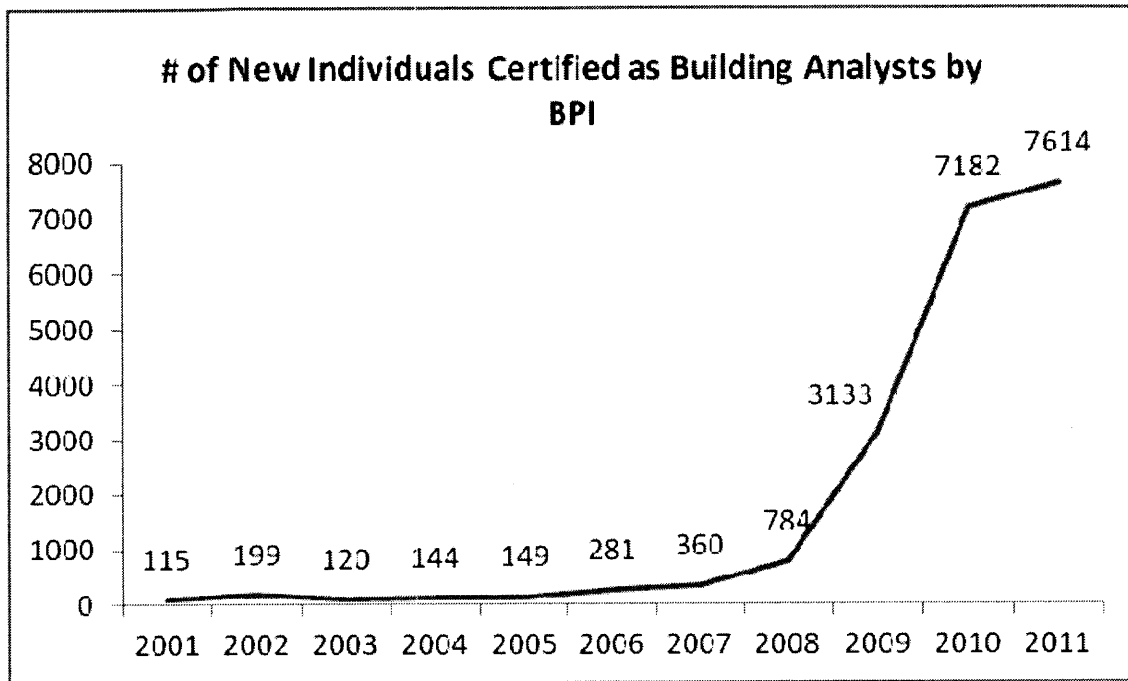
Table 1: Percent of Reported Frequency of Performing Certain Home Retrofit and Auditing Tasks

Activity	Residential Energy Auditor			Installation Worker or Crew Chief		
	Never/ Rarely	Sometimes	Often/ Always	Never/ Rarely	Sometimes	Often/ Always
Perform Blower Door Tests	21%	28%	51%	37%	22%	41%
Perform Duct Blaster Tests	56%	28%	16%	80%	12%	7%
Create detaile work scopes for retrofits	23%	37%	40%	65%	23%	13%
Install/Repair HVAC equipment	86%	12%	2%	65%	13%	23%
Install insulation and building envelope measures	52%	21%	26%	20%	20%	60%
Directly supervise retrofits	56%	23%	21%	29%	29%	41%

The data show that there is still wide variability in how even some of the core tasks identified with home energy auditing such as blower-door testing and creating work scopes for retrofits are distributed across occupations. For example, one in five employed home energy auditors report never or rarely performing blower-door tests, a central task in technically advanced audits, potentially speaking to the persistence of a lower-skill version of auditing. Similarly, almost one in four report never or rarely creating detailed work scopes for retrofits. Conversely, many individuals who identify primarily as installation workers and crew chiefs report performing blower-door tests often, just below the rate of employed energy auditors. Clearly, at least in this early sample, energy auditors do not enjoy a monopoly over this core technical task. This is consistent with continued variability in industry practice in how work is organized with many contractors adding energy auditing tasks to their repertoires. Yet clear tendencies emerge in the data that seem to distinguish energy auditing work from its other adjacent occupations. Energy auditors are far less likely to actually install measures or to directly supervise the work while being clearly more likely to define the scope of work for retrofits.

There is no source for data on the number of individuals who identify themselves as residential energy auditors currently or historically. Currently, the BLS is undertaking a study to try to count green jobs, including those of energy auditors. What is clear, however, is that there has been a significant rise in the energy auditors in the last few years. Figure 1 shows the number of individuals who have become certified as “Building Analysts” through BPI, the most prevalent certifying organization in home energy retrofits. Less than 200 new individuals were being certified each year in the basic tasks of energy auditing until the green job mobilization in the last three years. Since then the number of people seeking certification has risen to over 7,000 certifications a year and, while flattening out, it remains at this much higher level.

Figure 1: New Building Analyst Certified by Building Performance Institute by Year



Another simple measure of the increase in the prevalence of energy auditing comes from the DSIRE database at North Carolina State University. This database collects information on state and local incentive programs that support renewable energy and, since 2006, energy efficiency. Table 2 shows the number of states that had incentive programs for residential energy efficiency retrofits that included home energy audits. It increased from just 7 states in 2006 to 38 in 2010 and from 7 total programs to 88 in the same time period.

Table 2: State Programs Specifically Requiring a Home Energy Audit

	2006	2007	2008	2009	2010
# of States with at least 1 Program Requiring a Home Energy Audit	7	19	16	20	38
Total # of State Programs Requiring a Home Energy Audit	7	35	36	37	88

While very coarse, these measures show a clear pattern of exploding demand for at least the tasks involved in home energy audits.

Demographic and Job Characteristics of Energy Auditing

So who are those entering the occupation of energy auditing and what do the quickly expanding energy auditing jobs look like? One difficulty in studying new occupations for researchers is the lack of representative data and the inability to get a decent sample frame for collecting original data. Unlike established occupations categorized and tracked by the Bureau of Labor Statistics through expensive national random sample surveys or organized in professional associations or other groups that can provide access to a broad sample of the occupational community, individuals in emerging occupations are difficult to identify and survey. This helps partially explain why most research on emerging occupations has been qualitative in nature.

The rapid expansion of energy auditing due to the mobilization of federal resources influenced by environmental and labor activists and political operatives provides a unique opportunity to collect data at a point of important transition for a job that does not yet have the trappings of an occupation but is rapidly developing them. The fast-moving developments in the field required seeking a reasonable sample frame that captured not just individuals who identified or were employed as energy auditors but also individuals who could potentially

identify as energy auditors because they participated in at least some of the tasks of energy auditing. The geographically diffuse nature of the residential retrofit industry and the wide variation in institutional supports across states and localities made it important to find a national rather than local sample.

Data Collection and Sample Frame

I use a sample frame of individuals who sought to obtain a certification in the application of building science to home retrofits offered by the Building Performance Institute. BPI certification has quickly become the dominant certification in the area of energy auditing and home retrofits. Its specific training and certification guidelines were heavily influential in creating the workforce development and training standards developed by US Department of Labor. There are, however, other organizations offering relevant certification. RESNet, which focuses mostly on energy ratings for new construction homes rather than retrofits of existing homes, is the largest alternative. Also, local certifications and training certificates have begun to appear as well. Some utility companies and WAP organizations have their own training programs for auditors and do not necessarily send individuals for BPI certification (Goldman, Peters et al. 2010). Still, BPI offers the most nationally recognized and increasingly important certification. In 2010, BPI certification and accreditation was specifically written into the pending HomeStar legislation, which would have required contractors to gain BPI certification to be eligible to offer homeowners large government incentives. This led many already trained or otherwise certified individuals to seek BPI certification. While the legislation ultimately did not pass, it helped cement BPI's certification as the gold standard. The Department of Energy then chose BPI in a competitive process to pilot four new weatherization-specific certifications,

including one for energy auditor. In the absence of other more representative data, using individuals who sought certification from BPI seems like a reasonable proxy and at the very least represents a very important subset of potential energy auditors, individuals who invested at least a moderate amount of effort and money to seek certification and were exposed to significant opportunities for continuing education, training and participation in the occupational community.

In partnership with BPI, I have collected information regarding individuals who have taken any of BPI's certification exams beginning in January 2010 and continuing to today. I have done so through two different data collection efforts. The first was an email survey sent out between December 2010 and January 2011 to individuals who sat at least one certification exam from January to November 2010. When an individual takes a BPI exam, BPI assigns the individual a unique identifier number and collects information including their names, email and physical address. This includes individuals who ultimately do not pass the exam or become certified. Overall, 10,902 unique individuals sat for one BPI exam; 10,787 of these provided an email address. Consequently, we decided to conduct the survey exclusively through email; however, we found 500 of the email addresses were invalid or incomplete. Ultimately 10,287 were successfully delivered to an email address. Of these, 2,119 responded to the survey, a gross response rate of 21%. Before this survey, BPI had gathered little demographic or other information regarding certification seekers or those certified by the organization. For example, they did not know the gender, age, employment, educational or ethnic composition of either group. Clearly, the results from this survey are at risk of suffering from response bias along these dimensions. However, they provide the best national information about those employed or seeking employment as energy auditors from this time period.³

³ For a complete discussion of potential selection issues and selection tests for this survey, see the results section of Chapter 4.

Second, I designed a real-time ongoing data collection effort for certification seekers to overcome some of the pitfalls in email or mail surveys that leveraged the structure of BPI certification exams. All BPI exams nationwide are now conducted on a computer at a testing center overseen by a BPI proctor. Working with BPI, I have arranged for an online survey to be offered to every individual who sits an exam. The survey offer appears as part of the normal testing process. The individual can choose to complete the survey before, after or both before and after the exam. The survey is automatically populated with the individual's unique ID and the exam they are taking. This allows me to screen potential duplicates. It also somewhat reduces the risk of selection on things such as the person's failing or passing the exam and their level of email and computer use. BPI proctors have all been instructed by the organization to encourage individuals to fill out the survey and give them the time to do so, and trained to respond to concerns such as if it will affect their exam scores (it does not). The trade-off to offering the survey systematically at the certification exam is that any survey must be short, typically no longer than 5-7 minutes so it does not interfere with or distract from the exams themselves. Because the survey is administered through an online provider, it also gives me the opportunity of switching questions in and out of the survey in real time. To date I have collected three different waves of data from this tool. The first wave was from June 6 to August 9, 2011. It randomized four different blocks of questions from the more extensive email survey. One block collected more detailed human capital information, the second block measured work activities, the third offered an occupational commitment scale, and the fourth measured participation in the occupational community. All respondents answered demographic questions and questions regarding their attitudes toward the environment and participation in environmental social movement organizations. The second wave took place from October 1, 2011 to January 10, 2012

and was designed by researchers in the Lawrence Berkeley National Labs. It contains detailed information on the individuals' work history and training. The third wave was released January 25, 2012 and the data reported here stops on April 10, 2012. It encompasses the demographic, education, employment and environmental attitude blocks of the original email survey. I will refer to these as certification surveys 1-3 based on chronological order. Table 2 summarizes the dates and gross and completed response rates for each survey. I calculate these response rates based on whether the person filled out the last question on each survey. Generally, if they filled out this question, the surveys are mostly complete though they may have skipped one or two questions. The response rates began very high in the first wave, at almost 60%, then dropped, probably because the proctors have become more lax in encouraging the certification seekers to take the survey. However, the response appears to have stabilized near one-third of respondents.

Table 3: Dates and Response Rates for Surveys

Survey	Dates	Surveys Administered	Response Rate	# of Energy Auditors
Email	1/1/2010-11/30/2010	10,287	21%	695
Certification Survey 1	6/1/2011-8/9/2011	1654	57%	408
Certification Survey 2	10/1/2011-1/10/2012	4767	33%	N/A
Certification Survey 3	1/25/2012-4/10/2012	3143	34%	171

An effort was made during all these waves to use the exact same question wording when possible to track data over time and allow aggregation across surveys. In providing the descriptive statistics in the rest of this chapter, I will only aggregate responses across surveys

where the question wording was exactly the same. To indicate from which survey data were taken I will indicate with superscripts which surveys data was drawn from. ^e indicates email and ¹⁻³ the respective certification surveys. So data such as gender reported collected in all surveys will be indicated with ^{e123}.

Demographics of Energy Auditors

To identify home energy auditors from others who were seeking certification I asked: “What is your primary job related to residential energy efficiency or the job you are seeking if you are not currently employed in this field? Primary job is defined as the job you spend (or plan to spend) most your time performing.” Because so many of the individuals seeking certification were currently unemployed or employed in another field, it was important to capture both those currently employed as auditors and those seeking to become so. All together 1,264 individuals^{e13} identified their primary job as home energy auditor from a menu of choices that included common job titles in the industry and well as more generic choices such as “sales and marketing,” “senior manager or owner” and “other.” For the moment I restrict my analysis to them. Here is a breakdown of their basic demographics.

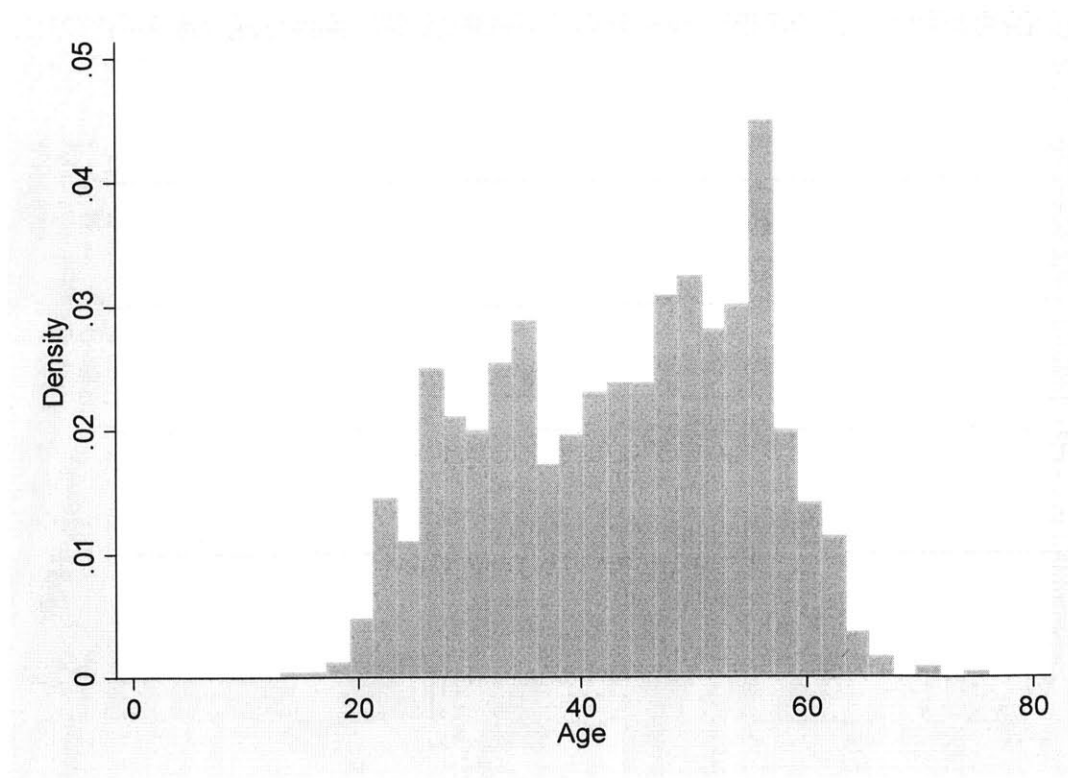
Table 4: Basic Demographic Statistics for Energy Auditors Seeking Certification

	% Female ^{e13}	% Minority ¹³	# Unempld ^{e13}	Average Age ^{e13}
N	9%	24%	21%	43.3
	1228	536	1274	1223

According to this sample, energy auditing remains largely a male field, though it has about twice the female participation of HVAC installers, installation installers or residential

construction workers, which hovers consistently around 4% (see the Bureau of Labor Statistics, OES database). About 24% of those identifying as home energy auditors also identify as a minority, though this is based on a smaller sample since the question was not asked in the email survey. Across the three surveys, 21% reported that they were unemployed at the time they answered the survey. The average energy auditor is 43 years old but the distribution is somewhat bimodal. There is a large grouping of energy auditors in their 50s and another of younger auditors in their 30s. Splitting the sample between those over 40 and those under, the younger cohort has greener attitudes which might be expected by basic generational trends. They have an average score on the seven-question environmental attitude index of 3.71 versus 3.58, a difference which is significant at the $p < .05$ level.

Figure 2: Histogram of Energy Auditor Age



The educational and work background energy auditors brought to the job varied widely. Almost half reported having an associates degree or at least some college. Just over 30% had a bachelor degree. The prevalence of bachelor degrees may very well be related to the difficult economy as most industry experts consider energy auditing to be a job targeted toward those with community college or limited college training. In two certification surveys, the respondents or subset of the respondents were asked how related their highest degree and work experience in the previous five years was to a number of fields proximal to energy auditing. The question was asked on a six-point scale. I reduce the data here and report the percentage of individuals who report that a field was “more related than unrelated,” “mostly related,” or “totally related,” The data show that roughly half of respondents saw their degrees related to each field. Work experience was slightly different. Two-thirds reported work experience in the field in the last five years in the areas of building science, residential construction and energy conservation, indicating that they are coming to identify with these fields. identify them as what?

Table 5: Educational and Recent Work Background of Energy Auditors

Highest Degree ^{e13}	%	Field	% More Related than Unrelated ¹³	
			Highest Degree	Work Experience
HS or Less	13%	Building Science	50%	65%
Associates/Some College	47%	Residential Construction/remodeling	50%	67%
Bachelors	32%	Environmental Sciences	43%	49%
Masters	7%	Business Management	45%	54%
PhD/JD	1%	Energy and Resource Conservation	55%	63%
		HVAC installation/services	31%	44%
N	978	Approximate N	270	270

Job Characteristics of Residential Energy Auditing

The most extensive data on the job characteristics of energy auditors were collected in the 2010 email survey which was more extensive. I continue to collect job characteristic data at intervals in the ongoing certification survey. Here I limit my descriptive reporting responses from the email survey. In the future, I will be able to analyze basic time trends using the certification survey, which will have the added benefit of uniform distribution and hopefully response selection dynamics. The responses are restricted to the individuals who reported being currently employed at the time they took the survey.

Residential energy auditors are employed in a number of different organizational forms and among organizations of various sizes (See Table 6). Recall in this sample the most prevalent form of employment is self-employment, followed closely by contractors specializing in residential energy efficiency. WAP and non-profits also employ a substantial percentage. Direct employment by utility companies is relatively low, by contrast.

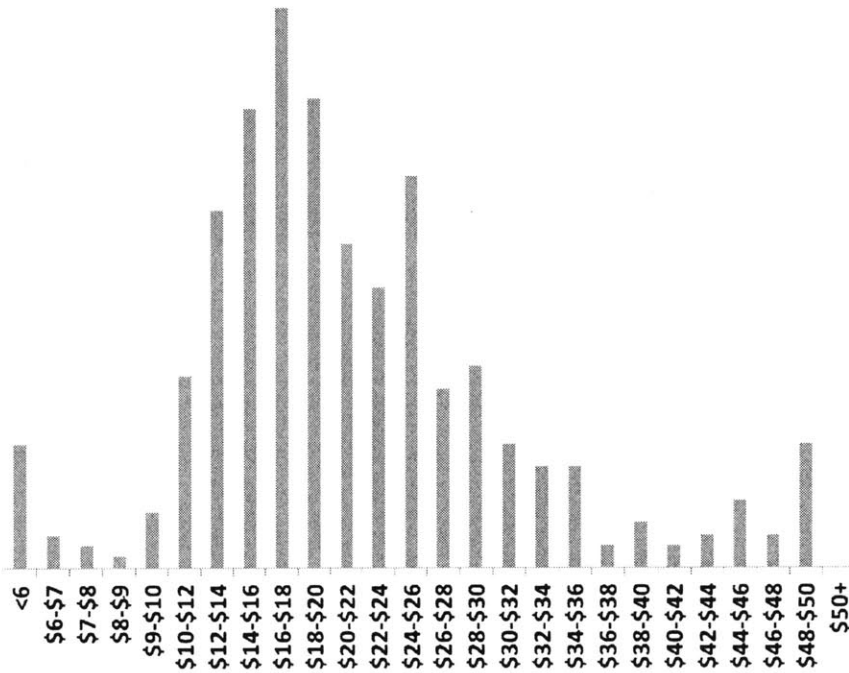
Table 6: Employing Organizational Form for a Sample of Employed Energy Auditors

Employer	2010 Email Sample	2012 Certification Test Sample	Combined Sample
Self-employed	28%	18%	25%
Specialist Residential Contractor	19%	25%	20%
Non-profit	16%	21%	17%
Gvt/WAP	16%	16%	16%
Generalist Residential Contractor	8%	8%	8%
Utility	6%	5%	6%
Other REE	6%	4%	5%
Other Non-REE	1%	2%	1%
Other for profit	0%	2%	1%
Community College	1%	0%	1%
N	478	170	648

The overall distribution of employment across organizational forms would be expected to have significant implications for job quality. Larger and more established organizations tend to pay higher wages and provide benefits as well as career advancement at higher rates. Currently, it is unclear which organizational forms will come to employ more energy auditors. Government employment by the WAP agencies and utilities would both be expected to provide more stable jobs, while contractors, especially those in the residential sector, have been notorious for low job quality. Of significant interest is how energy auditor jobs within specialist contractors will play out in terms of job quality. Energy auditors could either be core to the business or be managed as expenses, especially if many of them offer audits at a discount or loss in hopes of selling retrofit services. Self-employed auditors are tasked with directly articulating a clear value proposition to consumers for paying for an energy audit, though some can also act as independent contractors for various utility, city and state programs.

Wage data collected from the sample show employed energy auditors reporting average hourly pay between \$18 and \$20 an hour and a median wage between \$16 and \$18 an hour, though a significant subset reported making more.

Figure 3: Distribution of Wages for a Sample of Residential Energy Auditors



In terms of benefits, less than half report getting health or retirement benefits through their employer and only 3% report being union members. Together with the wage distribution, these figures indicate that energy auditing as a job appears to be teetering on the edge of becoming a family-sustaining job. The average represents just under \$40,000 a year with only an even chance of having retirement or health benefits.

Table 7: Retirement and Health Benefits and Union Membership for Energy Auditors and other REE Occupations

% who receive through employer	Health Benefits	Retirement Benefits	Union Member
All job categories	54%	41%	6%
Insulation Installatio	44%	37%	8%
Crew Chief	46%	28%	8%
Energy Auditor	48%	38%	3%
HVAC Specialist	75%	55%	7%
Other - Misc	69%	56%	9%
Sales and Marketing	55%	37%	2%
Senior Manager/Owner	48%	34%	4%
Trainer	65%	59%	15%

Conclusion

Residential energy auditing is an intriguing case with which to study the dynamics of the emergence of an occupation. It is representative of a category of middle skill jobs requiring approximately two years of technical training and significant on-the-job training. Its knowledge base, a mix of building science and the mechanical and structural elements of homes, places it at the boundaries of a number of existing occupations. This provides it both a potential claim to unique jurisdiction but also means that there are a number of potential competitors wishing to absorb their core tasks of building diagnostics and analysis. Institutional supports such as

certification programs and the powerful fact that government agencies such as the Bureau of Labor Statistics have now defined the occupation and begun efforts to collect data on its incumbents have increased its profile and legitimacy.

As residential energy auditing has been acquiring the attributes of the social organization of an occupation within a nascent industry sector, its fortunes have historically been intertwined with different waves of social movement activity. The latest wave of social movement organizations has framed residential energy efficiency as a green job and has specifically targeted job creation and job quality as distinct goals of their activism. This confluence of events provides the opportunity to study how social movements which target the market as means of social change can help new occupations form and become institutionalized within a market. I now turn to three in-depth studies of different aspects of this complex phenomenon.

References

- Department of Labor (2011). Employment Situation Summary Handbook, December 2010. D. o. Labor.
- Abbott, A. (1988). The System of Professions: an Essay on the Division of Expert Labor, University of Chicago Press.
- Barley, S. R. (1996). "Technicians in the workplace: Ethnographic evidence for bringing work into organization studies." Administrative Science Quarterly 41(3): 404-441.
- Barley, S. R. (2008). "Coalface institutionalism." Handbook of organizational institutionalism: 491-518.
- Barley, S. R. and P. S. Tolbert (1991). Introduction: At the Intersection of Organizations and Occupations. Research in the sociology of occupations. S. R. Barley and P. S. Tolbert. Greenwich, CT, JAI Press. 8: 1-13.
- Barley, S. R. and P. S. Tolbert (1997). "Institutionalization and structuration: Studying the links between action and institution." Organization Studies 18(1): 93-117.
- Blumstein, C., B. Krieg, et al. (1980). "Overcoming Social and Institutional Barriers to Energy-Conservation." Energy 5(4): 355-371.
- Bucher, R. and A. Strauss (1961). "Professions in Process." American Journal of Sociology 66(4): 325-334.
- DiMaggio, P. J. and W. W. Powell (1983). "The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields." American sociological review 48(2): 147-160.
- DOE (2011). Home Performance with Energy Star - Sponsor Guide. D. o. Energy.
- Goldman, C., J. Peters, et al. (2010). Energy Efficiency Services Sector: Workforce Education and Training Needs, Lawrence Berkley National Laboratory.
- Golove, W. H. and J. H. Eto (1996). Market barriers to energy efficiency: a critical eappraisal of the rationale for public policies to promote energy efficiency. D. o. Energy, Lawrence Berkley National Labortory.
- Greenwood, R., R. Suddaby, et al. (2002). "Theorizing change: The role of professional associations in the transformation of institutionalized fields." Academy of Management Journal 45(1): 58-80.
- Hiatt, S. R., W. D. Sine, et al. (2009). "From Pabst to Pepsi: The Deinstitutionalization of Social Practices and the Creation of Entrepreneurial Opportunities." Administrative Science Quarterly 54(4): 635-667.
- Hughes, E. C. (1984). The Sociological Eye: Selected Papers, Transaction Publishers.
- Jaffe, A. B. and R. N. Stavins (1994). "The Energy-Efficiency Gap - What Does It Mean." Energy Policy 22(10): 804-810.
- Kochan, T. A. (2005). Restoring the American Dream : a working families' agenda for America. Cambridge, Mass., MIT Press.
- Krigger, J. and C. Dorsi (2009). Residential energy : cost savings and comfort for existing buildings. Helena, Mont., Saturn Resource Management.
- Lawrence, T. B. and R. Suddaby (2006). "Institutions and institutional work." Handbook of organization studies 2: 215-254.
- Lounsbury, M. (2001). "Institutional Sources of Practice Variation: Staffing College and University Recycling Programs." Administrative Science Quarterly 46(1): 29-56.
- Lounsbury, M. and E. T. Crumley (2007). "New practice creation: An institutional perspective on innovation." Organization Studies 28(7): 993-1012.
- Lounsbury, M. and W. N. Kaghan (2001). Organizations, occupations and the structuration of work. Research in the Sociology of Work. S. P. Vallas. 10: 25-50.
- Lounsbury, M., M. Ventresca, et al. (2003). "Social movements, field frames and industry emergence: a cultural-political perspective on US recycling." Socio-Economic Review 1: 71-104.
- Nelsen, B. J. and S. R. Barley (1997). "For Love or Money? Commodification and the Construction of an Occupational Mandate." Administrative Science Quarterly 42(4): 619-653.

- Osterman, P. (1999). Securing prosperity : the American labor market : how it has changed and what to do about it. Princeton, N.J., Princeton University Press.
- Osterman, P. and B. Shulman (2011). Good jobs America : making work better for everyone. New York, Russell Sage Foundation.
- Powell, W. and J. Colyvas (2008). Microfoundations of institutional theory. The SAGE hankbook of organizational insitutionalism. G. Royston, C. Oliver, K. Shalin and R. Suddaby. London, England, JAI Press.
- Rao, H., P. Monin, et al. (2003). "Institutional change in Toque Ville: Nouvelle cuisine as an identity movement in French gastronomy." American Journal of Sociology: 795-843.
- Schneiberg, M. and M. Lounsbury (2008). "Social movements and institutional analysis." The Handbook of Organizational Institutionalism: 648-70.
- Scott, W. R. (2000). Institutional change and healthcare organizations: From professional dominance to managed care, University of Chicago Press.
- Segerstrom, C. (2009). "Thirty Years Later." Home Energy Magazine(May/June 2009).
- Sherman, R. (2010). "" Time Is Our Commodity": Gender and the Struggle for Occupational Legitimacy Among Personal Concierges." Work and Occupations 37(1): 81-81.
- Strang, D. and W. Sine (2002). Interorganizational Institutions. Blackwell Companion to Organizations. J. Baum. London, Blackwell Scientific Publications.
- Strang, D. and W. D. Sine (2002). "Interorganizational institutions." Companion to organizations: 497-519.
- Weber, K., K. L. Heinze, et al. (2008). "Forage for thought: Mobilizing codes in the movement for grass-fed meat and dairy products." Administrative Science Quarterly 53(3): 529-567.
- Weber, L. (1997). "Some reflections on barriers to the efficient use of energy." Energy Policy 25(10): 833-835.
- Weeden, Kim A. (2002). "Why Do Some Occupations Pay More than Others? Social Closure and Earnings Inequality in the United States." American Journal of Sociology 108(1): 55-101.
- Zald, M. N. and M. A. Berger (1978). "Social movements in organizations: Coup d'etat, insurgency, and mass movements." American Journal of Sociology 83(4): 823-861.

Chapter 2- Planting the Seeds of an Occupational Mandate: The Environmental Movement and Residential Energy Auditing

“In addressing the effective retrofit, we emphasize that real houses depart in important ways from the textbook idealization of the house as a warm box sitting in cold air. There are usually numerous ways of reducing energy consumption in real houses that are at least as cost effective as those that textbook models prescribe, and that can best be detected on site. *We envisage the evolution of a cadre of workers with various levels of on the job training – workers who have various employers, including themselves. Diagnostic tools for these workers must include both the simple methods of measurement and simple methods of data reduction. For the most part these do not exist.* Our research program has addressed the question: given an hour or a day in house, and the objective of advising on the most effective strategies to reduce energy consumption, how should those giving advice spend the time?”

(Socolow et al., 1978, p 207-8, emphasis added)

Introduction

How do new work or job opportunities emerge, survive and grow into an accepted occupational form without being absorbed or overtaken by other more established occupations doing similar work in the product market(s) they serve? Some might say the answer is simple and obvious: Labor is a derived demand and therefore whether an occupation is formed and survives, and the nature of its characteristics, are fully derivative of the product market in which it is embedded. However, work in sociology and industrial relations challenges this view by arguing that institutional and agency factors also influence why some jobs/occupations emerge and survive while others do not (Durkheim 1964; Hughes 1984; Barley 1986; Abbott 1988; Barley 1988). Surprisingly, there is little empirical research on the emergence of occupations compared to the vast array of research on the characteristics of well-established occupations and professions (Nelsen and Barley 1997; Lounsbury 2001; Lounsbury and Kaghan 2001; Sherman 2010).

In this chapter I seek to add to the understanding about the forces that may assist a new occupation to organize by tracing the history of the occupation of residential energy auditor from its origins in the 1970s oil crises to its current efforts to gain a foothold in the emerging “green economy.” I will demonstrate that the prospects and development of this occupation have been tightly entangled with the efforts of social movements at multiple levels to shape the field of energy consumption and efficiency. I highlight how social movement activities drove three basic processes of occupation emergence –creating new abstract knowledge and practices, task bundling, and driving significant demand for the services of the nascent occupation. Together these created the earliest forms of residential energy auditing and gave it the early supports necessary to develop as a distinctive occupation avoiding absorption of its jurisdiction by established, related occupations. I argue this is a result of social movement activists and organizations working diffusely across multiple levels -- from national policy to the founding of small labs to community level pilot projects – and persisted in the face of significant political and economic shifts. This case study contributes to work which seeks to more fully integrate the sociology of occupations, organizations and markets (Barley and Tolbert 1991; Barley and Tolbert 1997; Lounsbury and Kaghan 2001; Barley 2008) as well as social movements and institutional change (Powell and Colyvas 2008; Schneiberg and Lounsbury 2008; King and Pearce 2010).

Literature Review

One natural place for new occupations to emerge is within new market segments and industries. A stream of recent research has highlighted the role social movements can play in fostering such new markets. Social movements, for example, can work to destabilize and

deinstitutionalize a traditional market, opening up opportunities for new products and services (Hiatt, Sine et al. 2009) or can help actively pioneer new organizational forms (Schneiberg, King et al. 2008). By describing new social problems, movements can create new categories of goods and services (Weber, Heinze et al. 2008) and help develop early technology and new practices (Lounsbury and Kaghan 2001; Lounsbury, Ventresca et al. 2003; Sine and Lee 2009). However, despite the significant rise in research which addresses social movements as key protagonists in the development of some new markets and organizational forms, there are still very few detailed narratives which focus on their impact on the development of the division of labor within these markets. This is exacerbated by the lack of research on occupational emergence more generally (Barley 1988; Nelsen and Barley 1997; Barley 2008; Sherman 2010). This gap is significant as professional and occupational groups are key actors in institutionalizing practices, meanings, and trade relationships within markets (DiMaggio and Powell 1983; DiMaggio 1991; Greenwood, Suddaby et al. 2002; Lawrence and Suddaby 2006; Adler, Seok-Woo et al. 2008) and their communities are often key sites of technical and social innovation (Strang and Sine 2002; Rao, Monin et al. 2003; Lawrence and Suddaby 2006; Lounsbury and Crumley 2007). Narratives of the invention of new occupations should therefore be central interest in the study of nascent markets, including those fostered by or an unintended result of the activity of social movements. Refracting a field's history through the lens of an occupation central to the operation of the changing market promises one fruitful way of bridging between the macro- and micro-levels of analysis, an acute need recognized by scholars of markets and institutional change (Lounsbury and Kaghan 2001; Barley 2008; Schneiberg and Lounsbury 2008; King and Pearce 2010).

Lounsbury's work on the rise of recycling within the field of waste management is the most robust effort to study the nexus between social movements and new occupations in new

markets (Lounsbury 2001; Lounsbury and Kaghan 2001; Lounsbury, Ventresca et al. 2003). This body of work examines one occupation in which social movement activists pioneered new forms of activity (recycling) and then used their influence to push for the creation of a new job, recycling coordinator, within organizations in which they gained influence, namely universities (Lounsbury 2001). The creation of new recycling-specific job descriptions provided a foundation for the early steps in forming an occupational community and an elaboration of rationalized practices. As the field developed, recycling coordinators found the new jurisdiction to be more contested by existing occupations (Lounsbury and Kaghan 2001). Eventually, these recycling practices become at least partially institutionalized within the broader waste management industry but further removed from their roots in social movement activity (Lounsbury, Ventresca et al. 2003). This latter work did not focus on the fate of the occupation specifically and the earlier work expressed skepticism that recycling coordinators could establish themselves as a strong occupation not absorbed into existing occupational roles (Lounsbury and Kaghan 2001). Intriguingly, however, recycling coordinator has appeared to successfully maintain some identifiable jurisdiction as it was recognized, along with energy auditing, as a new and emerging occupation in the green economy by BLS in 2009 (Dierdorff, Norton et al. 2009). This chapter examines processes that might help explain the resilience to absorption of occupations fostered by social movements in the markets they help create. I use the emergence of residential energy auditing as another case study of social movements' impact on occupational invention and emergence in new markets to expand on this earlier work.

The field of residential energy efficiency retrofits in which residential energy auditing is embedded has gone through multiple phases from its initial birth in the context of the 1970s oil crises to its virtual collapse in the mid-1980s to a re-emergence in the mid-to-late 2000s. Over

this period two substantially different though related incarnations of social movement activism arose which managed to mobilize resources for this market, the initial one anchored by the environmental movement and the second by a coalition of the environmental and labor movements. By comparing different social movement mobilizations around the same market and occupation against each other and each of these against a period of low mobilization residential energy auditing as a case provides the opportunity to better isolate the nuanced influence of social movements on occupational emergence. Understanding how the occupation- and field-level dynamics interacted and co-evolved sheds light on the multi-level influence of social movements on the emergence of the occupation.

Theory

To ground the study theoretically in the work on occupations, I focus on two core processes identified in the literature on the social construction of occupations: the creation of abstract knowledge and new practices and task bundling. These linked and dynamic processes are the beginning to creating an occupational mandate and eventually establishing and protecting the jurisdiction required to carve out a place for a new occupation separate from those in a favorable situation to absorb the tasks. In addition, I consider the role of social movement organizations and actors in helping to create and shape market demand for the tasks of residential energy auditing in ways which privileged energy auditing as a distinct occupation.

Creation of Abstract Knowledge and New Practices

Andrew Abbott (1988) identified the creation and claim to abstract knowledge as being central to obtaining and maintaining professional and occupational jurisdiction. This is especially important for professionals and those in expert occupations where their work consists

of diagnosing specific, idiosyncratic cases based on more general principles. Different forms of knowledge relate to more concrete practices and tasks that can be enacted and seen by clients. As different occupations compete to solve client problems, they come to appeal to their distinct practices and knowledge to legitimate their particular occupational mandate. Such disputes are played out at multiple levels: day to day with consumers' interactions in the marketplace, within organizations at the site of work, and lobbying the state.

New practices and innovation often come from the fringes of established fields and occupations, which is why collective action by groups within professions or occupations are often depicted as being like social movements (Bucher and Strauss 1961; Rao, Monin et al. 2003; Lounsbury and Crumley 2007). However, it is important to make a distinction between social movement as metaphor for collective action within an occupation and social movements as specific organized movements with roots outside the field which act exogenously on the occupation (Barley 1988; Schneiberg and Lounsbury 2008; King and Pearce 2010; Kellogg 2011). One reason this distinction is important is that fringe movements within existing occupations and professions which become successful have been shown to lead the transformation of the existing occupations rather than the creation of new ones (Rao, Monin et al. 2003; Lounsbury and Crumley 2007). I will argue that the creation of new knowledge in the form of applied building science and new practices such as residential energy auditing techniques were a direct result of environmental activists working in the absence of clear market demand and outside of existing industry infrastructure. Because the knowledge and techniques were largely cultivated outside the existing residential construction infrastructure, the members of existing industry were resistant to adopting them. In this way, social movement driven

knowledge creation may be particularly conducive to the creation of knowledge and tasks not readily absorbed by existing occupations and thus available for new occupations.

Task Bundling

Beyond the creation of new knowledge and practices, for an occupation to exist there must be enough people doing roughly the same set of tasks. Everett Hughes (1984) referred to this as task bundling. Part of the emergence of a new occupation then are the processes by which tasks are bundled together within a job across enough organizations and types of organization that the job's internal organization is more than idiosyncratic to one or a few organizations. There will always be some variation in the exact tasks performed by any given individual or in any given organization even in well-established occupations, but there should be a recognizable core of activities that belong to the occupation. The bundling of tasks into jobs and occupations can be driven by technical complementarities but also by social construction (Hughes 1984; Abbott 1988; Barley 1988). Indeed the boundaries of where one occupation ends and another begins are often shown to be a rich source for social conflict and social action mediated by institutions and social structure (Larson 1977; Starr 1982; Abbott 1988).

In Abbott's widely used model of new jurisdiction for professions and other expert occupations, existing professions and occupations play the major role. Through collective action, members of an occupation often seek to change the bundle of tasks associated with the job (Bucher and Strauss 1961; Abbott 1988). One recognized way for occupations to become more prestigious and better compensated is to discard low status or dirty tasks to others while trying to claim new tasks from occupations above them (Etzioni 1969; Hughes 1984). As new activities and tasks enter the market, existing occupations often have incentives to incorporate these tasks into their purview or avoid them. There have been few direct studies of task bundling which

have looked for influences outside of those related to contestation between existing occupations, leaving a major question of how a nascent expert occupation can possibly defend a new jurisdiction from more well-established competitors. Lounsbury's (2001) study of recycling coordinators demonstrated that social movement organizations might play a role in some circumstances through direct advocacy and pressure on employing organizations to create a new job rather than to roll them into the job descriptions of existing jobs. Weber, Heinze and DeSoucey (2009) have recently argued that social movements can create new market niches and producer communities defined by their opposition to existing practices. I extend these views by presenting a case where the environmentalists directly influenced legislation and regulatory bodies, which helped rapidly diffuse residential energy auditing as a distinct bundle of tasks in the early period when there were no standard definitions for the job.

Shaping Labor Demand

Social movements can shape the demand for labor in ways that foster or discourage new occupations. One of the heavily documented findings in the literature on markets and social movements is how social movements can influence the creation, selection and legitimating of new organizational forms (Rao 1998; Swaminathan and Wade 2001; Suddaby and Royston 2005; Schneiberg, King et al. 2008). Little research has given extensive consideration to what this may mean for the demand of new and existing occupations supporting these forms. For example, social movements have been shown as often effective in creating niches where new forms of specialist organizations can thrive (Carroll and Swaminathan 2000; Weber, Heinze et al. 2008). We might expect specialist organizations to be particularly fertile ground to grow novel expert occupations as an outgrowth of their competitive strategy where generalist organizations may try to serve the same market by diffusing the same tasks across the existing occupational structure.

In their role in creating new frames for collective action and legitimating new activities, social movements may provide cultural support for a new occupation while delegitimizing its competitors, helping to build an occupational mandate (Abbott 1988). On the flip side, a given framing may also hinder attempts to construct a new occupational mandate (Anteby 2010). For example, Nelson and Barley (1997) demonstrated how paid roadside Emergency Medical Technicians had to create a rhetoric which established the moral justification for being paid when confronted with the socially motivated volunteers who had largely invented the service. These cultural mandates are critical for driving consistent demand for an occupation's labor (Hughes 1984).

The extant literature focuses on how individuals who are pursuing an occupation can act collectively to try to shape demand for their services. My account focuses on how social movement actions at the field level can filter down to shape demand when there are few incumbent advocates for the occupation itself. In helping to construct new demand for residential energy retrofits, social movement actors and organizations helped build business models and institutional support for business models favorable to the emerging occupation of residential energy auditing. In the most recent period, the additional social focus of labor organizations involved in the green job movement made new job creation and job outcomes more explicit than in the earlier iterations. However, in both periods of high social movement activity and even in the more fallow period in between, social movement activism helped create circumstances favorable to the new occupation, even in the absence of collective advocacy from individuals doing the job.

Data and Methods

I use a field analytic approach to follow the history of energy auditing from its origins to the present day. Such field analysis has often been used in the study of social movement and markets (DiMaggio 1991; Rao 1998; Schneiberg, King et al. 2008). The field analytic approach focuses on the study of the different forms of organization that make up a given field of economic activity, their patterns of interaction and their change over time (Scott 2000; Dacin, Goodstein et al. 2002; Lounsbury, Ventresca et al. 2003). This includes the regulatory environment and the prevailing beliefs and logics that support the pattern of interactions. I follow the general thrust of field analysis by concentrating on the changes in the legislation, regulatory actions that structured the field of residential energy efficiency as well as the founding and development of the key organizations in the field. I draw on a wide range of sources traditionally used in field analysis, including actors' published accounts of the development of the field, research and governmental reports, social movement organizations documents, legislative histories and industry trade publications and, importantly, interviews with key individuals who founded or worked for organizations significantly involved in the development and institutionalization of residential energy auditing. Traditionally, professions and occupations with their trade associations, training and institutionalized practices have been recognized as key agents of action in such field studies and have never been the focal outcome of this type of analysis. To keep the focus tightly on the emergence of the occupation as the core outcome, I therefore invert the normal structure of the field analysis.

I begin at the macro-level by defining the three major time periods in which the field of energy production and conservation coalesced around a different mix of dominant institutional logics and regulation. Borrowing from Lounsbury, Ventresca and Hirst (2003), I refer to these

periods as representing different “field frames” and describe how political contestation and social movement activities led to significant shifts from one frame to another. For my understanding of much of the broader industry and political context, I draw heavily on the work of Richard Hirsh and his highly regarded history of the transformation of the utility industry from the 1970s through the mid-1990s (Hirsh 1999). His account centers squarely on the antecedents and consequences of the Public Utilities Regulatory Policies Act of 1978 (PURPA), a key legislative event which fundamentally shaped the field of residential energy efficiency retrofits. While I pull extensively from Hirsch’s work, I reanalyze and reorient this history in specific relation to concentrate on the ebbs and flows of the role of residential energy efficiency. New primary and secondary sources enhance and clarify the narrative: interviews with key leaders and scientists involved in residential energy efficiency, and public individual and organizational histories not included in Hirsh’s work. I then extend the field-level account beginning in the late 1990s and continue it through the green job mobilization period when a new piece of federal legislation, the American Reinvestment and Recovery Act, and complimentary changes in state regulation and industry action have again shifted the field.

After defining the field-level political and industry dynamics and the shifts between them, I delve into the activities and organizations which linked these major macro-shifts with the development of the occupation of residential energy auditing in terms of knowledge and practice creation, task bundling and the creation and shaping of market demand to support or inhibit the emerging occupation in each period. I specifically highlight how these dynamics informed the struggle against absorption by existing industry actors and occupations such as insulation installers and heating, ventilation and air conditioning (HVAC) contractors. As whole this

provides a compelling multi-level and multi-layered narrative that shows the diffuse and broad-reaching effects of social movement activity in supporting the creation of a new occupation.

Field Analysis

In the over 40-year history relevant to residential energy auditing, I identify four periods when a substantially different overall configuration of the economic, political and cultural aspects of the field residential energy efficiency came to be fostered or stymied within the US power industry (see Figure 1). I begin with a brief overview of these periods. In the first period encompassing the 1950s until the first big oil shock post-World War II, utilities and their regulators acted on a logic that equated increased energy production with economic growth and rising living standards. Energy efficiency, including resident energy efficiency, was a low priority for policy makers, consumers and residential builders. Consequently, there was virtually no market or mainstream push for residential energy retrofits. This changed dramatically in the mid-1970s to early 1980s when a series of oil shocks coupled with a receptive political environment presented a political opportunity for environmental activists to push energy conservation, including residential energy efficiency, as a solution to national problems. Environmentalists were successful in framing energy conservation as both a public obligation and an economical rationale for utility companies to pursue residential energy efficiency. This represented the first shift in the field frame, from a system predicated on a logic which equated growth of energy production with economic growth and rising standards of living to one where energy conservation through active regulation became part of an energy company's legitimate responsibility.

This emerging frame quickly faced a hostile economic and political environment in the form of falling energy prices and a new presidential administration resistant to conservation aims. This led to a general collapse in government, utility and market resources for residential energy efficiency. This ushered in the third period, which required industry regulators to create a new justification for utility involvement in energy efficiency focused on the ability of collaborative demand-side management programs to increase utility profits. Their efforts led to a developing acceptance among utility administrators that energy efficiency programs when cast as demand-side management were legitimate profit-seeking opportunities. The fragile consensus that began to emerge around demand-side management reversed sharply, however, in the wake of significantly accelerated industry deregulation following legislative changes in 1992. Utilities scrambling to adjust to this new world diverged sharply in their support of demand-side management programs with many severely curtailing them or abandoning them all together. During the remainder of this period, residential retrofits came to be quarantined largely in the state-run weatherization assistance programs or a few low-income utility programs. The field became predicated on the logic of poverty reduction, with significant consequences for the development of energy auditing.

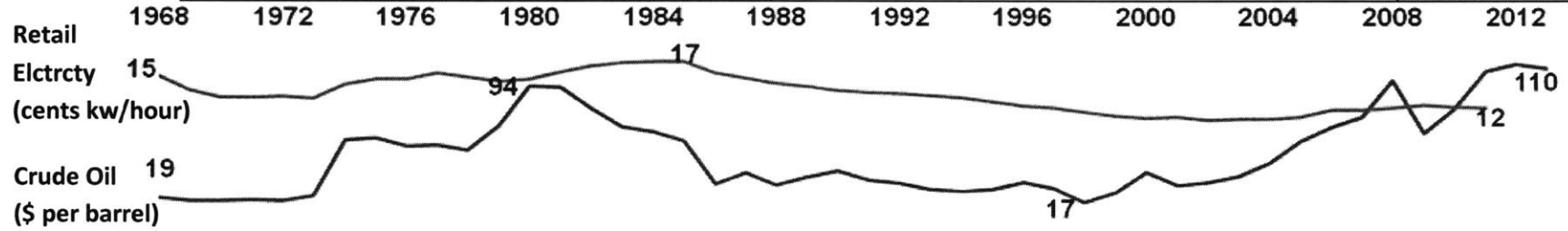
In the latest shift, early but largely unsuccessful efforts to rebuild the residential energy retrofit industry on a logic of market transformation - relieving market barriers to create a middle-class market for retrofit services – found a new ally in the form of social activism encompassing a partnership between environmental and labor groups built around the concept of green jobs. Coupling a renewed urgency around climate change with the need to create new jobs in the wake of the collapse of the housing and finance markets, these activists again seized on residential energy retrofits as a joint solution to both problems. Consequently, this fourth period

is marked by logic emphasizing workforce development and job quality along with the traditional environmentalist concerns.

As I will show now in detail, the way in which environmental activists, later joined by labor organizations, framed and mobilized resources for residential efficiency came to directly impact the prospects of residential energy auditing as a distinct occupation. Their influences on the more macro aspects of policy and industry actions were complimented by the micro-level actions of social movement driven institutional entrepreneurs. Many of the core activists in the environmental movement concerned with energy and energy policy were directly linked to residential energy efficiency. Among these were some connected specifically to central aspects of residential energy auditing in their direct professional practice. This link between environmental activism and the practice of residential energy efficiency in a form conducive to energy auditing extended through each period, even those that ended up being the least munificent for the industry. These early origins and the persistence of environmental activists in the field of residential energy efficiency help explain why auditor-centric residential energy retrofits re-emerged as a natural fit for the green job movement in the last few years. The totality of the narrative will illustrate how directly and deeply intertwined social movements can become in shaping an emerging occupation, from creating new knowledge and practices, to bundling these into a distinct job, and then shaping demand to carve out a niche for a new expert occupation.

Figure 1: Chart of Phases and Key Events in the Development of Residential Energy Auditing (found on following page)

Dominant Field Frame	Growth Through Energy Consumption	Conservation and Active Regulation	Demand Side Management, Deregulation and Low Income Programs				Green Jobs and Market Generation
Key Legislation		ECPA-WAP PURPA NECPA and RCS RCS expires	State DSM laws EPA PACE (CA, CO)			PACE (28 States) Freddie/Fannie oppose ARRA PACE	
Social Movement Events	Earth Day Silent Spring Energy Policy Project	Lovins – FP article NRDC sues BPA	Activist Tech Committee NARUC “Negawatts”			Van Jones “Green Jobs” Ella Baker Cntr GJ Project Green4All Blue Green Emerald Cities	
Key Project and Events		Twin Rivers Project Princeton Summer Study TVA EE program Three Mile Island	Hood River Project	CA and WIS DSM	WAP Advncd Energy Audit Utility DSM Spending Peaks	1 st HPWES Program 2008 Election HomeStar Fails	
Org Foundings	Princeton CEES	LBNL CBS Oak Ridge BTC NASUCA ACEE	CSG RESNet	ACI CEE	BPI NEEP	Apollo Alliance Blue Green Coalition Green4All Efficiency First	
Energy Auditor Occupational Milestones		1 st Train Prgm	1 st Auditor Manual HE Mag Founded	1 st ACI Conf		Training Expands ONET/DoL Wrkfrce BLS Stndrds	



Field Frame 1: 1950s to 1973 – Growth Through Energy Consumption and Passive Regulation

From the 1950s through the early 1970s, oil and coal were steady, cheap and abundant sources of energy for American consumers. The United States utility industry ran as a series of protected, regulated monopolies, but power rested firmly with utilities and not regulators. Hirsch (1999) calls this the era of the “grow and build strategy” where the primary concern of utility companies and their passive regulators was finding ways to expand energy supply as quickly and efficiently as possible (p.46). Put simply energy conservation, including energy efficiency in homes, was not a social problem or priority politically or economically among mainstream government and industry actors. Consequently, the quickly expanding supply of energy helped shape the built environment. Energy efficiency in the design of everything from buildings to cars was of secondary importance. For homes this was manifested in lax building codes, appliance standards and construction practices that gave only cursory consideration to energy efficiency (Sherman and Dickerhoff 1998). Equally undeveloped was the scientific understanding of how buildings and homes specifically used energy. Relatively little time, effort or scientific resources had been engaged in studying the energy dynamics in homes (Socolow 1978). For example, until the mid 1970s, the basic scientific and computer models used to develop US home building codes were not capable of recognizing how something as simple as having more south-facing windows in a home significantly affected its energy needs (Rosenfeld 1999). There was virtually no market for energy efficiency retrofits or home analysis and the trades involved in home improvement and construction had little impetus to learn or invent techniques that maximized efficiency.

Creation of Abstract Knowledge and New Practices and Early Task Bundling

In the early 1970s, a small set of environmental activists began to take an interest in energy production and energy policy, seeing in the rapid expansion of energy production and consumption a threat to the environment through pollution. Among these individuals involved in the environmental movement were a few scientists who began to problematize the lack of energy efficiency in homes. Two small labs were founded by environmentally concerned physicists who began studying the dynamic of energy use in the homes. The first was founded by Robert Socolow at Princeton University in 1971, the Center for the Environment (Socolow 1985; Socolow 1986). The second was a new research group formed by Eric Hirst at Oak Ridge National Laboratories (ORNL), which was eventually referred to as the Building Technologies Center (ORNL,2011). Notably these labs and their study of home energy efficiency began before the major energy crises that were to mark the 1970s and eventually provide the economic and political impetus to move energy efficiency to the center of American political and consumer consciousness. In response to the first major energy crisis of 1970s the third major lab that came to play a major role in residential energy efficiency, the Center for Building Science, was founded by Fermi-award winning physicist Arthur Rosenfeld at Lawrence Berkley National Labs (LBNL) in 1974 (Khan 1993; Rosenfeld 1999).

It was in these programs that the basic advancements in knowledge about energy uses in homes were developed (Hirst, Marlay et al. 1983; Socolow 1987). One of the first projects undertaken by Socolow and colleagues at Princeton began in 1972 and lasted five years. Using newly built identical tract homes in a planned community in New Jersey, Socolow and his students ran experiments on how to modify energy uses. Among their primary conclusions were those related to the possibility and problems of retrofitting a home for better energy use.

Socolow's (1978) summary report at the end of the study is evocative of both the deep inadequacy of the underlying scientific and technical knowledge of the time, and also foreshadowed a central role for energy auditing in any attempt to retrofit homes.

“In addressing the effective retrofit, we emphasize that real houses depart in important ways from the textbook idealization of the house as a warm box sitting in cold air. There are usually numerous ways of reducing energy consumption in real houses that are at least as cost effective as those that textbook models prescribe, and that can best be detected *on site*. We envisage the evolution of a cadre of workers with various levels of on the job training – workers who have various employers, including themselves. Diagnostic tools for these workers must include both the simple methods of measurement and simple methods of data reduction. For the most part these do not exist. Our research program has addressed the question: given an hour or a day in house, and the objective of advising on the most effective strategies to reduce energy consumption, how should those giving advice spend time?

Answers to this question will come, in part, from carefully structured pilot programs, on the scale of our program or larger. Ours might be considered a pilot study of pilot programs, and it provides insights into the opportunities and limitation inherent in disciplined, subsidized projects where a set of houses are modified and the resulting changes are monitored and interpreted.” (emphasis in the original, p. 207-8)

The other labs also contributed major advances in building science applied to energy usage in homes. These included the creation of new computer models that became the standards used for designing and assessing energy usage in homes: the DOE-1 and DOE-2 programs at LBNL and NEAT at ORNL. The labs trained the graduate students who would go on to play key roles in the development of residential energy efficiency. Thus the science and techniques developed by these labs came to form the backbone of a more sophisticated understanding of the complexities of energy use in homes. They developed the basic diagnostic tools, modeling programs, and principles which would make up the foundation for the “whole home approach” to energy efficiency (Hirst and Hannon 1979; Hirst, Marlay et al. 1983; Socolow 1987; Tolbert 1996; Krigger and Dorsi 2004).

Absence of Market Demand

In the days before the repeated energy crises that rocked the 1970s, studying energy efficiency in homes was a low status field (Rosenfeld 1999). Robert Socolow (1986) wrote "...a strong message [in the early 1970s] was that real men don't study how to use less energy. We physicists who worked together on the 1974 American Physical Society summer study were seeking to undermine this belief that it is appropriate for physicists to work on problems of energy supply, but inappropriate for us to work on problems of energy use" (p. 4). In the earliest days before these political and economic changes, the environmental movement provided the impetus for joining the endeavor. Michael Blaylock⁴, one of the first graduate students in the Princeton program who worked on the Twin Rivers studies and later became one of the primary technical experts in the field of evaluating home retrofit programs, recalls, "We were just a bunch of environmentalists who were also science geeks. Almost everyone I worked with was the type of guy who would spend our weekends fiddling with our own solar arrays in the backyard. You had to be pretty green to do be doing that back then."

Because these scientists had started much of this work prior to the two major energy crises which created the political opportunity to change the cultural rhetoric and beliefs regarding energy consumption and to mobilize significant state resources, they had pilot projects, ideas and the promise of developing solutions ready to offer to policy makers, utilities companies, and consumers (Hirst, Berry et al. 1981; Hirsh 1999; Rosenfeld 1999). This fortuitous timing would go a long way in shaping events that followed. The presence of these scientists in this low-status field, but connected with high-status institutions (Princeton, and two high-profile national labs), lent legitimacy to these new practices, aiding in bringing them the attention of policy makers casting about for new solutions and eventually helping legitimize them in the eyes of consumers.

⁴ Interview with the author, June 2011

Not only did these activist scientists create a new abstract knowledge base on which a new occupation could claim jurisdiction, but it rendered it concrete. Socolow and colleagues' vision of the "cadre of workers" "on-site" with specific expertise and on-the-job training to evaluate individual homes is essentially the imagining of residential energy auditing as an occupation.

Additionally, because there was no demand for residential energy efficiency during this time, most of this development took place almost completely outside of the structure and organizations of the existing building trades, equipment manufacturers and research institutions. The knowledge, tools and techniques were critiques of existing trade and industry practice. There was little incentive for conventional builders and tradesmen to pay attention to, absorb, or try to foster organic demand for these nascent approaches. Instead, in the following years these new building science approaches would find themselves at the center of a number of pilot projects and pieces of legislation which would come to define the demand for energy auditing tasks. Indeed, the first widespread use of energy auditing techniques outside the labs occurred not among residential contractors, insulation installers or HVAC professionals but rather in a very unlikely set of organizations: utility companies and state-funded community-action agencies charged with fighting poverty.

Field Frame 2: 1973 - 1985: From Growth Through Consumption to Conservation and Active Regulation

It wasn't until two exogenous world events led to the oil shocks of the 1970s that energy conservation became a major issue for policymakers, utility management or their regulators within the United States. In 1973, the oil producing Arab states imposed an oil embargo causing world oil prices to triple almost overnight from under \$20/barrel to almost \$60/barrel. The price

jumped again roughly 4 years later in the wake of the 1978 Iranian revolution, peaking in 1981 at over \$90/barrel (EIA, 2012). This five-fold increase in oil prices created multiple political and economic problems within the US. Energy security and increasingly the impact of energy prices on the elderly and poor became the major social issues of the day.

These events presented a political opportunity for the small number of environmental activists concerned with energy production and consumption. Foremost among these were Amory Lovins and S. David Freeman. Both had written extensively, directly challenging the ingrained assumption that economic growth required ever-increasing levels of energy consumption (Freeman 1974; Lovins and Price 1975; Lovins 1976; Lovins 1977). Among their most powerful arguments, they framed the conservation of electricity through efficiency as being the equivalent of generating new power (Hirsch, 1999). Lovins, for example, coined the evocative term “negawatt” to refer to a watt of energy created through conservation (Lovins 1996). In their framework, they argued that such conservation measures were in the interest of utility companies as well as consumers, and thus that it was legitimate for utility regulators and governments to make running energy conservation programs a responsibility of utility companies. This directly attacked the prevailing industry logic among utility managers, and utility regulators recognized an opening to pursue a more powerful and active role than under the old system. Under the continuing pressure of rising energy costs and increased political urgency to act, these arguments succeeded in bringing about a new active field frame based on energy conservation through activist regulators (Hirsch 1999).

Central to both Freeman’s and Lovins’ proposed solutions to the energy crisis under this new set of ideas was to dramatically increase the efficiency of homes by drawing directly on the work in the labs headed by Socolow, Rosenfeld and Hirst (Freeman 1974; Lovins 1977). This led

to a rapid mobilization of resources for residential energy efficiency from two important sources. The first was the significant and proactive adoption of select utility companies of residential energy programs. The second was through series of significant federal legislation, which caused the rapid diffusion of residential energy auditing and came to provide broader support for its development. I will describe these major industry and legislative efforts and then directly link them to their profound and long-lasting effects on the emergence of residential energy auditing as an expert occupation due to their impact on the continuing development of its knowledge and techniques, and show how these were bundled within the division of labor and where the demand for these skill bundles became embedded.

Even before significant legislation to support residential energy efficiency was passed, significant efforts by two utilities spearheaded by environmental activists began the first attempts to pursue residential energy efficiency at significant scale. The earliest effort was started by Pacific Gas and Electric (PGE) in 1976, spurred on by active state utility regulators influenced by Rosenfeld and his colleagues at LBNL. PGE created what is considered to be the first training program specifically for energy auditors (Seegerstrom 2009). Seegerstrom (2011) recalls, “When we started the program there wasn’t really anything such as an energy audit. We pretty much just made it up.” The other effort was led directly by S. David Freeman who, before being tapped to lead the Energy Policy Project in the early 1970s, had served in numerous civil and governmental roles, including working on the staff of the Tennessee Valley Authority as a lawyer and civil engineer. In 1976, he became a member of the Carter transition team and in 1977, he was appointed head of the TVA, where he quickly put into practice what he had preached, acting to turn the TVA into a progressive environmentally friendly utility (Hirsh 1999; Freeman 2003). Among his most high-profile efforts was an aggressive energy efficiency

program, which offered free energy audits linked with no-interest loans and lists of approved contractors to customers within the TVA system. By 1982, the TVA had done 500,000 energy audits and underwritten 250,000 loans to home owners (Hirsch, 1999 p. 159). Due to the success of this and other energy efficiency programs, the TVA cancelled the construction of multiple nuclear power plants. The comprehensive system of providing home energy audits coupled with subsidized financing and contractor lists is today still considered one of the most effective institutional arrangements for home energy efficiency programs.

The other major pilot project for residential energy retrofits also directly resulted from environmental activism. The Hood River Project in Hood River, Oregon came about when it became clear in the 1970s that the hydroelectric power that had provided clean and cheap energy to communities throughout four states in Northeast would no longer be sufficient to meet growing demand if it continued on its current trajectory. The utility, Bonneville Power Authority (BPA), began to plan to build a number of power plants to meet the project demand. The National Resource Defense Council, an environmental social movement organization that helped pioneer legal tactics in the fight for environmental causes, sued the BPA in 1975 to stop the plans pending environmental impact studies. As part of this battle, the NRDC developed an alternative plan based on energy efficiency to slow demand. One of the center-pieces of the plan was a pilot project to prove the feasibility of the plan. The pilot took place in Hood River, Oregon beginning in 1982 (Hirst and Goeltz 1986; Brown and Keating 1989; Hirst 1989).

Complementing these seminal pilot projects, Lovins, Freeman and others like them had moved from the fringe to the center of the public policy debate. Lovins, for example, testified before Congress and was eventually hired by the Carter administration as a consultant. Consequently core elements of the Carter administration's energy policy borrowed many

elements from Lovins and Freeman (Lovins 1977; Hirsh 1999). Specifically, Carter passed three pieces of legislation which became critical in the development of residential energy efficiency and residential energy auditing.

The Environmental Conservation Policy Act of 1976 (ECPA), PURPA (1978) and PURPA's companion legislation, the National Energy Conservation Policy Act of 1978 (NECPA), were the heart of the Carter administration's response to the oil crises (Hirsh 1999). The ECPA included a provision which launched and funded the Weatherization Assistance Program for low-income households. Designed as a poverty-relief tool for seniors and the poor who were suffering under high energy prices, the ECPA called on the Community Action Program (CAP) agencies started during Johnson's War on Poverty to weatherize the homes of individuals near the poverty line. The program was funded by the federal government but administered by the states and local CAP agencies (Tonn, Schmoyer et al. 2003; Kaiser 2004). NECPA had a provision which created the Residential Conservation Service act. The RCS required utility companies to provide free or low-cost "home energy audits" to any customers who requested one. It went further and defined the elements of a "Class A" audit, which was to become the standard. These audits required an individual visit by a "trained" auditor to a customer's home to inspect both the mechanical systems and building shell and to create lists of contractors who could then install the recommended energy efficiency measures. This language drew heavily on the understanding of residential energy efficiency being developed in the Princeton, Berkley and Oak Ridge labs as well as early pilot programs at the TVA and PGE (Hirst, Berry et al. 1981; Walker, Rauh et al. 1985).

Abstract Knowledge and Practice Creation

One of the first effects of this significant shift towards energy conservation was a dramatic increase in the resources available to build and refine new methods of making homes more energy efficient. These new resources went largely to the three pioneering and newly established labs. What had started as a small, low-status field was able to attract new talent and significant, stable resources to continue the development of nascent techniques in residential energy auditing. These resources were consequently controlled by the environmentally motivated scientists who focused on creating more refined and sophisticated techniques for measuring energy usage and putting them into practice on a larger scale.

Each of the labs was able to secure long-term funding to support the new utility initiatives or government programs. The Building Technologies group at ORNL, for example, was directly charged with consulting and supporting the WAP programs and was heavily involved in evaluating and supporting the TVA energy efficiency program. These efforts led directly to the creation of the first manuals on energy auditing and home retrofits (ORNL 1983), a key step in early formalizing a new occupation (Wilensky 1964). Similarly, LBNL worked directly in support of PGE early efforts and its development of the first energy auditor training program. The first class of trainees from the program went on to help start programs in utilities across the country in the wake of the RCS mandates (Segerstrom, 2010).

In the BPA project, comprehensive energy retrofits were given to over 90% of 1500 homes in the community (Hirst and Goeltz 1986; Brown and Keating 1989; Hirst 1989). Because one of the goals was to demonstrate energy savings, the program developed rigorous test-in and test-out procedures providing an opportunity to test the state-of-the-art diagnosis and retrofit techniques (Hirst 1989). While savings in energy use were considerable, they were also far

below the optimistic estimates of program administrators (BPA 1987). However, the data and experience amassed during the Hood River Project would become foundational in the further development of the building science behind residential energy retrofits.

Taken together, these pilot projects provided the primary base for taking the very preliminary work done at Princeton and quickly developing in-depth expertise both in terms of abstract knowledge, such as the home energy modeling computer programs, and deep on-the-ground practice in applying this knowledge to individual homes among a core set of individuals. The deepest reservoir of this knowledge resided in the labs controlled by environmentally motivated scientists and within projects also directly under the influence of environmental activists. Only by the end of this period were significant attempts made to translate this knowledge for the general building tradesperson. In 1984, graduate students at LBNL began the first trade publication, *Energy Auditor and Retrofitter Magazine*, designed to translate the new research in residential building science into a format accessible by the average tradesperson.

Task Bundling

The other impact of both the structure of these seminal pilot projects and legislations was to create a significant boundary between the activities of diagnosing homes for energy efficiency and the installation of the measures. The structure of the RCS, for example, effectively bundled by legislative fiat the tasks of home energy auditing into a separate job from traditional home contractor work. Though it did not specify that audits were to be carried out by employees of the utility, many utilities began to develop programs that went this route. By creating a system where the auditing process was conducted under the auspice of the utility company but the actual installation was undertaken by independent contractors, these measures quickly created a new job with defined boundaries focused on home energy assessment. This helped set the ground for

the emergence of the distinct occupation of home energy auditor. The pilot projects themselves, which helped inform the writing of the RCS legislation also used a model that separated the new auditing techniques from the trades that installed the measures. This was the model followed by the TVA, PGE and eventually Hood River.

Thus, entering the 1980s, energy prices were high and energy security a concern. Previously weak state regulators in the utility industry had found empowerment by taking up conservation in the face of the energy crisis. Residential energy retrofits fit neatly with this new set of goals and perspectives. Audits were beginning to take place across the country in varied forms. The technically idiosyncratic nature of diagnosing home energy as articulated by its chief innovators supported by legislative decisions created a newly defined task bundle that was distinct from existing occupations. Based on a new set of abstract knowledge in the building sciences and techniques tested and refined in a number of projects driven by environmentally minded institutional entrepreneurs, energy auditing looked to have a promising future.

Shaping Market Demand

The framing of energy conservation as being a responsibility of energy producers represented a double-edged sword when it came to creating demand for new practices of residential energy auditing. It mobilized resources but not through the existing market structure of residential contractors. The flurry of legislative activity created a new demand for residential energy auditing but only within state and utility programs. Hundreds of thousands of energy audits would be done by utilities and in the WAP program between 1976 and 1985 (Walker, Rauh et al. 1985). Utilities were restricted to charging consumers no more than \$15 for an audit which most estimated to cost around \$100. Given the choice between a free audit and paying over a \$100, consumers had no incentive to buy residential energy audits on the open market.

This practice trained customers that labor- and skill-intensive audits could be had for free. In turn, those running home-contracting firms had little incentive to invest in learning the practice or to build businesses around it. This left demand auditing mostly dependent on its relationship with the utility industry and thus vulnerable to later shifts in the utility industry's approach to energy conservation.

And there was still resistance among many utility managers who fought these shifts. Many utility companies dragged their feet implementing the RCS auditing provisions. For example, by 1985 when the RCS law's mandates ended, 12 states had not even proposed a plan to implement the audits (Walker, Rauh et al. 1985). The provisions did not require companies to market audits and since utilities were not allowed to recover the costs of audits which were turning out to be expensive, many chose to comply only minimally. The law didn't require audits to be supported with any follow-up measures such as loans or help in connecting with contractors. The Hood River project demonstrated that energy savings could be difficult to obtain and costly to measure. Early evaluations of utility programs showed a low conversion rate of audits into customers pursuing retrofits. Together this helped limit diffusion of the demand for energy audits in many states (Walker, Rauh et al. 1985). Then came the next major shift in the field, which would bring about challenging circumstances for the development of residential energy auditing as an occupation.

Field Frame 3: 1985-2006 - Demand-side Management, Deregulation and Low-Income Programs

The political and economic environment changed dramatically with the election of Ronald Reagan in 1980 and the rapid decline of oil prices soon after. The new political realities

of the 1980s left conservation-minded regulators and activists playing defense. Reagan made clear that his administration had no intention of enforcing the RCS provisions (Hirsh 1999). Strikingly, he symbolically took down the solar panels Carter had installed on the White House. Arthur Rosenfeld wryly noted that in the battle to maintain his lab's budget he had to change the name from Center for Energy and the Environment to "Applied Science," to help spare it from the Reagan administration's axe (Rosenfeld 1999). Decision power again began to shift to utility managers and the overriding concern was not about the general public welfare or the long-term economic implications of growth in energy consumption. These became insufficient justifications for spending money on conservation measures. Rather the question was whether conservation programs made economic sense for a specific utility in terms of profit and loss. These events helped lead to another moment of shift in the field surrounding residential energy efficiency. In sum, the field began to revert back in many ways to the pre-crisis period (Hirsh 1999).

However, seeing the writing on the wall and armed with recent successes which demonstrated the potential of energy efficiency to significantly reduce some utilities' expenses, Lovins and other progressive energy policy advocates began emphasizing the economic logic for utilities to continue to pursue energy efficiency programs such as residential energy retrofits. Demand-side management, a term which coalesced in the mid 1980s in response to the political shifts, emphasized that efforts to reduce energy usage could help utilities by helping them forgo building expensive power plants (Wirl 1995; Lovins 1996; Hirsh 1999). However, incentive structures in the industry did not allow utilities to book energy savings as profit or revenue, creating a perverse short-term incentive to not invest in such programs even when they were proven effective. Recognizing the problem, a number of [active activist?] regulators set out to

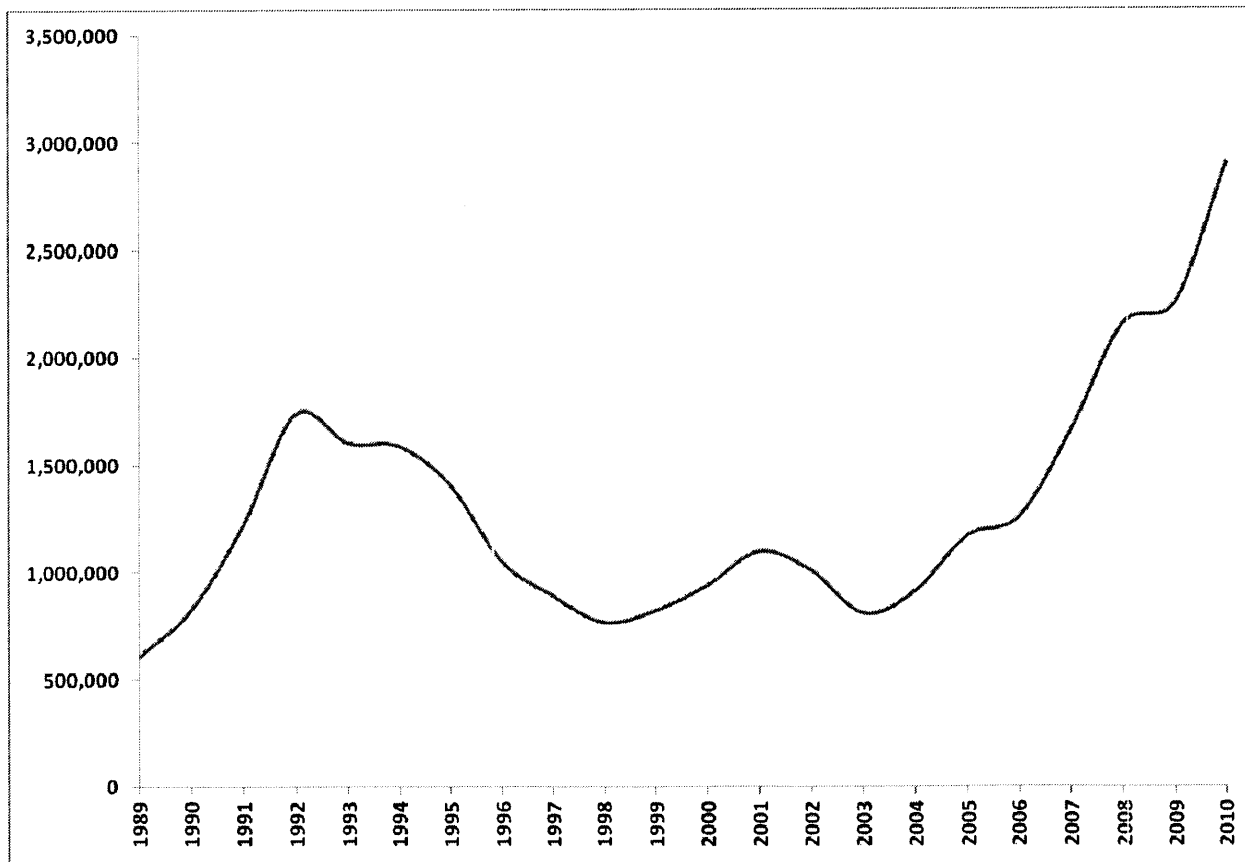
amend laws that allowed utility companies to book energy efficiency savings the same way they would book sales of generated electricity. Other state regulators created incentive schemes that paid utilities bonuses for reaching certain energy conservation benchmarks. The payments were designed to offset the loss of revenue resulting from effective conservation measures (Wirl 1995).

Pioneered again in California, where Lovins and his colleagues had places on the technical advisory committee of the state regulation agency, other states such as Wisconsin began slowly to follow their lead. By 1989, the Energy Information Agency (EIA) began requiring large utilities to report both the amount spent on DSM programs and estimations of the amount of energy saved. Hirsch (1999) described it as an emerging but “fragile consensus” around this new utility profit model for DSM programs. Accordingly, from 1989 to 1992, DSM spending by utilities specifically on energy efficiency programs rose steadily.

However, in this same period conservative critiques of government regulation and advocates for free-market reform began to grow. Paul Joskow, an influential professor at MIT, specifically targeted DSM programs as an example of the need to deregulate. In a series of papers, he and his colleagues questioned whether DSM programs were an effective use of rate-payer money and directly attacked the negawatt logic (Joskow and Marron 1991). He and others argued that those who took advantage of the program would have invested in energy efficiency without utility subsidies, that many of the energy savings reported were actually taken back by consumers through increased energy use, and that ultimately upgrading efficiency should be the responsibility of the consumer not producer of electricity. Embedded in the broader movement toward deregulation happening across many industries, these arguments began to gain traction. In 1992 the Bush administration passed the Energy Policy Act which effectively deregulated the

industry and threw the utilities open to competition. Scrambling to adjust to this new reality, utility companies began to drop DSM programs. For two years following the Energy Policy Act, advocates for energy efficiency DSM programs held out hope that the gains of the past few years could be maintained (Hirst, 1994). However, DSM spending on energy efficiency programs began declining rapidly. It only began to rise again in the mid 2000s. Programs with higher administrative expenses or complexity such as residential energy efficiency programs were especially vulnerable.

Figure 2: Demand-side Management Spending on Energy Efficiency by Utilities 1989-2010 (in thousands of 1993 dollars)



The transition from a field frame of conservation through active regulation to deregulation and profit-based DSM programming led to a significant shift in the center of gravity for residential retrofit programs and consequently residential energy auditing. Without a foothold in the broader market outside of utility- and government-sponsored programs, the falling levels of utility participation left residential retrofits largely sequestered in programs pitched toward helping low-income homes, most prominently the WAP programs administered by the states.

The focus on low-income homes extended to the remaining utility programs. Founded in 1985, Conservation Services Group was the largest single employer of residential energy auditors in the country during this period. A non-profit organization which runs weatherization programs for utilities, it has its origins in rate-payer activism for the poor in Massachusetts. The two founders, Paul Houlihan and Steve Cowell, were directors of a CAP agency focused on providing services to poor senior citizens in the Boston area. After seeing many elderly who used their services struggle with paying their energy bills, Houlihan and Cowell began to mount a campaign against Con Edison, which they saw as arbitrarily setting and raising rates. Their actions included classic social movement tactics such as bussing in to disrupt local public board meetings and organizing picket protests outside the company's offices. As a result of these activities the utility agreed to fund a program to weatherize the homes of its low-income customers. Not wanting to run the program, the utility put out an open bid for organizations to do it. As Paul recalls:

“We were a real thorn in their side. Those guys hated us. I mean really hated us and we didn't like them much either. When they put out the 8 bids to run the program we thought 'what the hell' and we set up a new non-profit and submitted an application. We figured that they might give us one of the 8 contracts as a way to keep us quiet and as far as we were concerned that would have been great. It would have given us enough funding to keep our program running and help people. We were shocked when they announced

that they had given us 7 of the 8 contracts. We went to them and asked why. We said, 'You guys hate us, why would you give us all this money to run these programs?' The guy said, 'You know, we don't like you. We don't play golf with you, but we trust you to be in our customer's homes because we know you really care.' I will remember that until the day I die."

Paul, who has since left CSG, admits that, at the time, the environment was not a motivation for their original activism. "It was about poverty, not the environment. We didn't really know anything about that. Of course, that changed over time and now it's much more about what CSG is about."

Thus, by the mid-2000s residential energy retrofitting as an industry was mostly a service associated with low-income homes. While the technical base of building science and a whole home approach was available to private market contractors, including HVAC and insulation sellers, it made few inroads. Thus, energy auditing was stifled in its ability to develop broader legitimacy among contractors and home owners. Instead of being central to utility DSM programs, home energy retrofits were small add-on programs pitched largely toward the utilities' poorest customers and tended to appear where active citizen groups mobilized. The fractured field was held together largely by organizations and individuals who were holdovers from the late 1970's and early 1980's activism, and who still saw the potential in energy efficiency to help the environment and the poor.

While energy prices collapsed, environmental conservation was challenged, and utility companies dropped auditing programs, the WAP programs augmented by a few utility programs provided a modicum of stability to the field. From the mid 1980s through the 2000s, the WAP program became the center of continuing development in energy auditing and weatherization techniques, technologies, and know-how (Talwar and Hirst 1981; Tonn, Schmoyer et al. 2003;

Kaiser 2004). How did these field-level changes in this period come to impact the development of residential energy auditing and its progression towards a distinct expert occupation?

Abstract Knowledge and New Practice Creation

Within the WAP program, energy auditing continued to develop but slowly. By 1996, 38 of the 50 states reported that their WAP programs had embraced the practice of using advanced energy audits, which included the use of blower doors, duct blasters, and modeling software (Berry, Brown et al. 1997). For quality and administrative control purposes most states had adopted test-in and test-out procedures to measure energy reductions in the homes they retrofitted providing a platform where the basic, distinctive technical tasks associated with energy auditing were refined. While the Princeton group moved on to other concerns, the two national labs at Oak Ridge and Berkley continued to evaluate and develop more sophisticated models, tools and understanding for diagnosing energy efficiency in homes.

The activity and funding generated by WAP was also sufficient to keep a rudimentary set of important organizations and potential occupational supports on the edge of viability. Intriguingly, many of these were driven by individuals who had roots in either environmental causes or the poverty activism which was becoming more and more central to the remaining residential retrofit programs. For example, the WAP programs became the primary justification for the continued publication of *Home Energy Magazine*, a small residential retrofit trade magazine started by Alan Maier and some graduate students at LBNL to translate academic advances in the building sciences into useful and accessible information for contractors and workers. Originally launched as *Energy Auditor and Retrofitter* magazine in 1984, it changed its name in the 1987 to try (mostly unsuccessfully) to attract broader interest among HVAC contractors and insulation installers. Another key support was American Home Comfort

Institute (ACI), which developed and hosted conferences on residential energy efficiency and retrofits. The first conference was held in 1985, planned as a one-time event. The conference continued only because one staffer of the Pennsylvania state office who hosted the event, Linda Wigginton (2012), quit, bought the rights to the conference and ran it as an independent non-profit. Wigginton entered the industry in the 1970s as an environmental activist joining the staff of CAP agency weatherization program. In ACI, Linda saw the continued opportunity to align her work with her deeply held personal values regarding the environment, illustrated by the fact that she has lived “off-grid” and on renewable power since the 1980s. The ACI conferences provided a venue for those working in weatherization and home energy efficiency to maintain a sense of community and continue to develop and share knowledge and expertise.

Task Bundling

During this period, there became fewer and fewer forces pushing for energy auditing tasks to be bundled into a unique occupation. Some WAP programs had a dedicated job for energy auditors, though others frequently allowed contractors and other tradesmen to perform these activities. CSG continued to follow an organizational model that maintained energy auditing as a separate job. However, with the expiration of the legal mandate, decline in utility programs meant little scale to the industry. With market and legal considerations no longer pressing for task specialization, there was no discernible advocacy within the industry to develop or protect jurisdiction around residential energy auditing.

This shift is exemplified by another organization important to the development of residential energy auditing as an occupation founded during this period, the Building Performance Institute (BPI). BPI was a small non-profit started in 2001 to help administer a utility residential energy efficiency program in New York State. It created training and a set of

standards for contractors to follow performing home retrofits. This in turn led to the creation of a set of voluntary worker certifications around the tasks of auditing homes for energy efficiency as well as providing organization-level accreditation to small contractors. BPI generally pushed a model of integrating the tasks of energy auditing into the jobs and skill sets of existing residential construction occupations. They targeted HVAC contractors and insulators with their training and certification in a building science based approach to home retrofits. However, they found the appeal limited outside the small state program they were designed to support. It certified only two to three hundred individuals a year mostly in and around New York State, Vermont and New Jersey.

Limited Market Demand

Finally, during this period there was little headway made in establishing energy retrofits or energy auditing as a valuable market service that a homeowner might want to pay for out of pocket. This was reinforced by energy auditing being rooted in the RCS mandate when homeowners had never been asked to actually pay the true cost of an energy audit. It was a service to be offered free or for a small co-pay. Consequently, little headway was made in building legitimacy within the broader marketplace for the occupation (Golove and Eto 1996). Cheap and stable oil prices and steadily dropping residential electricity prices over this period did not help in spurring interest in energy efficiency among homeowners, especially efficiency which required largely invisible but messy, disruptive work to a home's shell and mechanical systems. Consumers who wanted to scratch the itch for increased efficiency had a variety of popular, easier alternatives including upgrades to new efficient appliances.

For contractors, especially during the new housing boom, retrofit solutions which emphasized low-cost fixes such as weather stripping, duct sealing and caulking held little appeal

as a business. Instead a market grew up around selling efficient boilers (the larger, the better), windows and doors – fixes that often directly contradicted the rate of return calculations which dominated WAP program decisions (Blumstein, Krieg et al. 1980; Weber 1997). The limited market for the new jurisdiction created around these tasks was simply not appealing to the mainstream occupations in residential building. The totality of the market was inimical to the growth of residential energy retrofits as a viable market-based business and consequently to energy auditing as a viable occupation. Hence, even though the jurisdiction make-up of energy auditing tasks would have been easily absorbed by existing occupations within the industry, there was little interest in taking it. The tools, techniques and building science knowledge created in the earlier period failed to make its way into mainstream residential contracting, leaving the jurisdiction largely open.

Field Frame 4: 2006-2012 - Green Jobs and Solving Market Failures

Dramatic changes were in store for residential energy retrofitting as an industry in the late 2000s when they again were put forward by environmental and labor activists as a central solution to a new set of economic and environmental crises. Activists' approach to revitalizing the industry came with three significant shifts in how they framed the field and placed it within the context of current cultural and political beliefs and tensions. The first shift was a revitalization of the use of residential energy retrofits to protect the environment by helping limit greenhouse gasses and stop climate change. The second shift was a new emphasis on job quality and employment outcomes for individuals entering the field, a new social requirement largely absent from earlier incarnations. The third shift was a focus on trying to create a viable private market for residential retrofits instead of relying solely on government incentives and utility

financed programs. Together these have had a profound impact on how resources have been mobilized in these efforts and the way in which residential energy auditing is emerging as a potential occupation.

The shared focal rhetorical point that the new social movement pushes to mobilize resources to create a robust residential energy retrofit industry is the creation of “green-collar jobs.” The term green-collar job has been around in some form since 1976. It is credited to Patrick Hefferan and his study “The Coming Green Collar Revolution” which was produced for inclusion in government hearings on labor and employment issues (Hefferan, 1976). It was then used in a small book published by an environmental non-profit in 1999 in reference to efforts to replace the timber industry in the Northwest with more ecologically friendly jobs (Durning 1999). Raquel Pinderhughes, a scholar at San Francisco State University, borrowed it from this book and began using it in her work, publishing in a small journal on race and environmental justice. From there the term was picked up and popularized by another environmental justice activist Van Jones (Pinderhughes, 2006; Jones, 2008).

The green job framing emerged from collaborations of some environmental SMOs with labor organizations coming from two primary sources. One strand is rooted in the environment justice approach which frames pollution as a problem which is foisted upon the poor and vulnerable (Pinderhughes 2006; Jones 2008). The environmental justice movement grew out of collective action against the placement of landfills and chemical plants and in efforts to take action against subpar environmental conditions found in many poor urban and predominantly minority areas. One of the motivating grievances for environmental justice activists is the discriminatory nature of such environmental decisions (Bullard 1990; Cole and Foster 2001). The other strand comes from efforts to bridge the interest of labor unions and environmentalists

and is rooted in a loose coalition which developed between environmental and labor groups to protest the 1999 WTO meetings in Seattle, Washington (Obach, 2004; Mayer, 2009).

Emergence of common ground among some environmental and labor activists led to the creation of a set of new social movement organizations which sought to link their interests, a classic example of frame alignment between SMOs through the mechanism of bridging (Snow et al., 1986).

Due largely to the efforts of the policy-focused Apollo Alliance, green-collar jobs became a significant topic in the run-up to the 2008 election, especially among Democratic primary candidates (Inslee and Hendricks 2008). It was crystallized in the national discourse in 2008 with the publication of *The Green-Collar Economy* by the Ella Baker Center for Human Rights activist Van Jones, who in 2009 would accept the position of Special Advisor for Green Jobs, Enterprise, and Innovation at the White House Council on Environmental Quality. All this activity was the product of the formation of a number of new social movement organizations which came to use green jobs as a central component. Three somewhat related environmental and environmental-justice social movement organizations led the charge in pushing the green job frame: the Apollo Alliance, GreenforAll, and the Blue-Green Alliance.

A set of non-profits, the Center for Wisconsin Strategy and the Campaign for America's Future, developed the Apollo plan which made the case for a heavy government investment in renewable energy and a slate of energy efficiency technologies including green construction and weatherization (ApolloAlliance 2008; Hendricks, Goldstein et al. 2009). Originally launched before the 2004 election in hopes of securing support from a potential Democratic administration, the Apollo plan was relaunched in the wake of the September 11 terrorist attacks and framed as an urgent plan for energy independence as well as environmental stewardship. It

also heavily emphasized the economic benefits of the creation of quality jobs. These progressive political organizations again invested heavily in promoting this plan during the run up to the 2008 US presidential election, getting high-profile Democratic candidates to endorse green job legislation as part of their political platforms. In 2007, the two non-profits spun off the Apollo Alliance organization to advocate for federal legislation to support the Apollo plan. By the end of 2008, the Apollo Alliance became the key organization in authoring the portions of ARRA which made an investment of over \$12 billion dollars in renewable energy and energy efficiency measures. Over \$5 billion was specifically allocated to expanding the WAP program and other residential energy retrofit initiatives. Beyond mobilizing federal resources, the organization also worked at local levels, including sponsoring high-profile initiatives such as Newark Green Jobs Summit and pushing local officials all over the country to sign the Apollo Green-Collar Jobs Pledge, which advocates using public resources to support the creation of green jobs in their localities. As of the summer of 2011 they have more than 20 projects underway at state and local levels.

GreenforAll sprang directly from the activities of the Ella Baker Center for Human Rights. It began a number of local initiatives under the rubric of green-collar jobs, including those led by Van Jones, and began to receive national attention. Underpinning these efforts was a coalition of environmental activists and labor unions seeking the dual goal of creating living-wage jobs through activities that sought to conserve resources, especially in the energy sector. Publishing a number of reports on local community organizing initiatives in workforce training and job creation, which focused on both residential and commercial renewable energy projects as well as residential energy efficiency, the activities of the center became a template for other local and soon national programs (GreenForAll 2009). As more attention was given to the efforts of

the Center, it soon created GreenForAll, a non-profit organization dedicated to expanding these activities in localities across the country. Green for All was especially rooted in the larger frame of environmental justice and emphasized the inclusion of disadvantaged workers as a core part of its mission. Since its founding it has launched local residential energy efficiency related programs in over 30 cities including some of the more high-profile projects. An example representative of the language the organization uses in framing residential energy efficiency as a green job and rooting it in the bigger issue of environmental justice comes from its 2009 annual report:

With leaders in city halls and labor halls, at for profits and non-profits, Green for All created unprecedented policy breakthroughs like Clean Energy Works Portland. This work is translating into real opportunity for those who live with unemployment and poor environmental quality as a daily reality, not numbers or abstractions. People like Tahalia Williams. Tahalia is a single mother from Brooklyn struggling to raise her child in today's shattered economy. Thanks to the green jobs training program that has worked not just to prepare her for a job, but for a career, Tahalia now works full time on residential weatherization projects. Such projects are just one aspect of our 2009 focus: creating jobs in energy efficiency.

Finally, the Blue-Green Coalition, an organization started in 2006 as a partnership between the Sierra Club and the United Steel Workers, advocates for a variety of legislation to support the creation of jobs in the US through investments in renewable energy, aimed especially at manufacturing. It came to be supported by the four largest environmental organizations in the US and a number of the largest unions. This legitimized the green job frame as a central new claim of some of the United States' strongest and most politically connected social movement organizations. The Blue-Green Coalition also targeted the US presidential election and pushed for federal and state legislation that would support the creation of jobs pursuing environmental goals. The Blue-Green Coalition organizes the annual "Good Jobs, Green Jobs Conference" to bring together policy makers, think tanks, labor unions, and academics to further the agenda by

refining the policies and public rhetoric associated with green jobs. It also played an important role in shaping the ARRA legislation, for example, in successfully aiding the push for ARRA jobs paid for by weatherization funds to meet Davis-Bacon prevailing wage standards for federal contracting, a key union priority. In 2010, the Apollo Alliance and Blue-Green Alliance officially merged, speaking to both their dense organizational connections and their very similar agendas. The announcement of this change couched green jobs strongly in terms of its own “movement” with the continuation of specific social movement organizations focused solely on green job priorities and agendas.

The new green job frames had a number of implications for how these SMOs have looked to influence the mobilization of resources for residential energy retrofits. Organizations such as the Apollo Alliance, GreenForAll, and Blue Green Coalition were concerned not only with decreasing carbon emissions from homes but also with creating good sustainable jobs which could be largely supported by the private market. This meshed well with the political needs facing the Obama administration. Confronted with the need to spur job creation but also constrained by high deficits and lacking the political power or will to significantly increase deficit spending, the argument that retrofitting homes could be self-funding and based in the private market made it attractive to legislatures. This argument was based in analysis about why residential energy retrofits failed to find a hold in the 1990s and 2000s. A number of analysts and academics involved in the field argued for the need to create a market transformation by understanding and solving the market failures which plagued the sector.

Consensus around the nature of these market failures was built in the late 1990s and early 2000s. It identified a number of barriers to a viable market for retrofits. Some of these were in the demand side of the industry rooted in consumer behavior and the structure of the housing

market. For example, home owners were shown to be subject to hyperbolic discounting of the savings from decreasing their energy bill, meaning they severely undervalued them relative to their objective value. This led them to be unlikely to pay even for retrofit services with clearly attractive return on investments. Another major market barrier to investing in a home's energy efficiency is the uncertainty many homeowners face in how long they will be in the home, curtailing their incentives to pay for increased energy efficiency if they may not be there long enough to recoup their investment. This is exacerbated by the lack of clear, legitimated system which assures that more energy efficient homes get commensurately higher resale values. A similar issue is faced in rented homes where the renters pay the utility bills, leaving the owners little incentive to invest in efficiency since they typically do not pay the utility bills.

Another set of market failures revolved around the supply side of the industry. The quality of weatherization and retrofits installations is difficult for consumers to observe. Much of the work takes place behind walls, in crawl spaces and in attics. They are also services and goods that home owners buy infrequently. This circumstance creates classic information asymmetry which can distort and suppress markets. This problem is faced generally by insulation contractors, window and door installers and HVAC contractors who want to sell their services based on promises of future savings. Problems of quality control, fraud and consumer trust have been major issues in these industries. [[Building sciencebased methods to retrofits have tended to add to the criticisms of these industries as selling expensive and poor quality solutions to energy efficiency problems. A strong, credible system of professional certification, accreditation and community control is one common solution to these types of information asymmetries.

In response to these market transformation arguments, the Obama Administration's Middle Class Taskforce's initial report on actions to take to develop a thriving home retrofit

industry (2009) directly targeted the lack of nationally recognized training and quality standards as one of the barriers the industry faced.

To achieve the desired scale of efficient and healthy home retrofits, a sizable increase in the number of well-trained green retrofit workers is needed. Many states and localities are looking for guidance and information on how to both streamline and rapidly expand quality training opportunities for those looking to enter the home energy retrofit industry. Furthermore, there is no clear guideline or standard to assure consumers of the quality of the work being done on their home. A consistent set of standards will increase consumer confidence in energy retrofit workers, promote good green job opportunities and training opportunities for people of all skill levels, and facilitate the mobilization of a national home retrofit workforce.

The proposed solution was to help propagate voluntary worker certification programs as a way to create consumer confidence in savings projections and quality of work and to provide potential workers with the labor market infrastructure necessary to receive training and portable certification of their skills.

To rapidly expand retrofit capacity, a national effort is needed to conclusively identify required job skills upon which certification standards will be based, and develop standard training goals or methods. The availability of model training programs based around best practices will lower the barriers to entry for programs needed to train workers, allowing an expanded offering of quality training opportunities. The widespread adoption of model training approaches will also facilitate the development of a well-trained workforce across the country, which will improve energy and environmental outcomes, enable worker mobility, and enhance career opportunities....

To facilitate consistent, high-quality training of a green retrofit workforce, the Federal Government will:

1. Advance a nationally recognized worker certification standard for comprehensive training that provides evidence that a worker is well qualified to properly complete efficiency and healthy home retrofits.
2. Promote a nationally recognized training accreditation standard to enable students to identify trainers with a demonstrated capacity to provide quality instruction. (p.10-11)

In creating and promoting these standards the government ultimately chose to go outside the traditional HVAC and insulation installation industry and instead turned to BPI and its building science based approach. In 2011, it announced that BPI had won the bid to develop

home performance specific related certifications. In June of 2012, BPI launched the first pilot of four new certificates. Among these was a certificate specifically for Energy Auditing, recognizing it as a key job within the home retrofit industry.

Another attempt to transform the market fell short, however. While the weatherization portion of ARRA simply increased funding for low-income weatherization, a number of parallel efforts focused on solving the long market failures in an attempt to create a stable industry sector to absorb the short-term jobs created by stimulus funding. Among these was legislation named Gold Star which sought to expand weatherization to the middle class market by providing almost \$6 billion in subsidies and financing for home retrofits predicated on a home performance business model. This model requires homes to be tested before and after retrofit measures are installed with a sliding scale of rebates and incentives tied to the amount of energy reduction. The legislation was based on a small pilot programs in the Home Star with Energy Efficiency program that was an extension of the popular Energy Star program for appliances. Core to the program was the need for reliable and independent energy use measurements to verify energy use reduction so that private and public financing could ensure a decent return on investment. To administer this program BPI's building science based certification and accreditation were chosen to be a central component of the bill. This was over protestation from groups lobbying on behalf of the HVAC and insulation industry. Gold Star eventually failed to pass after Democrats lost control of the House of Representatives after the midterm elections, depriving the home retrofit industry continued federal support in the form of incentives and subsidies.

As ARRA funding winds down and hopes for prolonged federal support have dried up with continuing budget concerns and a polarized Congress, the test of whether the industry can stabilize around private financing has begun in earnest. States and utilities have begun to step in

to fill the void at least partially. Energy efficiency DSM programs began to grow again in 2004 and have continued to grow at a steady pace. These again have begun to include an increasing number of residential retrofit programs, especially in states with environmentally friendly electorates. Some states are passing laws called Energy Efficiency Resource Standards (EERS) which set targets for utilities to reduce energy consumption, some voluntary and others with penalties, a return to the activist regulators of the late 1970s. As lobby efforts move to the state level, states where the environmental and labor lobbies are more powerful are likely to maintain funding and innovate new sources of market demand as are the local efforts of the social movement organizations tied to mobilize and coordinate new local retrofit initiatives. Where then do these activities leave residential energy auditing specifically as an occupation?

New Knowledge and Practice Creation

During this period there was little direct development of new knowledge or practices as there had been in the previous decades. Instead, one of the key selling points made by the organizations involved in pushing weatherization and retrofits was that it was based on well-established, existing techniques which could be quickly diffused and implemented at a national scale. Weatherization as a “shovel-ready” project was a direct result of the green jobs emphasis on job creation as an equal and even more urgent outcome than environmental protection.

Unemployment, especially in the decimated construction sector, was a most pressing political problem. This led policy makers and those responsible for implementing ARRA to rely heavily on the small existing professional and knowledge infrastructure which had survived the period of minimal resources.

For example, even though BPI was a small organization which had certified less than 2,000 total unique individuals with its most basic “building analyst” certificate, in the 9 years

prior to 2009 and the announcement of ARRA, its training and certification standards became the recognized standard in the industry across the country. In 2009, more than 3,000 individuals became certified by BPI in basic residential energy auditing techniques. In 2010, this number more than doubled to 7,000 and BPI has maintained that level in 2011 and 2012. This represents by far the most commonly used certification in the new retrofit industry. Training programs and community colleges around the country have come to use these guidelines as the basis for developing their courses (Goldman, Peters et al. 2010; Goldstein 2011). This was further underscored by choices to use BPI and the building-science based approach it represented to develop new nationally supported certifications for the new industry, often rebuffing the lobbying efforts of HVAC and insulation contractors to use their alternative standards and certifications which [the government evaluators not clear who is they here] deemed as being inadequate. This had the effect of legitimating the knowledge and practices which had ultimately become embedded in the WAP program and what remained of the residential energy efficiency programs in the utility sector, knowledge and practices that had been pioneered earlier by scientists motivated to increase energy efficiency to reduce the impact on the environment.

Task Bundling

During this most recent mobilization of resources for residential energy retrofits, a number of significant efforts were launched to create professional standards, certification, and training programs (Goldstein 2011; NREL 2011). Motivated on one hand to solve the perceived market failures that had thwarted previous market-building efforts and on the other by the desire to create jobs with decent wages and a career path, social movement organizations pushed worker certification and credentialing. The performance- and measurement-based business models chosen on which to build an infrastructure of certifications and career ladders were

especially conducive to energy auditing as a distinct bundle of tasks. The job task analysis undertaken by the federal government to help kick start the industry has been used to support a new energy auditing certification. This process has culminated with the BLS taking a major step in legitimating energy auditing as an occupation by going through its official process to define the tasks and skills associated with it and even provide it its own preliminary standard occupational code. It is significant that it did so under the auspices of an initiative to specifically identify new and emerging occupations in the green economy. By again framing residential energy efficiency within the category of green activities, social movement organizations have helped this potential occupation receive resources, attention and legitimacy that it has largely lacked without their support.

Additionally, it is important to note that these efforts have largely taken place in anticipation of market demand and among efforts to actively structure a retrofit industry. In this sense the jurisdiction of diagnosis and measurement of home energy use and improvement has taken steps to institutionalize the bundling of auditing tasks into a distinct occupation as an active political project not associated with groups of auditors advocating for their occupational mandate. As will be shown in more detail in Chapter 4, the occupational communities capable of such collective action are forming concurrently with these more field level social movement efforts. While these may come to play an important role in future advocacy for the occupation, the seeds of their occupational mandate have been planted mostly by forces external to occupational and professional groups.

Maintaining Market Demand

The new shift in the political, cultural and economic environment in which activities in the field of residential energy efficiency are embedded has moved to diversify the sources of

market demand for the industry. Beyond mobilizing federal resources on a significant scale for the first time in the form of ARRA and revitalizing utility- and state-based programs which were first developed in the mid-1980s, innovative projects to develop other potential sources of demand have arisen. These range from direct community mobilization models which use grassroots activism in communities to educate consumers and coordinate retrofit activities by such organizations as GreenForAll and Emerald Cities to trying to create new private financing solutions through things such as PACE legislation. While there has been uneven success across these efforts, they do represent a significant change from both the low-income centered programs which anchored the field in the late 1980s through most of the 2000s, and from the original mobilization in the 1970s and early 1980s. Significantly, energy auditing as an occupation is seen as playing a prominent role in the envisioned structure of the industry. In anticipation of the eventual demand created by these new approaches, there has been a significant increase in those seeking training and certification in energy auditing through organizations such as BPI. While it looks as if most federal sources of support and funding are drying up, state and utility funding is again on the rise. Coupled with more localized efforts by social movement organizations and a continued push to introduce new financing options through things like PACE, there may be a chance that a stable home retrofit industry will survive in at least some part of the country and with it the opportunity for residential energy auditing to move from an emerging occupation to a more well established one.

Discussion

This chapter described how intricately tied an occupation can be to the field-level dynamics in which it is situated. In the case of residential energy retrofits and the work of energy

auditing, its roots can be directly traced back to [social movement-driven individuals who chose a low-status field of residential building science in which to create new knowledge and practices even though, at the time, there was little interest from either consumers or industry in developing the knowledge. While Socolow and his colleagues could “envision a cadre of workers” who would use this new knowledge to diagnose homes to increase their energy efficiency, this cadre only gained a market foothold when world events created moments when political conditions provided opportunities to environmental social movement activists to mobilize resources to support residential energy efficiency initiatives. Initially these opportunities were used to push legislation and policy innovations which required utility companies to perform energy audits for their customer even when there was only a vague idea of what this might entail. In this sense, residential energy auditing has always been a green job from its inception, through its hibernation and to its current emergence. nice green metaphor!

As the national pressures began to subside, there was a shift to the state-level advocacy to continue to regulate utilities to pay for and provide these services. This led to significant state-level variation in the continued support for the industry where again more environmentally progressive states provided more accommodating homes. As even this support began to give way as the more general growing push for deregulation began to hold sway within the utility industry, residential energy efficiency and with it the tasks of residential energy auditing became sequestered in government-supported low-income programs. As the resources available for residential retrofits and consequently energy auditing ebbed, social-movement-driven actors often took up the cudgel, even when the field was at the fringe of viability. Their efforts maintained the scientific research and institution memory needed to make auditing available to be reinvented, reintroduced, and practically offered as a solution to new social problems.

Now a mix of environmental and labor activists have reached back to pluck residential energy retrofitting out of relative obscurity and put it back on the national agenda. Mobilizing resources at the federal, state and local levels, social movement organizations such as the Apollo Alliance, GreenforAll, and the Blue-Green Coalition have breathed new life into the industry and subsequently the occupation of residential energy auditing. While there have been set backs such as the failure of the Green Star legislation and difficulties with turning PACE legislation into viable programs, the cumulative and persistent pressures from these social movement forces have been sufficient for the BLS to commission a national survey of this new occupation. Significant increases in both the adoption of certifications related to the occupation and the level of elaboration and specificity of these certifications also provides evidence that residential energy auditing is making some strides in becoming a distinct occupation which will avoid absorption by more established occupations such as HVAC and insulation installers.

The large but temporary increase in federal funding and support appears to be coming to a close. Whether there will be a repeat of the collapse in this emergent industry and its new occupational structure that happened in the mid-1980s or whether it can build a more stable foothold remain to be seen. However, there appears to be promise in the continued efforts at the state and local level to support legal and institutional changes to support a residential energy efficiency retrofit industry. In the next chapter, I will examine whether the volume of certification across states is systematically related to the work of the social movements at the state and local levels, controlling for other latent sources of demand for energy conservation and therefore for energy auditing. The long-term legacy of social movement activism in this industry may be both in helping it emerge where market forces alone were not sufficient and consequently in shaping where it ultimately survives and thrives.

References

- Abbott, A. (1988). The System of Professions: an Essay on the Division of Expert Labor, University of Chicago Press.
- Adler, P. S., K. Seok-Woo, et al. (2008). "Professional Work: The Emergence of Collaborative Community." Organization Science 19(2): 359-376.
- Anteby, M. (2010). "Markets, Morals, and Practices of Trade: Jurisdictional Disputes in the US Commerce in Cadavers." Administrative Science Quarterly 55(4): 606-638.
- ApolloAlliance (2008). The New Apollo Program - Clean Energy, Good Jobs: An Economic Strategy for American Prosperity, Apollo Alliance.
- Barley, S. (1988). Technology, power and the social organization of work: Toward a pragmatic theory of skilling and deskilling. Research in the Sociology of Organizations. N. DiTAMISCO and S. Bacharach. Greenwich, CT, JAI Press. 6: 33-80.
- Barley, S. R. (1986). "Technology as an Occasion for Structuring - Evidence from Observations of Ct Scanners and the Social-Order of Radiology Departments." Administrative Science Quarterly 31(1): 78-108.
- Barley, S. R. (2008). "Coalface institutionalism." Handbook of organizational institutionalism: 491-518.
- Barley, S. R. and P. S. Tolbert (1991). Introduction: At the Intersection of Organizations and Occupations. Research in the sociology of occupations. S. R. Barley and P. S. Tolbert. Greenwich, CT, JAI Press. 8: 1-13.
- Barley, S. R. and P. S. Tolbert (1997). "Institutionalization and structuration: Studying the links between action and institution." Organization Studies 18(1): 93-117.
- Berry, L., M. Brown, et al. (1997). Progress Report of the National Weatherization Assistance Program. D. o. Energy, Oak Ridge National Laboratory.
- Blumstein, C., B. Krieg, et al. (1980). "Overcoming social and institutional barriers to energy conservation." Energy 5(4): 355-371.
- BPA (1987). The Hood River Conservation Project: Cooperation and Community Conservation, Comprehensive Report. B. P. Administration.
- Brown, M. A. and K. M. Keating (1989). "Special Issue Devoted to the Hood River Conservation Project - Foreword." Energy and Buildings 13(1): 1-1.
- Bucher, R. and A. Strauss (1961). "Professions in Process." American Journal of Sociology 66(4): 325-334.
- Bullard, R. D. (1990). Dumping in Dixie : race, class, and environmental quality. Boulder, Westview Press.
- Carroll, G. R. and A. Swaminathan (2000). Why the Microbrewery Movement? Organizational Dynamics of Resource Partitioning in the US Brewing Industry 1, UChicago Press. 106: 715-762.
- Cole, L. W. and S. R. Foster (2001). From the ground up : environmental racism and the rise of the environmental justice movement. New York, New York University Press.
- Dacin, M. T., J. Goodstein, et al. (2002). "Institutional theory and institutional change: Introduction to the special research forum." Academy of Management Journal 45(1): 45-56.
- Dierdorff, E. C., J. J. Norton, et al. (2009). "Greening of the World of Work: Implications for O* NETÂ®-SOC and New and Emerging Occupations." Raleigh, NC: National Center for O* NET Development. Retrieved July 30: 2009-2009.

- DiMaggio, P. J. (1991). "Constructing an organizational field as a professional project: US art museums, 1920-1940." The new institutionalism in organizational analysis: 267-292.
- DiMaggio, P. J. and W. W. Powell (1983). "The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields." American sociological review **48**(2): 147-160.
- Durkheim, É. (1964). The division of labor in society. [New York], Free Press of Glencoe.
- Durning, A. (1999). Green-Collar Jobs. Seattle, WA, Sightline Institute.
- Etzioni, A. (1969). The semi-professions and their organization; teachers, nurses, social workers. New York, Free Press.
- Freeman, S. D. (1974). Energy: the new era. New York, Vintage Books.
- Freeman, S. D. (2003). Conversations with History: Energy Conservation and the Public Interest. H. Keisler. Berkeley, CA, Institute of International Studies, UC Berkeley.
- Goldman, C., J. Peters, et al. (2010). Energy Efficiency Services Sector: Workforce Education and Training Needs, Lawrence Berkeley National Laboratory.
- Goldstein, B. (2011). Workforce Guidelines for Energy Upgrades. D. o. Energy.
- Golove, W. H. and J. H. Eto (1996). Market barriers to energy efficiency: a critical reappraisal of the rationale for public policies to promote energy efficiency. D. o. Energy, Lawrence Berkeley National Laboratory.
- GreenForAll (2009). Making the Dream Real, Green For All.
- Greenwood, R., R. Suddaby, et al. (2002). "Theorizing change: The role of professional associations in the transformation of institutionalized fields." Academy of Management Journal **45**(1): 58-80.
- Hendricks, B., B. Goldstein, et al. (2009). Rebuilding America: A National Policy Framework for Investment in Energy Efficiency Retrofits, Center For American Progress.
- Hiatt, S. R., W. D. Sine, et al. (2009). "From Pabst to Pepsi: The Deinstitutionalization of Social Practices and the Creation of Entrepreneurial Opportunities." Administrative Science Quarterly **54**(4): 635-667.
- Hirsh, R. F. (1999). Power loss : the origins of deregulation and restructuring in the American electric utility system. Cambridge, Mass., MIT Press.
- Hirst, E. (1989). "The Hood River Conservation Project - a Unique Research and Demonstration Effort." Energy and Buildings **13**(1): 3-9.
- Hirst, E. (1989). "Reaching for 100-Percent Participation in a Utility Conservation Program - the Hood River Project." Energy Policy **17**(2): 155-164.
- Hirst, E., L. Berry, et al. (1981). "Review of Utility Home Energy Audit Programs." Energy **6**(7): 621-630.
- Hirst, E. and R. Goeltz (1986). "Recommendation and Installation of Retrofit Measures in the Hood River Conservation Project." Energy and Buildings **9**(3): 221-229.
- Hirst, E. and B. Hannon (1979). "Effects of Energy-Conservation in Residential and Commercial Buildings." Science **205**(4407): 656-661.
- Hirst, E., R. Marlay, et al. (1983). "Recent Changes in United-States Energy-Consumption - What Happened and Why." Annual Review of Energy **8**: 193-245.
- Hughes, E. C. (1984). The sociological eye: Selected papers, Transaction Publishers.
- Inslee, J. and B. Hendricks (2008). Apollo's fire : igniting America's clean-energy economy. Washington, DC, Island Press.
- Jones, V. (2008). The Green Collar Economy: How One Solution Can Fix Our Two Biggest Problems, New York: HarperCollins Publishers.

- Joskow, P. and D. Marron (1991). *What does a Negawatt Really Cost?* Cambridge, MA, MIT.
- Kaiser, M. J. (2004). "WAP explained." *Energy Policy* **32**(16): 1843-1860.
- Kellogg, K. C. (2011). *Challenging Operations : Medical Reform and Resistance in Surgery*. Chicago, University of Chicago Press.
- Khan, J. (1993). "LBL Energy and Environment History Division." *Research Review Magazine Lawrence Berkley National Labs*.
- King, B. G. and N. A. Pearce (2010). "The Contentiousness of Markets: Politics, Social Movements, and Institutional Change in Markets." *Annual Review of Sociology* **36**(1): 249-267.
- Krigger, J. and C. Dorsi (2004). *Residential Energy: Cost Savings and Comfort for Existing Buildings*, Saturn Resource Management, Inc.
- Larson, M. S. (1977). *The rise of professionalism : a sociological analysis*. Berkeley, University of California Press.
- Lawrence, T. B. and R. Suddaby (2006). "Institutions and institutional work." *Handbook of organization studies* **2**: 215-254.
- Lounsbury, M. (2001). "Institutional Sources of Practice Variation: Staffing College and University Recycling Programs." *Administrative Science Quarterly* **46**(1): 29-56.
- Lounsbury, M. and E. T. Crumley (2007). "New practice creation: An institutional perspective on innovation." *Organization Studies* **28**(7): 993-1012.
- Lounsbury, M. and W. N. Kaghan (2001). Organizations, occupations and the structuration of work. *Research in the Sociology of Work*. S. P. Vallas. **10**: 25-50.
- Lounsbury, M., M. Ventresca, et al. (2003). "Social movements, field frames and industry emergence: a cultural-political perspective on US recycling." *Socio-Economic Review* **1**: 71-104.
- Lovins, A. B. (1976). "Energy Strategy - Road Not Taken." *Foreign Affairs* **55**(1): 65-96.
- Lovins, A. B. (1977). "Soft Energy Paths." *Power Engineering* **81**(4): 142-142.
- Lovins, A. B. (1996). "Negawatts - Twelve transitions, eight improvements and one distraction." *Energy Policy* **24**(4): 331-343.
- Lovins, A. B. and J. H. Price (1975). *Non-nuclear futures : the case for an ethical energy strategy*. San Francisco, Friends of the Earth International.
- Nelsen, B. J. and S. R. Barley (1997). "For Love or Money? Commodification and the Construction of an Occupational Mandate." *Administrative Science Quarterly* **42**(4): 619-653.
- NREL (2011). *Workforce Guidelines for Home Energy Upgrades: Stand Work Specifications for Single Family Homes*. D. o. Energy.
- ORNL (1983). *Residential Conservation Service Model Audit Manual*. D. o. Energy, Oak Ridge National Laboratory.
- Pinderhughes, R. (2006). "Green-Collar Jobs: Employment Impacts of Climate Change Policies." *Race, Poverty and the Environment Journal* **Summer 2006**.
- Powell, W. and J. Colyvas (2008). Microfoundations of institutional theory. *The SAGE handbook of organizational insititutionalism*. G. Royston, C. Oliver, K. Shalin and R. Suddaby. London, England, JAI Press.
- Rao, H. (1998). "Caveat emptor: The construction of nonprofit consumer watchdog organizations." *American Journal of Sociology* **103**(4): 912-961.
- Rao, H., P. Monin, et al. (2003). "Institutional change in Toque Ville: Nouvelle cuisine as an identity movement in French gastronomy." *American Journal of Sociology*: 795-843.

- Rosenfeld, A. (1999). "The Art of Energy Efficiency: Protecting the Environment with Better Technology." Annual Review of Energy and the Environment **24**: 33-82.
- Schneiberg, M., M. King, et al. (2008). "Social Movements and Organizational Form: Cooperative Alternatives to Corporations in the American Insurance, Dairy, and Grain Industries." American Sociological Review **73**(4): 635.
- Schneiberg, M. and M. Lounsbury (2008). "Social movements and institutional analysis." The Handbook of Organizational Institutionalism: 648-70.
- Scott, W. R. (2000). Institutional change and healthcare organizations: From professional dominance to managed care, University of Chicago Press.
- Segerstrom, C. (2009). "Thirty Years Later." Home Energy Magazine(May/June 2009).
- Sherman, M. and D. Dickerhoff (1998). Air Tightness of US Dwellings, Lawrence Berkley National Labs.
- Sherman, R. (2010). "" Time Is Our Commodity": Gender and the Struggle for Occupational Legitimacy Among Personal Concierges." Work and Occupations **37**(1): 81-81.
- Sine, W. D. and B. H. Lee (2009). "Tilting at Windmills? The Environmental Movement and the Emergence of the U.S. Wind Energy Sector." Administrative Science Quarterly **54**(1): 123-155.
- Socolow, R. H. (1978). "Twin Rivers Program on Energy-Conservation in Housing - Highlights and Conclusions." Energy and Buildings **1**(3): 207-242.
- Socolow, R. H. (1985). "The Physicists Role in Using Energy Efficiently - Reflections on the 1974 American-Physical-Society Summer Study and on the Task Ahead." Aip Conference Proceedings(135): 15-32.
- Socolow, R. H. (1986). "Reflections on the 1974 Aps Energy Study." Physics Today **39**(1): 60-&.
- Socolow, R. H. (1987). "Field Studies of Energy Savings in Buildings - a Tour of a 15-Year Research-Program at Princeton-University." Energy **12**(10-11): 1029-1043.
- Starr, P. (1982). The social transformation of American medicine. New York, Basic Books.
- Strang, D. and W. Sine (2002). Interorganizational Institutions. Blackwell Companion to Organizations. J. Baum. London, Blackwell Scientific Publications.
- Suddaby, R. and G. Royston (2005). "Rhetorical Strategies of Legitimacy." Administrative Science Quarterly **50**(1): 35-67.
- Swaminathan, A. and J. B. Wade (2001). Social Movement Theory and The Evolution of New Organizational Forms. The entrepreneurship dynamic : origins of entrepreneurship and the evolution of industries. C. B. Schoonhoven and E. Romanelli. Stanford, Calif., Stanford University Press: xxii, 451 p.
- Talwar, R. and E. Hirst (1981). "Energy Savings from the Minnesota Low-Income Weatherization Program." Energy Policy **9**(1): 48-51.
- Tolbert, P. S. (1996). "Occupations, organizations, and boundaryless careers." The boundaryless career: A new employment principle for a new organizational era: 331-49.
- Tonn, B., R. Schmoyer, et al. (2003). "Weatherizing the homes of low-income home energy assistance program clients: a programmatic assessment." Energy Policy **31**(8): 735-744.
- Walker, J. A., T. N. Rauh, et al. (1985). "A Review of the Residential Conservation Service Program." Annual Review of Energy **10**: 285-315.
- Weber, K., K. L. Heinze, et al. (2008). "Forage for Thought: Mobilizing Codes in the Movement for Grass-fed Meat and Dairy Products." Administrative Science Quarterly **53**(3): 529-567.

- Weber, L. (1997). "Some reflections on barriers to the efficient use of energy." Energy Policy **25**(10): 833-835.
- Wilensky, H. L. (1964). "The Professionalization of Everyone." American Journal of Sociology **70**(2): 137-158.
- Wirl, F. (1995). "Impact of Regulation on Demand-Side Conservation Programs." Journal of Regulatory Economics **7**(1): 43-62.

Chapter 3 - Green Thumbs: Institutional and Market Effects in the Diffusion of Voluntary Worker Certification in Residential Energy Efficiency Retrofits

Introduction

The purpose of this chapter is to investigate the dynamics involved in the early pattern of diffusion of voluntary worker certifications in the field of residential energy efficiency retrofits. Worker certification in this field has increased exponentially in the last few years in response to the federal and other resources mobilized by the green jobs movement. However, certification has spread unevenly across the country. The variation in certification across different states provides an intriguing opportunity to study the impact of different institutional conditions and their interaction with the activities of social movements that may support or suppress the uptake in voluntary worker certification.

Voluntary certification programs appear to be a rapidly growing labor market phenomenon (Weeden 2002; Carter 2005). Yet, to date, there is very little evidence of either what is driving the increase in certification programs or the effects of voluntary certification on labor market outcomes especially at the level of the occupation as opposed to those for individuals (Weeden 2002). This chapter is the first of a two-part research program that seeks to assess both the determinants of voluntary certification of an occupation that has been struggling to emerge and survive in recent years and then to go on to assess the effects of certification on wages and job quality. This chapter takes up the first part of the project; the second awaits publication of new national data on green jobs currently being collected by the Bureau of Labor Statistics.

Voluntary worker certification is a subtype of the more general category of voluntary certification. Among scholars interested in organization and market change, voluntary certification has been recognized as a particularly important process of the early institutionalization of nascent markets as well as a key vector for institutional change in more

established ones (Bartley 2007; Lee 2009). The forms of voluntary certification most studied have revolved around the certification of specific goods and producers, the most widely studied examples of which are the impact of environmental and labor standards in production (Bartley 2007; Locke, Qin et al. 2007; Lee 2009). To date the diffusion of certification of individual skill and competence via voluntary worker certification has received little attention (Carter 2005; Kleiner 2006). The case of residential energy efficiency retrofits highlights the importance of including voluntary worker certification and the struggles over the legitimacy and normative control of work practices within this broader field of voluntary certification. The case of the green job movement and residential energy efficiency provides a context where industry self-regulation such as voluntary worker certification represents collective action attempts to overcome market failures as well as attempts of social movements to use the market as a means of broader social change. These social movements have specifically targeted worker certification to create high-quality jobs as a distinct social good. As such it provides an interesting case to develop and test theories of social movement-influenced market development and change through the creation of work standards and certification.

I hypothesize that voluntary worker certification in a nascent industry will be highly sensitive to initial institutional support for stable labor demand, the activity of social movement organizations in creating local programs and that the activity of social movement organizations will be more effective at spurring worker certification in states that are more politically and socially aligned with their particular rhetoric and aims. Using data on the variation in voluntary worker certification in residential energy auditing activities across 49 states over five years, I find that general institutional supports for residential energy efficiency are important in predicting increased worker certification. Resident and political support for the environment is also positively associated with higher levels of worker certification. Contrary to the hypothesis, however, local “green job” social movement activities are not associated with worker certification regardless of whether the state is high or low in environmental support.

Voluntary Worker Certification and Early Institutionalization of Occupations in Nascent Markets

A growing set of literature has identified voluntary certification as often critical in shaping and changing market institutions (DiMaggio and Powell 1983; Bartley 2007; Lee 2009;

Lee, Sine et al. 2010). Voluntary certification organizations and regimes can help solve collective action problems and market failures within an industry (Garud, Jain et al. 2002), but they can also arise due to political contestation from normative actors wishing to define what constitutes good and appropriate practice from the perspective of broader social goals (Bartley 2003; Bartley 2012). In more established, functioning markets, voluntary certification is often the result of pressure from social movement organizations seeking to change practices within in the industry. The rise of labor standards in the production of apparel and footwear is an example of voluntary certification undertaken as a defensive measure by producers targeted by labor activists (Bartley 2007; Bartley 2012). In nascent markets, on the other hand, certification can play the role of creating and legitimizing new market categories (Sine, David et al. 2007). For example, the creation of voluntary certification regimes for organic food helped to organize, coordinate and grow a new market for these goods (Lee, Sine et al. 2010). In both established and nascent markets, the organizations that ultimately come to shape certification regimes then become powerful normative market actors in the creation, legitimization and enforcement of specific rules, measurements, and criteria of practice.

Voluntary certification within the realm of work and occupations is one important form of certification which impacts a critical market structure. Occupational and professional control help spread norms and practices across organizations making them powerful forces in the institutionalization of fields (DiMaggio and Powell 1983; Lounsbury and Kaghan 2001; Lawrence and Suddaby 2006). Professional and occupational communities are also sites of innovation and change (Brown and Duguid 1991; Lounsbury 2007; Adler, Seok-Woo et al. 2008). Their professional projects have been shown to be major vehicles of change within markets (Greenwood, Suddaby et al. 2002; Rao, Monin et al. 2003; Lounsbury 2007). In new and uncertain markets with the need to establish legitimacy, the process of creating new occupational mandates and licenses can become intertwined with the fate of the market itself. Like other forms of voluntary certification, voluntary work certification is a tool often associated with the early stages of institutionalizing new occupations and new markets. Sociologists interested in occupations have largely ignored voluntary certification, except to note it as a step on the path towards stronger forms of institutionalization such as occupational licensing (Wilensky 1964; Weeden 2002). However, voluntary worker certification's potential role in legitimating and organizing new markets -- such as the attempt to create a viable market for

residential energy retrofit services -- implies it is important not to ignore early stages of occupational development. Voluntary certification can help create an occupational mandate by driving business which might be accomplished by others toward a specific occupation at a time when such decisions may be more malleable compared to those made when established patterns of production and trade develop (Weeden 2002).

There is also a second motivation to understand the dynamics of voluntary worker certification. Economists have proposed voluntary certification as a theoretically superior solution to balancing increases in quality of service while minimizing the costs (wages) associated with a more constrained labor supply (Friedman and Kuznets 1945; Viscusi 1978). The basic argument is that voluntary certification can provide a signal of quality needed by consumers to differentiate providers without unnecessary social closure that can drive up wages beyond the marginal cost of providing the services. Surprisingly, however there is limited empirical research in economics directly on voluntary certification and outcomes such as wage and job quality. The small stream of economic research regarding voluntary certification is motivated by the puzzle of why firms would subsidize training in broadly recognized worker certification. Acemoglu and Pischke (2006) and Acemoglu (2010) argue that employers might underwrite employee certification precisely because the certification leads to higher employee wages when similar on-the-job skills training would not. The signal provided to the market of the employees' knowledge increases their market power and leads to higher pay. Firms, they argue, often find they need to split the economic rents of training with the employees as a way to incentivize their acquisition of skill. The use of certification is one way of accomplishing this goal. In these models certification of a new occupation can be a key mechanism for raising its wages and status for individuals which does not require a particular critical mass for social closure to raise worker pay. Weeden (2002), in her sociological study of social closure mechanisms and their effects on wages, finds that voluntary certification coverage is associated with a strong and positive effect on an occupation's as opposed to an individual's wages. The effect is similar to stronger forms of social closure such as licensing and unionization. Research such as this suggests that in the geographically defined labor markets such as those that characterize residential construction and retrofits, states and localities with higher levels of certification might be associated with better wages for workers than those where certification is rare. Hence, for those interested in worker outcomes within new industries or occupations, the

drivers of the pattern of diffusion across states or metropolitan areas then becomes helps to understand where new forms of work might be become a good job and where job quality may suffer.

The belief that voluntary worker certification can help raise wages and job quality, especially for traditionally disadvantaged workers is one of the motivations that has led the social movement organizations involved in mobilizing resources and attempting to structure the market for residential energy retrofits to make voluntary certification one of their major thrusts (Jones 2008; White 2010). In this case labor outcomes associated with the organization of work are not just a byproduct of the political contestation of markets but a central focus of social movement actors. As income inequality and stagnant wage growth foment the rise of new social movement activity - such as the green job movement, labor standards activism and Occupy Wall Street - seeking to change labor market outcomes, it becomes increasingly necessary to reincorporate the study of work and labor market institutions such as voluntary worker certification into the analysis of institutionalist accounts of markets formation and change.

Market and Institutional Forces Driving Worker Certification in Residential Retrofits

The fuller history of the struggle to create a sustainable market for home energy efficiency retrofits and home energy auditing as a potential key occupation within that industry is covered in the previous chapter. Here I will briefly tailor this account as it specifically relates to the development of to voluntary worker certification. I use it to develop a basic model of how social movements interact with basic market forces to drive differential uptake in voluntary worker certification across states.

The market for residential energy efficiency retrofits has long struggled to emerge in the United States. It was given a jump start in the late 1970s and early 1980s when skyrocketing fuel prices made energy use a significant national and consumer problem. In response to this crisis, Jimmy Carter passed a number of bills that provided resources for government agencies to help retrofit and weatherize homes of low-income households formalized in state-run Weatherization Assistance Programs (WAP) and required utility companies to perform home energy audits for their customers (Barry, Brown et al. 1997; Hirsh 1999). The concept behind these pieces of legislation originated largely from environmental and energy policy activists such as Amory Lovins and S. David Freeman who articulated the need and possibility of moving from

an energy production system predicated on the production of energy in large, centralized, carbon-intensive power plants to a system organized around small, localized energy production by renewable energy sources coupled with high levels of energy efficiency (Freeman 1974; Lovins 1976; Lovins 1977).

In response to these governmental actions and the high price of energy, a limited market infrastructure to diagnose and retrofit single-family homes for energy efficiency propped up by state mandates for utility companies began to form (Hirst, Marlay et al. 1983; Hirsh 1999). New practices were created, core technologies such as the blower door invented, and research by national labs into the building science of home energy use advanced (Sherman and Dickerhoff 1998). The beginning of a new set of supports for new occupations such as home energy auditing began to emerge, such as the publishing of Home Energy Auditor and Retrofitter, the founding of American Home Comfort Institute and its conferences, and local training programs within WAP and some utilities (see chapter 2). Nascent efforts by some entrepreneurs to expand beyond government and utility programs into the open market began. This was cut short in the mid-1980s by the election of Ronald Reagan who moved rapidly to deregulate the utility industry including suspending the requirement for national requirement for utilities to provide home energy audits. The collapse of oil and energy prices which followed shortly thereafter made it even more uninviting for creating new businesses (Hirsh 1999; Rosenfeld 1999; Segerstrom 2009). While a few utilities kept energy auditing programs, often in states with more active regulators, and the WAP maintained some level of funding, virtually no private market for home energy retrofits existed. In the case of both WAP and the utility programs, the services were offered free or virtually free to homeowners. While the organizations were concerned with quality control and monitoring the contractors who participated in their programs, the usual need for certification as a portable sign of knowledge of this niche was of little use to organizations or workers. Consequently, the WAP and utility programs which trained individuals in the techniques of home energy analysis and retrofits had little need to certify these workers.

In 2001, the Building Performance Institute, a standards-based organization founded in 1998 as part of a small New York State energy efficiency program training workers and accrediting contractors, began to offer a certification program for individuals as building analysts. To be accredited by BPI contractors were required to have a certain number of certified staff and audits had to be done by certified workers. While remaining small and largely

localized around a few utility programs, the resulting worker certification program was considered the most comprehensive standard in the small field.⁵ Through 2005 the organization never certified more than 200 individuals annually nationwide as building analysts, the most basic of its certification for individuals in the field of residential energy efficiency (see Figure 1 in Chapter 1). However, this began to change as residential energy efficiency slowly began to grow as an industry. This growth was largely a result of increased investment in residential whole home retrofit programs by utilities, state energy efficiency offices, and to a lesser extent a small entrepreneur population seeing opportunity in increasing energy prices started to again rebuild demand. A small pilot program called Home Performance with Energy Star was started by the Department of Energy and the Environmental Protection Agency to try to foster a new business model for home energy efficiency retrofits (DOE 2011). Home Performance with Energy Star programs required support by utility and state-backed loan programs that relied on tying rebates and incentives to changes in home energy performance based on before and after home energy audits. It emphasized increased training in building science and encouraged worker and contractor certification, especially for home energy auditing to provide valid measurements of energy conservations. However, it left programs to choose which certifications and certifiers it would use. While some programs chose to create local certification programs, others looked to organizations such as BPI. The slow diffusion of this performance based model begin to create a new niche for worker certification in the field (Segerstrom 2009).

In 2008, when the Apollo Alliance (2008) began pushing for public policy to encourage the growth of green jobs, it quickly centered on home residential energy efficiency as one of its focal proposals. Home energy efficiency retrofits were appealing to a variety of stakeholders. Residential energy usage had been long recognized by environmentalists as a large source of energy usage and thus pollution. Unions had long experience in the construction industry and had always considered residential construction as an exploitative but hard to organize part of the industry. Other labor activists focused on the problem of low skilled and disadvantaged workers saw jobs that could require minimal training and be accessible to their target populations.

⁵ There was a related certification that appeared, Home Energy Rating System (HERS), focused on rating the energy efficiency of homes for the purpose of mortgage financing. It started small in 1981 in support of government backed mortgage programs to allow people to buy more energy efficient homes. The program was little used, however, and like home retrofit efforts struggled once energy prices dropped. In 1995, an effort was made to relaunch the program by private lenders and gained some more traction. The HERS rating is focused mostly on comparing an existing home's efficiency to a hypothetical home's energy use. It does not emphasize diagnosing a home for how to upgrade energy efficiency, but it uses many of the same measurement tools.

Weatherization projects had even been piloted in California at the grass roots level as green-collar jobs as early as 2006. In the wake of the collapse of the home construction industry, its proximity to the residential construction industry made it particularly appealing to politicians trying to stabilize job losses in hard-hit industries.

This led to the national-scale intervention into the tiny industry through provisions in ARRA. It was recognized right away that to quickly provide a large number of workers nationwide, workforce development and training guidelines specific to weatherization were needed. The lack of a developed occupational infrastructure including training programs, standards and certification that were recognizable to consumers was highlighted as one of the major barriers to the advancement of the home retrofit industry. The Obama Administration's Middle Class Taskforce's (2009) initial report on actions to take to develop a thriving home retrofit industry directly targeted the lack of nationally recognized training and quality standards as one of the barriers the industry faced.

To achieve the desired scale of efficient and healthy home retrofits, a sizable increase in the number of well-trained green retrofit workers is needed. Many states and localities are looking for guidance and information on how to both streamline and rapidly expand quality training opportunities for those looking to enter the home energy retrofit industry. Furthermore, there is no clear guideline or standard to assure consumers of the quality of the work being done on their home. A consistent set of standards will increase consumer confidence in energy retrofit workers, promote good green job opportunities and training opportunities for people of all skill levels, and facilitate the mobilization of a national home retrofit workforce.

The proposed solution was to help propagate voluntary worker certification programs as a way to create consumer confidence in savings projections and quality of work as well as to provide potential workers with the labor market infrastructure necessary to receive training and portable certification of their skills.

To rapidly expand retrofit capacity, a national effort is needed to conclusively identify required job skills upon which certification standards will be based, and develop standard training goals or methods. The availability of model training programs based around best practices will lower the barriers to entry for programs needed to train workers, allowing an expanded offering of quality training opportunities. The widespread adoption of model training approaches will also facilitate the development of a well-trained workforce across the country, which will improve energy and environmental outcomes, enable worker mobility, and enhance career opportunities....

To facilitate consistent, high-quality training of a green retrofit workforce, the Federal Government will:

1. Advance a nationally recognized worker certification standard for comprehensive training that provides evidence that a worker is well qualified to properly complete efficiency and healthy home retrofits.
2. Promote a nationally recognized training accreditation standard to enable students to identify trainers with a demonstrated capacity to provide quality instruction. (p.10-11)

While the federal government stopped short of creating a specific national certification program or mandating a particular certifier, it relied heavily on the Building Performance Institute's training and certification guidelines to ultimately help define job skills, training requirements and a framework for certification. BPI's standards became the defacto national standard. BPI took advantage of the opportunity by quickly expanding its offerings and seeking accreditation from the American National Standard Institute (ANSI), the oldest and most respected standards accreditation organization in the United States. The vast majority of the stimulus money for retrofits was doled out on a per capita basis to the states, which were then left to implement the expansion of the program with a few guidelines regarding household income eligibility and per-home spending limits. States and local communities were largely left on their own to organize and implement retrofit programs. As a consequence, like in the period before ARRA, there appears to be wide variability in how worker certifications such as BPI's have been affected by this new inflow of funds.

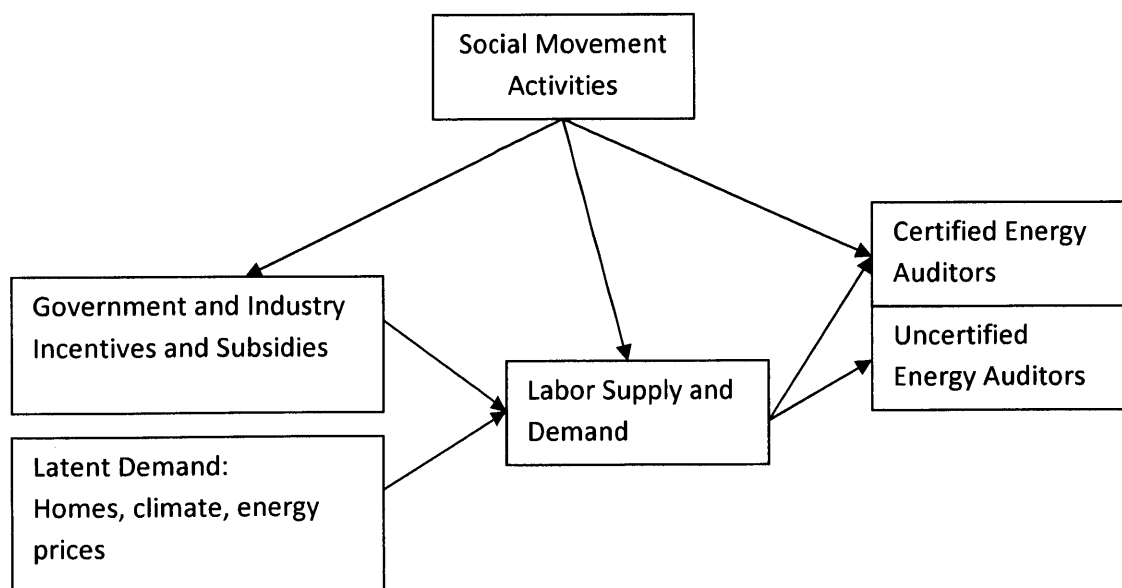
I summarize the basic model of the three different pathways by which social movement activity can affect the number of voluntary worker certifications that are attained in a state, represented graphically in Figure 1. First, in periods before and after ARRA, state and utility programs have been the major drivers of demand for residential energy retrofits and the labor to accomplish them. Through subsidizing retrofits in a variety of ways, state and utility programs have helped create and define the market. While ARRA stoked demand for labor in the retrofit industry, the spending was only temporary and set to expire in 2012. With the failure of follow up efforts such as the HomeStar Act in 2010, federal money for retrofits began to look unlikely. However, state and utility money dedicated to residential energy efficiency programs continued to rise. As reported in chapter 1, as of 2011 thirty-seven states had state-level, whole home retrofit programs. Overall spending by utilities on demand side management has also been increasing rapidly. These programs offer the promise of more stable demand for the knowledge

and skills of retrofit workers as this will give them more incentive to invest in retrofit specific training and certification. As detailed in chapter 2, environmental social movement organizations and activists targeted state government and even utilities directly to push for such programs, leading to increased resources for the field within the state. This is represented in the model by the link between social movements and government and utility incentives. The establishment of these programs should lead to higher levels of stable demand for retrofit workers which in turn should lead to higher levels of certification in energy auditing tasks.

Second, social movement activities can have even a more direct effect on the demand and supply of retrofit labor. New markets and technologies often take root in niches of early adopters. One motivation for early adoption is among consumers who become aligned with social movement critiques of available options. The environmental movement, for example has succeeded in helping to create a number of markets such that for organically produced food and renewable energy (Faiers and Neame 2006; Weber, Heinze et al. 2008). Retrofits, like technologies for renewable energy production, can gain a foothold in niche markets where socially motivated consumers are willing to be early adopters. One of the consistent findings among studies of users of utility home energy audit programs is that they are often utilized by customers already likely to be investing in energy and environmental conservation (Walker, Rauh et al. 1985; Socolow 1987; Joskow and Marron 1991). Hence we would expect that where social movements advocating energy efficiency for ecological reasons have more resonance there should be a larger number of potential home owners willing to invest in retrofits and energy audits. Similarly on the labor supply side, social movement activities can lead individuals to try and enter new occupations and industries that align with their values (Sine and Lee 2009). As shown in chapter 4, there is a positive relationship between environmental consciousness and commitment and activity in the occupation of energy auditing. The interviews in that chapter reveal that at least some people have entered the occupation primarily because of its link to the environment. These individuals are more likely to invest in the nascent occupational communities. Hence, states where residents have on average a higher resonance with the environmentalist framing of energy auditing could have larger number of people seek to become certified and enter the occupation. This is represented by the arrow from social movement activities directly to labor demand and supply.

Finally, even after accounting for these indirect and direct effects of social movements driving general demand and supply of retrofit labor which would increase both certified and uncertified labor, is the possibility of a direct effect on increasing the likelihood that workers who enter the field would seek to become certified. As detailed above, in the green jobs movement, the desire to create high quality jobs on and to legitimize the entire market sector has led the social movement organizations involved to promote and create training programs which emphasize certification (ApolloAlliance 2008; GreenForAll 2009). Residential energy efficiency projects spearheaded by organizations with these goals would increase the ratio of individuals in the sector who have the opportunity to become certified by both directly funding such individuals and helping construct a local infrastructure for training and certification. They would also raise awareness of voluntary worker certification and help legitimize for some workers. In states, where these organizations are not active this type of institutional entrepreneurship must be done by others.

Figure 1: Basic Model of Social Movement’s Effect on Demand for Voluntary Worker Certification



Hypotheses

Establishing viable new forms of worker certification faces significant barriers for the standard-based organizations, such as BPI, that seek to develop them. The problem is especially acute when creating new classes of worker certification within nascent market sectors that themselves are not well established. In this case, the standard-based organization creating the certification is faced with trying to legitimize the market segment as well as legitimate the new certification within the segment (Aldrich and Fiol 1994; Lee 2009). Drawing on the resources and power of the state to establish an initial foothold in the market can be one path toward the birth of new standard-based certification organizations (Bartley 2003). This was the case with BPI which began as a small auxiliary organization designed to support the public utility energy efficiency program in New York. States differ dramatically in their overall support for energy efficiency policies and their adoption of residential home energy efficiency programs. At the most general level, state support of energy efficiency increases the visibility and legitimacy of energy efficiency efforts among the states residents and those who could potentially work in the sector. In such early stages individuals who live in states that support the more general category of activities that a new voluntary worker certification falls in could have more interest and reason to pursue certification even in the absence of specific programs.

Hypothesis 1: The level of support at the state level for energy efficiency policies will be positively associated with the number of individuals who receive voluntary worker certification in residential energy efficiency skills

The rise in residential energy retrofits has been in the context of an increasing focus on energy efficiency as a form of environmental protection. As detailed in chapter 2, residential energy efficiency retrofits as a cohesive policy sprang directly from environmentally concerned thinkers and activists. This framing of the residential energy efficiency activities as a green cause remain imprinted on the field even after changes at the federal level dried up most the federal and state resources, leaving a few poverty-oriented programs in which to develop and build industry practice. As will be shown in Chapter 4 the potentially positive environmental aspects of residential energy efficiency have continued to attract individuals to participate and innovate in this field as a means of expressing their environmentalist values, a trend that appears

to becoming stronger as the job is being framed in terms of being a green job. This should increase overall labor supply for residential energy auditors in states with a higher concentration of environmentally conscious workers which should be reflected in the number of individuals pursuing voluntary certification in these states.

Hypothesis 2: States where there are more environmentally-minded individuals will have more voluntary worker certification in residential retrofits

Finally, collective action around green jobs has led to the creation of social movement organizations working to establish residential energy retrofit green job programs and activities. Three organizations in particular have been working at the state and city levels to support and organize residential retrofit programs – GreenforAll, Emerald Cities and the Blue Green Coalition. Each of these organizations launched significant programs in multiple states which organized green job retrofit programs. The programs themselves often emphasized providing workers in their training programs with credible and portable certification as a way to increase their labor market outcomes and build a robust and sustainable retrofit sector (White 2010). Beyond directly providing training that prepares individual for certifications such as BPI’s building analyst certification, they work to raise general awareness in a city and state of the benefits and legitimacy of residential energy retrofits. They publish examples of successful programs and media on the saving attained by clients of their program. GreenforAll provides kits and templates for starting retrofit programs and green job training programs (GreenForAll 2009). The Blue Green coalition has been a key player in pushing innovations such as PACE at the legislative level but also helped bring together local labor unions, entrepreneurs and city leaders to create a workable infrastructure of residential retrofits in over 12 localities. I posit that the presence of at least one project run by one of these social movement organizations in a state will increase certifications in that state all else equal.

Hypothesis 3a: The presence of a social movement related residential energy efficiency program by GreenforAll, Emerald Cities, or Blue Green Coalition in a state will increase the number of worker certifications.

Additionally, the activities by these social movements in states where the population is more aligned with the green framing should be more effective as spurring increased certification rates not only among program participants but others whose attention is drawn by these efforts. There should be a larger labor base available to mobilize through the social movement's framing of the new industry to not only save money but also as a way to express their environmental values

Hypothesis 3b: The positive relationship between social movement activities will be stronger in states with higher average levels of environmentalism as measured by average level of the environmental consciousness among state residents

Data

I analyze the diffusion of voluntary certification related to residential energy auditing based on a unique combination of government and private data sources. The United States collects extensive data regarding the size and nature of its housing stock, climate data, and energy prices. Consequently, there is relatively high-quality national data regarding the underlying potential market for residential energy efficiency services and related labor supply. Because energy production and distribution have traditionally been highly regulated industries, there also exists largely reliable data on the institutional supports for residential energy retrofit programs beginning in 2006, when these types of programs were still rare. Currently, data from all sources is reported through 2010 yielding five full years of data. It covers all states except Hawaii for which a number of key variables are not available. This is worth emphasizing as the relative paucity of studies in the early stages of occupational emergence is as much for lack of timely and relevant data as it is for theoretical considerations. Getting reasonable data to estimate these basic underlying conditions is often not possible. In the case of residential energy auditing, I believe plausible estimates can be obtained.

The second data limitation to studying voluntary worker certification is the difficulty in accessing the certification data itself. In the case of state licensing, good public data often exists on the number of license holders in a state. Because voluntary certification tends to be so diffuse and run by private organizations, detailed and reliable longitudinal data are rare. Even more difficult is finding data that reaches back to the earlier moments of a given program. I know of

no existing study that uses geographically identified individual-level voluntary worker certification data over time.

Dependent Variable: Certification Data

I rely on unique data that captures every individual to be certified by what eventually became the most established certification organization in the field of residential energy efficiency, the Building Performance Institute. This organization has become heavily associated with residential energy retrofits and especially the emerging occupation of energy auditing. While BPI certification began expanding rapidly in recent years, the data begin in 2001 when fewer than 200 individuals were certified nationwide, most within two states that used the certification as part of an incentive program for residential retrofits. Even with the recent rapid expansion certification is still nascent when compared to the potential targeted population. The co-evolution of the diffusion of the certification program with the development of the market for residential retrofits provides a useful example to examine details of the relationship of certification from its earliest stages with its market and institutional growth.

The data include not only the date of certification for each individual but also the zip code in which the individual resides. The zip code represents the last known address of the individuals and not necessarily the zip code in which they lived at the time they were certified. Changing an individual's personal address was a process done by hand at the home offices of the organization based either on a phone call or written request by an individual. Those responsible for inputting new addresses did not keep a log of changes. The administrators in charge say that individual address changes were relatively rare occurrences. This is problematic as individuals who become certified might be subject to increased employment prospects including those for which they may move. While I believe that error potentially associated with this problem is moderate at best, though increasing as BPI certification spreads geographically over time, I do not have the data required to estimate it. The state-level model helps minimize this concern. While it is very likely a person might move across zip codes or across metropolitan areas, it is less likely they will move across state lines.

I focus specifically on BPI's most basic certification, the certification as building analyst. The building analyst certification requires a basic education in building science as it relates specifically to energy efficiency in single-family homes. It requires the individual pass two tests.

The first is a written test of 100 questions which cover a variety of technical topics on calculating energy loads, building material, combustion safety and equipment use. The second test is a field test where the individual must demonstrate the basic skills of operating a blower door, complete a combustion safety test and apply other basic diagnostic skills. Courses to prepare for the exam are often two to three weeks in length and cost around \$2,000, though the test can be taken without enrolling in a course. Roughly 70% of individuals who take the test pass on the first try. The certification received by successfully passing the test is good for three years. To become recertified an individual must again pass a shortened version of the test as well as demonstrate participating in a certain number of continuing education hours. The number of recertifications is small over this time period as all those certified after 2008 have three years before they must recertify. To make years comparable I focus only on new certifications and exclude those recertifying.

Control Variables

With new occupations it is often difficult to estimate the potential size of the market, as it is often unclear who or what should reasonably be included in such latent demand estimates. In the case of residential energy auditing, there are good proxies that allow a solid estimate of the full potential market for the services. Because I am interested in the institutional changes and social context that facilitate diffusion, I want to control for any confounding factors that might be related to the natural demand for home energy retrofit services. The most natural market for these services is single-family homes, even more specifically, single-family homes in which the occupant is the owner of the home. When a home is rented or is part of a multi-family housing unit, it quickly becomes complex to ascertain the direct incentives for its owners to invest in energy efficiency. Large apartment complexes or even modest multi-family housing have very different mechanical systems and building materials. These residents represent a largely separate market from detached single-owner homes. BPI for example has a certification specifically for multi-family homes that is completely distinct from the certification for single family homes. In general, the larger and more sophisticated the buildings the more developed the energy efficiency services market is. For the largest and most complex buildings and institutions, such as MIT, an industry populated by Energy Service Companies (ESCOs) has developed. This sector operates even more separately from the residential sector and to my knowledge there have been no

attempts for the ESCO industry to enter home energy efficiency. Therefore, I begin by controlling specifically for the number of owner occupied single family homes in the state divided by 1000 for scale purposes.

Additionally, there exists a significant difference in the energy efficiency retrofit potential for homes based largely on their age. Homes that were built before the enactment of new energy efficiency building standards are the prime targets for energy efficiency retrofits. These new standards were passed in 1990; however building practices had begun to incorporate far more energy efficiency improvements in the 1980s as well. Experts in residential energy efficiency have specifically targeted homes built before 1970 as having severe energy efficiency needs (Kriger and Dorsi 2004). More generally the older the housing stock of an area, the more demand there should be for energy efficiency retrofit services. To account for not only the aggregate size of a state's housing stock but also its relative need, I also include a measure for the percentage of a state's owner occupied single-family homes build before 1970.

There are good estimates of the size, nature and age of the housing stock in the United States on a fairly granular level. I use the 2000 census data on the United States housing stock available from the US Census Bureau's website. This is the most recent comprehensive detailed measure available for a state's housing stock. Even if there are differential rates of new home construction across states, this should have a very small impact on the demand for residential energy efficiency auditors and retrofitters who specialize in diagnosing established homes. A separate, though related, certification for "home energy raters" (HERS raters), focused on creating home efficiency ratings for newly built houses, exists in a somewhat separate system, though it is not uncommon for HERS raters to get BPI certification to work on older homes as well. Data on the number of HERS raters or certifications by state is not currently available.

Two other important factors influence the potential size of the residential energy efficiency retrofit market beyond the size and age of the housing stock. The cost of energy used by an inefficient home, and thus the level of theoretical willingness to pay for diagnosis and improvements, is predicated on the need for heating and cooling as well as the local price of energy. The need for heating and cooling in homes is driven by an area's local temperature and there is a standard measure for these variations kept by the US government weather service and Energy Information Agency (EIA) – heating, cooling degree days in a state. These data are weighted to account for the distribution of population across different temperature zones within

the state. I divide weighted heating and cooling degree days by 365 to convert the measures into degree years. This data are actively used in the computer models used by energy auditors when estimating potential energy savings. This measure tracks the number of days in which the temperature deviates from a standard norm for comfort as well as the extremity of the deviation from this temperature.

Energy prices also fluctuate by state and as energy prices rise, the demand for retrofit services should go up. State energy prices are taken from the Energy Information Agency monthly data and represent the combined price for all energy as paid at residential prices, labeled RETFD in the EIA database. This includes electricity as well as heating oil and other energy consumption. Because the standard methods of heating and cooling a home change by region, RETFD provides a reasonable if imperfect proxy which captures the general cost of energy to a consumer that is comparable across states. Here I label this variable as *price*.

Equally important when considering worker certification is to control for the size and demand from the labor force. As a more specific proxy for the potential demand for worker certification from workers, I use the Bureau of Labor Statistics estimate of the total number of individuals employed as HVAC installers in a state. This is a good general proxy for those involved in fields directly related to the energy usage of the home. A second important control for potential labor supply is the unemployment rate in the state. Because home energy retrofit jobs were widely publicized as one solution for unemployed workers and many retraining programs focused on the unemployed were started after the financial collapse I expect that states with higher unemployment rates will have higher demand for certification in this green job. As detailed in Chapters 1 and 4, over 30% of individuals seeking certification as home energy auditors or installation technicians were unemployed at or near the time they became certified. This makes this an important control.

Finally, some local utilities have residential energy efficiency programs and initiatives. Most of these do not include whole home energy retrofits but some do. There is currently no reliable, comprehensive existing data on specific individual utility energy efficiency programs. However, the EAI does ask utilities to report the overall amount of money they spend specifically on residential energy efficiency initiatives on EIA Form 861. I take my data, however, from the expenditures of utilities by state as calculated by Consortium for Energy Efficiency, which is based on the EIA data, but apportions out more correctly for utilities that

serve multiple states based on direct contacts with utility program administrators. Beginning in 2005, the CEE releases an annual report that details energy efficiency by state. I collapse the residential energy efficiency and residential low income spending for each state. This measure then represents the best measure of utility funded residential energy efficiency spending by state. Most of this spending is on programs not associated with whole home retrofits, a minority niche program especially pre-ARRA. Most the money is spent instead on appliance, boiler, heat pumps and lighting replacement and other programs.

To take into account the overall growth in BPI certification and focus on state variation I enter dummy variables for each year. I make 2008 the base year as the bridge year between the ARRA funding and the years prior to this mobilization.

Independent Variables

To test Hypothesis 1 regarding the positive relationship between the overall environment of support for energy efficiency in a state and demand for voluntary worker certification, I rely on data from the American Council for an Energy Efficient Economy, a trade association comprised of utility companies and other organizations involved in administering and advocating for energy efficiency programs. Beginning in 2005 it compiled a comprehensive state-level score card for the overall activity around energy efficiency in a state. This includes activity the industrial, commercial and residential sector and is based on data compiled from many public sources. For each year the organization provides a score that ranges from a maximum of 50 points to a minimum of 0 points based on 8 specific criteria based on a state's policies to foster energy efficiency. The spread across states is quite large with the highest rated state scoring in the mid-forties and the lowest in the single digits. Significant movement occurs in states overtime as new policies are enacted and expire. I lag this variable to account for time necessary for individuals to react to new policy changes. As shown in Chapter 2 it is clear that the level of energy efficiency supports in many states is partially due to direct efforts of environmentalists to create such programs.

To provide an alternative measure to test Hypothesis 1, I use the DSIRE database on alternative energy and efficiency incentives. Compiled by researchers at North Carolina State and funded by the Energy Department the *The Database of State Incentives for Renewables & Efficiency* (DSIRE) is a comprehensive source of information on state, local, utility, and federal

incentives and policies that promote renewable energy and energy efficiency. Established in 1995, the database started tracking residential energy efficiency incentive programs in 2006. Each entry includes detailed information on the nature of any state program related to either of residential energy efficiency or supports for renewable energy. It contains hundreds of entries on residential efficiency programs for state, county, town, and utility programs. These range from small incentives of \$50 rebates for replacing heat pumps and appliances to large rebate programs for whole house retrofits. A research assistant and I hand coded all the entries coded within the database by DSIRE staff as being residential efficiency-related. Reading the detailed descriptions of each program as well as other fields provided, we determined whether the program provided resources relevant to whole home retrofits. We included any program that included incentives for insulation and other building shell improvements as well as upgrading the mechanical system of the home. Programs that did only insulation or mechanical upgrades were excluded. BPI certification is predicated on knowledge of the interaction of the two systems which signify the whole home approach. We excluded all programs that dealt only with appliances or heat-pumps.

For this analysis I included measures for only for the existence of state level programs. To provide finer detail I used DSIRE's codification for whether the programs provide loans, grants or rebates. While the data wasn't systematic enough to provide estimates for the exact size of these programs, these categories do give a finer grained breakdown of the data. It is widely believed within residential energy efficiency circles and supported by rigorous research that most grant programs do little to increase demand for residential energy efficiency services while loan and rebate programs have shown to be more stable in driving demand for services, though loan programs are often utilized at lower rates. For the time being each of these variables is a simple count of the number of each type of program reported in a state for each year. The more programs that exist in the state, the more opportunities for administrators to link them to voluntary worker certifications such as BPI's building analyst certificate. For most state years the count is 0. For example, 191 of the total 250 state years there is no rebate program present. However, some states report having as many as 6 different state-level rebate programs available in a year. These include the Home Performance with Energy Star programs run at a state level.

I also include a dummy variable for any year in which a state passed legislation to authorize PACE financing and every year thereafter as no state has yet to repeal a piece of PACE

legislation. I take my data on PACE legislation from the DSRE database. The first PACE legislation was passed in California in 2008 and 25 other states followed in 2009 and 2010. However, even in states where PACE legislation has passed, almost no active PACE programs have been created, with the exception of California. Actions by Fanny May and Freddie Mac in late 2010 essentially froze all active efforts at implementing actual PACE-based programs (Digitale 2010). So while it may not be the actual existence of such programs that could be driving certification uptake it did provide an important signal to potential certification seekers as to whether more sustainable private funding for the industry might eventually become available locally.

To test Hypothesis 2, I look at two different measures of environmental attitudes within a state. For a time-varying measure I use the League of Conservation Voters score card for the federal Senate and House of Representatives of each state. The score card, begun in 2006, rates each state's national representatives' votes on environment specific legislation. The scores range from 0 to 100, 0 indicating that the individual voted against the environment on issues that year and 100 indicating voting in alignment with the League's environmental values on each issue. Proxies of a state's national representatives has been widely used in research which maps the geography of environmental attitudes and in studies of social movements and markets (Mazur and Welch 1999; Lee and Sine 2007; Sine and Lee 2009). Representatives of states where more of the electorate care about environmental issues tend to vote in environmentally-minded legislators and legislators in office receive pressure to vote in alignment with their constituents. By including both the Senate and the House candidates, average over the entire state the overall state score tends to reflect the political diversity in the state. This measure should also be correlated with the state-level legislators which decide state policy and its openness to environmentally minded legislation. As residential energy efficiency retrofits have become more and more cast in the light of environmental protection they should enjoy more legitimacy in states with an electorate amenable to this framing. However, this measure is not ideal as small shifts in election results can lead to large shift in the measure that are out of proportion to the shift in the underlying electorate. Legislators also face competing incentives in their votes from party pressures. In the United States, environmental votes at the national level have broken down more and more along party lines in line with the more general trend in polarization in US politics.

Consequently, I turn to a second, more direct measure of a state population's environmental attitudes, a national random-digit dialing survey of 9,000 households undertaken by the National Service for Recreation and the Environment (NSRE) in 1999. It is the single largest and most comprehensive survey of environmental attitudes undertaken in the US. I create an index of the strength of environmental attitudes based on 8 questions from the survey (see Table 1) I average the responses from all respondents in a given state ($\alpha = .72$). The number of responses with complete data for the items in the index ranges from 31 for Delaware to 491 for California with the median being 102 responses. This represents a total of 6,527 individuals, across 50 states, who completed responses to these 8 questions. This more direct way of measuring the level of environmentalism in a state's population is limited by the fact that it is time invariant and the number of responses in some states is quite small. I use it as an alternative measure. It has a moderately strong correlation with voting data (.52).

Table 1: NSRE Items Used for Environmental Index Scale

Question	Reverse Coded
Humans are severly abusing the environment	
Humans have the right to modify the environment to suit their needs	X
Humans are meant to rule over nature	X
If things continue on their present course, we will soon experience a major ecological catastrophe	
The balance of nature is delicate and easily upset	
The so-called "environmental crisis" has been greatly exaggerated	X
We are approaching the limit to the number of people the planet can support	
When humans interfere with nature, it often produces disastrous consequences	

To test Hypothesis 3a and 3b, I use is the presence of one of three social movement organizations that have directly advocated not only for green jobs but for green jobs within residential energy efficiency. The organizations are Green For All, Emerald Cities and the Blue

Green Alliance. As detailed in Chapter 2, these organizations led the charge to including residential energy efficiency within ARRA and lead specific programs trying to create local green jobs. One of the common critiques of the literature on social movements and markets has been the lack of direct measurement of social movement activities as a local level which directly related to the outcome study. For each social movement I count the year in which it started or ran any green job initiative within the state. Most of these initiatives targeted specific cities rather than states. However, these were often the major cities within a state and therefore have a potential significant impact at the state level. All these specific activities came after 2008 and during the green jobs mobilization that followed ARRA.

Model and Results

Table 2 contains descriptive statistics and correlations for all of the variables. A look at the basic correlation between the numbers of new BPI building analysts certifications in a state in a given year and the market and institutional environments within the state provides face validity to the basic hypotheses. Variables that help account for the overall size of the market and state such as the number of single owner occupied homes and the number of HVAC installers, are significantly coordinated with the number of certifications with correlations of .36 and .34 respectively. However, low correlations with the number of certifications are found for latent market conditions that would make the retrofitting of homes within the state more attractive such as higher energy prices (.03), more heating and cooling degree days (-.12) and a prevalence of older homes (.11). None reach the threshold of statistical significance at the $p > .05$ level. Variables related to state and utility support for residential energy efficiency are mostly, though not uniformly, significantly, positively correlated with certification. For example, utility spending on residential energy efficiency initiatives (.35) and the ACEEE overall rating of state's support for energy efficiency (.40) appear supportive of certification. The more granular data from DSIRE database indicates a potential difference between the type of state energy efficiency program and the increase in certificates. Grant programs are the least associated with certification (.07) while loan programs (.17), rebate programs (.32) and PACE legislation (.46) are more highly correlated. Finally, looking at the measures related to environmentalism and

Table 2: Descriptive Statistics and Correlations

Variable	Mean	SD	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12
1 # New BPI Building Analyst Certifications	45.5	92.4	0.0	651.0	1											
2 # Single-Family Owner Occupied Homes	10.8	10.5	0.8	53.6	0.36	1										
3 % of SFOO Homes built before 1970	0.6	0.1	0.2	0.9	0.11	0.11	1									
4 # Heating/Cooling Degree Years (in 1000)	6.6	1.6	3.6	11.6	-0.12	-0.37	0.13	1								
5 Avg Price of All Residential Energy	22.4	8.3	13.6	89.1	0.03	0.23	-0.13	-0.5	1							
6 # HVAC Installers	4.9	5.1	0.3	24.7	0.34	0.84	0.03	-0.46	0.13	1						
7 Unemployment Rate	6.7	2.7	2.6	14.1	0.49	0.21	-0.15	-0.24	0.03	0.09	1					
8 # of certifications in state in previous year	0.4	1.0	0.0	6.4	0.47	-0.02	-0.07	0.13	0.04	-0.07	0.36	1				
9 Utility Spending on REE	4.2	5.3	0.0	27.8	0.35	0.16	0.01	0.13	0.19	0.02	0.24	0.39	1			
10 year = 2006	0.2	0.4	0.0	1.0	-0.22	0	0	0	-0.06	0	-0.35	-0.2	-0.19	1		
11 year = 2007	0.2	0.4	0.0	1.0	-0.21	0	0	0	-0.04	0.03	-0.37	-0.19	-0.12	-0.25	1	
12 year = 2009	0.2	0.4	0.0	1.0	0.08	0	0	0	0	-0.01	0.42	-0.05	0.08	-0.25	-0.25	1
13 year = 20010	0.2	0.4	0.0	1.0	0.51	0	0	0	0	-0.05	0.47	0.59	0.26	-0.25	-0.25	-0.25
14 ACEEE State Energy Efficiency Rating	16.4	10.7	0.0	45.5	0.4	0.38	0.18	-0.02	0.16	0.24	0.24	0.28	0.69	-0.19	-0.06	0.09
15 # of state wholehome retrofit grant prgrms	0.1	0.3	0.0	1.0	0.06	0.1	0.32	0.09	-0.03	0.05	-0.01	-0.04	0.03	-0.02	0.05	0.05
16 # of state wholehome retrofit loan prgrms	0.4	0.7	0.0	4.0	0.17	0.02	0.09	0.41	-0.1	0	0.02	0.16	0.18	-0.05	-0.02	-0.01
17 # of state wholehome retrofit rebate prgrr	0.4	0.9	0.0	6.0	0.32	-0.03	0.12	0.11	0.01	-0.07	0.23	0.49	0.43	-0.13	-0.1	-0.09
18 State with PACE legislation = 1	0.2	0.4	0.0	1.0	0.46	0.23	-0.06	-0.09	0.22	0.09	0.37	0.39	0.29	-0.21	-0.21	0.14
19 State Resident Env Index	3.8	0.1	3.6	4.0	0.14	0.23	0.09	-0.27	0.35	0.19	0.16	0.16	0.26	0	0	0
20 Social Movement Retrofit Program = 1	53.5	25.5	0.0	100.0	0.21	0.11	0.41	0.12	0.31	0.02	0.07	0.21	0.44	-0.15	-0.02	0.12
21 LCV Voting Record of Cngrss Reps	0.1	0.3	0.0	1.0	0.42	0.23	0.16	-0.05	-0.06	0.12	0.39	0.21	0.31	-0.18	-0.18	0.2
22 SM x State Resident Env Index	0.4	1.2	0.0	3.9	0.42	0.23	0.16	-0.05	-0.06	0.12	0.39	0.21	0.31	-0.18	-0.18	0.2
23 SM x LCV Voting Record	7.3	22.0	0.0	95.0	0.44	0.21	0.18	-0.03	-0.05	0.12	0.4	0.24	0.36	-0.17	-0.17	0.21

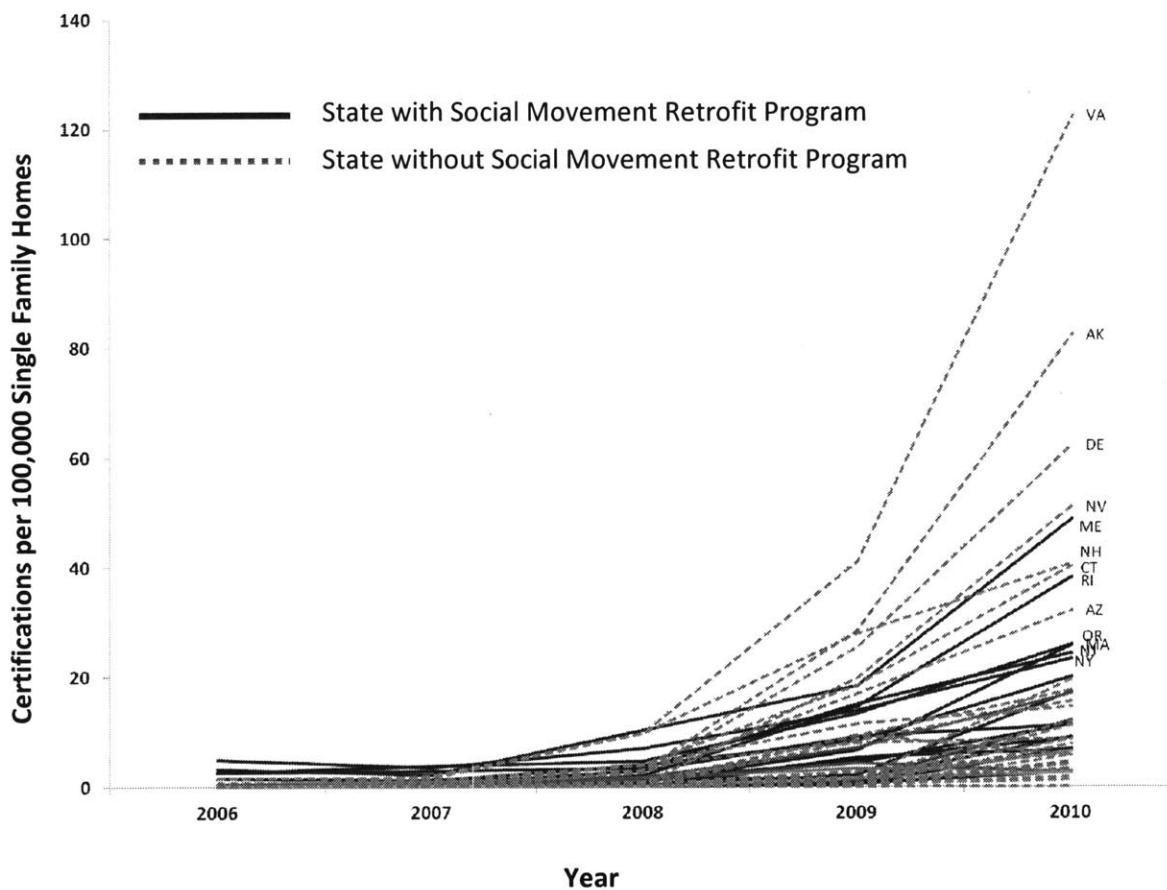
Table 2: Descriptive Statistics and Correlations continued...

13 year = 20010	1											
14 ACEEE State Energy Efficiency Rating	0.13	1										
15 # of state wholehome retrofit grant prgrms	-0.06	0.14	1									
16 # of state wholehome retrofit loan prgrms	0.07	0.29	0.1	1								
17 # of state wholehome retrofit rebate prgrm	0.42	0.32	-0.04	0.25	1							
18 State with PACE legislation = 1	0.45	0.28	-0.05	0.03	0.29	1						
19 State Resident Env Index	0	0.37	0.04	-0.05	0.13	0.18	1					
20 Social Movement Retrofit Program = 1	-0.01	0.64	0.17	0.13	0.27	0.18	0.52	1				
21 LCV Voting Record of Cngrss Reps	0.26	0.33	0	0.17	0.32	0.38	0.1	0.17	1			
22 SM x State Resident Env Index	0.26	0.34	0	0.17	0.32	0.38	0.1	0.17	1	1		
23 SM x LCV Voting Record	0.23	0.4	0	0.17	0.3	0.35	0.14	0.25	0.94	0.95	1	

Pairwise correlations. Correlations > |.125| are significant at $p < .05$

social movements within the state the estimated level of a state’s residents’ environmentalism is has a moderately positive correlation of .14 with certification while the alternative measure of the state’s congressional representatives’ voting records on environmental issues is .42. States in years where there is an active social movement organization program in residential energy retrofits show are associated with higher levels of certification as well with a correlation of .21.

Figure 2: New BPI Building Analyst Certifications per 100,000 Single Family Owner Occupied Homes by Year and State



To see the longitudinal dynamics of the rise in certification, I graphed the rise in the number of certifications per 100,000 single-owner homes for each state across the five year period indicating states where social movement organizations mounted a retrofit initiative in red and those where there was an absent of such an initiative in gray. This graph reveals that the states which saw the greatest rise in the certifications per home did not have social movement

initiatives, but on average, those with such initiatives saw increases larger than the bulk of the states without them. It also demonstrates nicely the great variability in new certifications across states over time. While some states saw almost no appreciable increase in the use of the BPI certification, even after ARRA, others saw its rise dramatically.

To better understand these patterns and formally test the hypotheses I turn to a multivariate model. I model voluntary worker certification in each state in each year as a count variable. Poisson and negative binomial based models are most common methods for modeling such count data (Hilbe 2007). The choice between the two models is dependent on the underlying distribution of the outcome data. The Poisson distribution assumes that the mean and variance of the outcome variable are roughly equal. A common issue, however, is over dispersion when the variance is significantly larger than the mean (Hilbe 2007). An investigation of the state certification data shows this is indeed the case. The variance (90) is almost twice the average certification count (45). In these cases, negative binomial regression is recommended. I therefore run a fully-balanced negative binomial panel regression for 49 states using the `-xtnbreg-` command in Stata. Table 3 report out the random-effects model which allows estimation for the time unvarying variables.⁶

Model 1 includes all the controls including the year dummies. The size and quality of the housing stock appears to be unrelated to the number of certifications. States with more and older single-family homes have not seen substantially different increases than in smaller states, the number of homes even being marginally negatively related to increases in certification count. States with higher energy costs do see more certifications. The labor supply controls are more robustly related to voluntary certifications. Higher unemployment rates are associated with higher levels of certification. This is consistent with descriptive data from people seeking certification from BPI over the last two years. Nearly a third were unemployed at the time they sought certification. States with larger numbers of individuals in HVAC, a proxy for related labor supply in the state is marginally but reliably positive across most the models. As expected, utility spending on energy efficiency programs is also positively related to certification counts in models in which the measure for a state's overall energy policy activism, speaking to the close

⁶ A fixed-effects model has similar results at the random effects model though it displays somewhat weaker results for hypothesis 5a. The coefficient for vote score is positive and significant at the $p < .1$ level while the env index variable representing direct attitude fails to be significant. All other independent variables have the same sign and significance level.

Table 3: Panel Negative Binomial Regression of Certification Count by State

VARIABLES	MODEL	1	2	3	4	5	6	7	8	9	10
# Single-Family Owner Occupied Homes		-0.003 (0.018)	-0.026 (0.017)	-0.005 (0.019)	-0.031* (0.018)	-0.030* (0.018)	-0.032* (0.018)	-0.034* (0.018)	-0.034* (0.017)	-0.035** (0.017)	-0.035** (0.017)
% of SFOO Homes built before 1970		0.724 (0.858)	-0.211 (0.814)	0.880 (0.885)	-0.110 (0.810)	-0.858 (0.865)	-0.694 (0.882)	-0.599 (0.879)	-0.461 (0.825)	-0.338 (0.837)	-0.313 (0.846)
# Heating/Cooling Degree Years (in 1000s)		0.017 (0.089)	0.043 (0.080)	0.025 (0.095)	0.075 (0.084)	0.042 (0.086)	0.036 (0.087)	0.036 (0.086)	0.084 (0.082)	0.079 (0.083)	0.079 (0.083)
Avg Price of All Residential Energy		0.107*** (0.031)	0.058* (0.030)	0.108*** (0.032)	0.056* (0.030)	0.034 (0.031)	0.029 (0.031)	0.027 (0.030)	0.030 (0.031)	0.026 (0.030)	0.026 (0.030)
# HVAC Installers		-0.014 (0.038)	0.041 (0.037)	-0.008 (0.042)	0.053 (0.038)	0.062* (0.038)	0.069* (0.038)	0.075* (0.039)	0.063* (0.037)	0.069* (0.037)	0.069* (0.037)
Unemployment Rate		0.184*** (0.051)	0.199*** (0.049)	0.183*** (0.052)	0.206*** (0.049)	0.208*** (0.048)	0.218*** (0.049)	0.219*** (0.049)	0.188*** (0.048)	0.198*** (0.048)	0.199*** (0.049)
# of certifications in state in previous year		-0.222*** (0.066)	-0.178*** (0.069)	-0.228*** (0.070)	-0.157** (0.074)	-0.193*** (0.072)	-0.204*** (0.073)	-0.196*** (0.074)	-0.171** (0.068)	-0.184*** (0.069)	-0.185*** (0.069)
Utility Spending on REE		0.034** (0.014)	0.001 (0.016)	0.034** (0.015)	-0.002 (0.017)	-0.001 (0.017)	0.004 (0.018)	0.008 (0.018)	-0.002 (0.015)	0.003 (0.016)	0.002 (0.016)
year = 2006		-0.637** (0.268)	-0.494* (0.264)	-0.629** (0.269)	-0.484* (0.264)	-0.498* (0.261)	-0.491* (0.261)	-0.470* (0.262)	-0.624** (0.267)	-0.621** (0.266)	-0.622** (0.266)
year = 2007		-0.353 (0.245)	-0.284 (0.238)	-0.331 (0.246)	-0.267 (0.241)	-0.298 (0.237)	-0.298 (0.236)	-0.287 (0.236)	-0.359 (0.240)	-0.362 (0.239)	-0.363 (0.239)
year = 2009		1.121*** (0.246)	0.929*** (0.246)	1.117*** (0.264)	0.842*** (0.256)	0.780*** (0.247)	0.773*** (0.246)	0.767*** (0.245)	0.913*** (0.243)	0.906*** (0.241)	0.909*** (0.241)
year = 2010		2.366*** (0.283)	2.162*** (0.284)	2.345*** (0.316)	2.046*** (0.305)	2.127*** (0.294)	2.131*** (0.292)	2.116*** (0.293)	2.169*** (0.293)	2.173*** (0.291)	2.176*** (0.292)

Table 3: Panel Negative Binomial Regression of Certification Count by State continued....

VARIABLES	MODEL	1	2	3	4	5	6	7	8	9	10
ACEEE State Energy Efficiency Rating		0.051*** (0.011)		0.053*** (0.011)	0.043*** (0.011)	0.044*** (0.011)	0.043*** (0.011)	0.047*** (0.011)	0.047*** (0.010)	0.047*** (0.011)	
# of state wholehome retrofit grant prgms			-0.129 (0.211)	0.040 (0.216)	0.065 (0.205)	0.083 (0.201)	0.073 (0.201)	0.049 (0.209)	0.075 (0.203)	0.072 (0.203)	
# of state wholehome retrofit loan prgms			-0.005 (0.141)	-0.090 (0.122)	-0.114 (0.127)	-0.102 (0.128)	-0.093 (0.126)	-0.054 (0.118)	-0.041 (0.119)	-0.037 (0.121)	
# of state wholehome retrofit rebate prgms			-0.001 (0.061)	-0.025 (0.063)	-0.020 (0.064)	-0.032 (0.063)	-0.045 (0.064)	-0.041 (0.060)	-0.046 (0.058)	-0.048 (0.059)	
State passed PACE legislation = 1			0.069 (0.169)	0.164 (0.164)	0.162 (0.157)	0.214 (0.163)	0.204 (0.164)	0.157 (0.151)	0.220 (0.158)	0.216 (0.158)	
LCV Voting Record of Cngrss Reps					0.012** (0.005)	0.012** (0.005)	0.012** (0.005)				
SM Retrofit Initiative in State = 1						-0.173 (0.165)	0.249 (0.575)		-0.195 (0.163)	-1.748 (6.770)	
SM x LCV Voting Record							-0.006 (0.007)				
State Resident Env Index								3.365*** (1.178)	3.427*** (1.180)	3.418*** (1.184)	
SM x State Resident Env Index										0.404 (1.759)	
Constant		-11.824*** (1.274)	-11.414*** (1.144)	-11.994*** (1.312)	-11.705*** (1.149)	-11.048*** (1.187)	-11.091*** (1.192)	-11.164*** (1.177)	-23.495*** (4.284)	-23.755*** (4.277)	-23.744*** (4.290)
ln s		0.022 (0.217)	0.380 (0.252)	0.028 (0.230)	0.452 (0.276)	0.438* (0.263)	0.429* (0.260)	0.464* (0.268)	0.517* (0.264)	0.504* (0.259)	0.496* (0.261)
ln n		1.536*** (0.374)	2.274*** (0.449)	1.556*** (0.417)	2.416*** (0.495)	2.340*** (0.457)	2.309*** (0.449)	2.372*** (0.463)	2.459*** (0.454)	2.413*** (0.445)	2.397*** (0.448)
Observations		244	244	244	244	244	244	244	244	244	244
Number of states		49	49	49	49	49	49	49	49	49	49
chi-square		734.7	754.2	739.9	756.0	802.9	810.3	803.7	788.4	797.7	801.7
p-value		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

relationship between state regulation and utility spending in energy efficiency discussed in Chapter 2.

Model 2 adds the state's score from the ACEEE's energy efficiency score card. Model 3 excludes this general policy measure and instead uses the alternative measure which examines the effects of the presence of different types of state energy efficiency whole home programs as reported in the DSIRE database. Model 4 includes all these measures simultaneously.

Hypothesis 1 is supported across these models. The general support of energy efficiency policies by a state is strongly associated with the number of new voluntary worker certification in the state. The coefficient for this variable stays consistent in magnitude across all models, showing no signs of being substantially mediated by direct measurement of the state-level policies directly associated with whole home retrofits or the more general social make up of a state. States that are actively pursuing progressive energy efficiency policies are providing environments attractive to workers to obtain these certifications. However, the use of the alternate measure does not seem to capture these dynamics. I keep them in the rest of the models, however, as an extra control for general increases in demand for certifications from state programs which could be derived from social movement actions at the state level.

Model 5 includes all the previous variables and adds the measure for a state's level of environmentalism based on the proxy of the votes of its nationally elected leaders. Models 6 and 7 add the dummy variable for the presence of at least one of the social movements in the state and then the interaction variable. I repeat these steps in Models 8,9 and 10 using the NSRE survey of environmental attitudes. Hypothesis 2 receives consistent support across all the models. Whether measured by the proxy of legislator voter records dynamically over time or by the average of the strength of environmental attitudes from the national random sample in 1999, states that have indications of having a more environmentally inclined populace show higher adoption of BPI's voluntary worker certification for residential energy retrofits, this after taking into account utility spending as well as general and specific state policies regarding energy efficiency. This relationship may come from either or both consumer and labor demand. As will be shown in chapter 4 the recent green job framing of residential retrofits has brought in a new and highly committed core of newly certified workers. It is also possible that individuals and entrepreneurs may see the higher prevalence of potential "green" consumers as providing a market opportunity for selling retrofits leading more workers to consider investing in

certification. In any case, certification is increasing disproportionately in green-leaning states which may have implications for where market footholds and innovation eventually develop.

Hypothesis 3a and 3b, on the contrary, receive no support. States where there have been active efforts by social movement organization to organize residential energy efficiency programs do not have higher rates of voluntary worker certification. Since the earliest of the social movement efforts began only in the last year or two it may be that data from 2011 and future years might begin to show a more substantial impact from their activities, especially if they persist when the big federal spending runs out. At this early stage, however, no immediate impact is apparent.

Discussion and Conclusion

This chapter examines the pattern of diffusion of a new voluntary worker certification in a nascent industry which has come to be heavily influenced by social movement activism. The slow emergence of a nationally relevant voluntary worker certification for skills in home energy efficiency retrofits in the mid-2000s, followed by its rapid advance following a large influx of federal money and support, illustrate not only the difficulty of creating and diffusing new voluntary worker certification but how such diffusion is related to institutional and social factors.

Results from these models show that more global changes in a state's support of the energy efficiency are more related to voluntary worker certification in residential energy retrofits than specific programs focused on retrofits. Similarly, measures of a states more general leaning towards environmental values is associated with higher rates of certification in this green field while specific social movement efforts to organize retrofit programs is not. At the most basic level this may speak to the need of developing cultural legitimacy in the nascent field for related voluntary worker certification to take root, rather than tying it to specific programs. On the other hand, it may be that the effects of specific programs may not yet being felt in the rapid expansion and workers are reacting to potential and planned programs that have not yet been implemented. In this scenario these more general institutional and social measures are simply a proxy for future programs that have been announced but not yet implemented. Even in this scenario, however, what is clear is that we can expect certification to be highest in states where institutional efforts are underway to support the growth of the new retrofit market and that these states tend to have more environmentally conscious constituents.

Regardless of causal order the institutionalization of occupations surrounding this nascent industry will be stronger in states where the green job frame and environmental motivation for retrofits is relatively high. As the industry develops this dynamic could help reinforce occupations such as residential energy auditors as “green jobs”. Another potential impact is that such jobs may become better jobs in these states as increased voluntary certification in these local labor markets helps to raise worker wages. To the extent that certification of workers becomes an important component of solving some of the market failures that have plagued the retrofit industry, we can expect to see viable markets more likely to emerge in these more institutionally supportive and socially green states, not necessarily the states with higher levels of latent demand.

Limitations and Future Research

This chapter as currently constructed has a number of important limitations that need to be addressed in future research. The first is that the independent variable has potential data quality problems. The data come from the certification database of BPI as it existed at the beginning of 2011. The zip code data used to place people into states represented their last registered zip code with no way to track changes. It is possible then that individuals were certified in one state, moved, and changed their address. BPI’s database nor administrative structure does not have the ability to track when or how many changes were made. Without the ability to estimate the size of the potential mobility problem the outcome data will always be suspect. It is possible certified individuals moved to states where employment opportunities were better. While anecdotal evidence from BPI would suggest this problem is limited without the ability to at least estimate the size of the problem the results must remain somewhat suspect.

The disconnect between the local city level labor markets that are indicative of residential construction related industries and the gross state-level measures is a second limitation of this data. A better approach would be to run a model at the level of metropolitan statistical area. Unfortunately, the certification data concerns about mobility become much more problematic. Much of the data used for the state level model can be gathered at the metropolitan area level. For example, most the social movement retrofit programs are actually city level initiatives not state level initiatives. Local labor market conditions can vary dramatically as well as the nature of the housing stock. Even the NSRE data can be aggregated at this level, though the number of

respondents per city can become quite small. A model using this more fine grained geographic variation would be much more convincing. Whether a compelling data can be collected across all the variables at this level requires further investigation, but only if the problems with the worker certification variable can first be solved.

There do remain some potentially confounding variables absent from this analysis. Among the most important is the absence of measures for the potentially competing certifications to BPI. The most important of these is RESNet's certification which has been used especially in California. I have yet to succeed in obtaining data from this organization though there is still some hope. More fine-grained data regarding spending by utilities and states on retrofit programs could also be significant. For example, the DSIRE database only indicates the existence of such programs with some details as to the incentives. No information on the total amount spent in such programs is available.

Another current limitation is the short amount of time that has passed since ARRA has fundamentally shifted the dynamics for the demand for voluntary certification, especially for BPI. Including even just one more year of data post-ARRA would begin to allow the analysis to better distinguish between the dynamics pre- and post- the social movement shaped federal intervention. Currently, most the statistical models won't converge if split into the two time periods. New releases of the different data sources used in this paper for 2011 are beginning to appear and it will be possible to expand the model to 2011 shortly. Because so much of the activity has happened recently, including the mounting of new programs by social movement organizations they may simply need more time to show an effect. Similarly, the data is limited in its ability to stretch further back in time. Unfortunately, many of the data sources such as the ACEEE ratings of state energy efficiency, the more refined measures of utility spending on residential energy efficiency programs, the League of Conservation Voters index of the environmental voting record of national representatives and the DSIRE database of energy efficiency incentives only date back to 2005 or 2006 so extending the model backward in time would be highly difficult if not impossible. However, expanding the model to 2011 or even through 2012 might make this a more interesting and viable project.

One potential path forward is offered by the promise of new data from Bureau of Labor Statistics who in 2010 has been collecting wage and other data on emerging green jobs, including residential energy auditing and weatherization. If they are successful in obtaining good estimates

of wages and employment counts the data collected here could be used to construct a model which analyzes the determinants of job quality across states.

References

- Adler, P. S., K. Seok-Woo, et al. (2008). "Professional Work: The Emergence of Collaborative Community." Organization Science **19**(2): 359-376.
- Aldrich, H. E. and C. M. Fiol (1994). "Fools Rush in - the Institutional Context of Industry Creation." Academy of Management Review **19**(4): 645-670.
- ApolloAlliance (2008). The New Apollo Program - Clean Energy, Good Jobs: An Economic Strategy for American Prosperity, Apollo Alliance.
- Barry, L., M. Brown, et al. (1997). Progress Report of the National Weatherization Assistance Program. D. o. Energy, Oak Ridge National Laboratories.
- Bartley, T. (2003). Certifying forests and factories: states, social movements, and the rise of private regulation in the apparel and forest products fields, Sage Publications. **31**: 433-464.
- Bartley, T. (2007). "Institutional Emergence in an Era of Globalization: The Rise of Transnational Private Regulation of Labor and Environmental Conditions." American Journal of Sociology **113**(2): 297-351.
- Bartley, T. (2012). Certification as a mode of social regulation. Handbook of the Politics of Regulation. D. Levi-Faur, Edward Elgar Publishing: 441.
- Brown, J. S. and P. Duguid (1991). Organizational Learning and Communities of Practice: Toward a Unified View of Working, Learning and Innovating. Organization Science **2**(1): 40-57.
- Carter, S. D. (2005). The growth of supply and demand of occupational based training and certification in the United States, 1990-2003, Wiley Online Library. **16**: 33-54.
- Digitale, R. (2010). Loan giants threaten Sonoma's energy program: Freddie Mac and Fannie Mae say county-backed solar loans are liens against their houses. McClatchy - Tribune Business News.
- DiMaggio, P. J. and W. W. Powell (1983). "The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields." American Sociological Review **48**(2): 147-160.
- DOE (2011). Home Performance with Energy Star - Sponsor Guide. D. o. Energy.
- Faiers, A. and C. Neame (2006). "Consumer attitudes towards domestic solar power systems." Energy Policy **34**(14): 1797-1806.
- Freeman, S. D. (1974). Energy: the new era. New York,, Vintage Books.
- Friedman, M. and S. Kuznets (1945). Income from independent professional practice. New York,, National Bureau of Economic Research.
- Garud, R., S. Jain, et al. (2002). "Institutional entrepreneurship in the sponsorship of common technological standards: The case of Sun Microsystems and Java." Academy of Management Journal **45**(1): 196-214.
- GreenForAll (2009). Making the Dream Real, Green For All.
- Greenwood, R., R. Suddaby, et al. (2002). "Theorizing change: The role of professional associations in the transformation of institutionalized fields." Academy of Management Journal **45**(1): 58-80.
- Hilbe, J. (2007). Negative binomial regression. Cambridge, Cambridge University Press.
- Hirsh, R. F. (1999). Power loss : the origins of deregulation and restructuring in the American electric utility system. Cambridge, Mass., MIT Press.

- Hirst, E., R. Marlay, et al. (1983). "Recent Changes in United-States Energy-Consumption - What Happened and Why." Annual Review of Energy **8**: 193-245.
- Jones, V. (2008). The Green Collar Economy: How One Solution Can Fix Our Two Biggest Problems, New York: HarperCollins Publishers.
- Joskow, P. and D. Marron (1991). What does a Negawatt Really Cost? Cambridge, MA, MIT.
- Kleiner, M. M. (2006). Licensing occupations : ensuring quality or restricting competition? Kalamazoo, Mich., W.E. Upjohn Institute for Employment Research.
- Krigger, J. and C. Dorsi (2004). Residential Energy: Cost Savings and Comfort for Existing Buildings, Saturn Resource Management, Inc.
- Lawrence, T. B. and R. Suddaby (2006). "Institutions and institutional work." Handbook of organization studies **2**: 215-254.
- Lee, B. (2009). "The Infrastructure of Collective Action and Policy Content Diffusion in the Organic Food Industry." The Academy of Management Journal ARCHIVE **52**(6): 1247-1269.
- Lee, B. and W. Sine (2007). "Constructing entrepreneurial opportunity: environmental movements and the transformation of regional regulatory regimes." Applied Evolutionary Economics and Economic Geography: 93-120.
- Lee, B., W. D. Sine, et al. (2010). Certifying the harvest: The role of standards-based certification organizations in the organic food industry. **18**.
- Locke, R. M., F. Qin, et al. (2007). "Does Monitoring Improve Labor Standards? Lessons from Nike." Industrial and Labor Relations Review **61**(1): 3-31.
- Lounsbury, M. (2007). "A TALE OF TWO CITIES: COMPETING LOGICS AND PRACTICE VARIATION IN THE PROFESSIONALIZING OF MUTUAL FUNDS." Academy of Management Journal **50**(2): 289-307.
- Lounsbury, M. and W. N. Kaghan (2001). "Organizations, occupations and the structuration of work."
- Lovins, A. B. (1976). "Energy Strategy - Road Not Taken." Foreign Affairs **55**(1): 65-96.
- Lovins, A. B. (1977). "Soft Energy Paths." Power Engineering **81**(4): 142-142.
- Mazur, A. and E. W. Welch (1999). "The geography of American environmentalism." Environmental Science & Policy **2**(4-5): 389-396.
- Rao, H., P. Monin, et al. (2003). "Institutional change in Toque Ville: Nouvelle cuisine as an identity movement in French gastronomy." American Journal of Sociology: 795-843.
- Rosenfeld, A. (1999). "The Art of Energy Efficiency: Protecting the Environment with Better Technology." Annual Review of Energy and the Environment **24**: 33-82.
- Seegerstrom, C. (2009). "Thirty Years Later." Home Energy Magazine(May/June 2009).
- Sherman, M. and D. Dickerhoff (1998). Air Tightness of US Dwellings, Lawrence Berkley National Labs.
- Sine, W. D., R. J. David, et al. (2007). "From Plan to Plant: Effects of Certification on Operational Start-up in the Emergent Independent Power Sector." Organization Science **18**(4): 578-594.
- Sine, W. D. and B. H. Lee (2009). "Tilting at Windmills? The Environmental Movement and the Emergence of the U.S. Wind Energy Sector." Administrative Science Quarterly **54**(1): 123-155.
- Socolow, R. H. (1987). "Field Studies of Energy Savings in Buildings - a Tour of a 15-Year Research-Program at Princeton-University." Energy **12**(10-11): 1029-1043.

- Viscusi, W. K. (1978). "Note on Lemons Markets with Quality Certification." Bell Journal of Economics **9**(1): 277-279.
- Walker, J. A., T. N. Rauh, et al. (1985). "A Review of the Residential Conservation Service Program." Annual Review of Energy **10**: 285-315.
- Weber, K., K. L. Heinze, et al. (2008). "Forage for thought: Mobilizing codes in the movement for grass-fed meat and dairy products." Administrative Science Quarterly **53**(3): 529-567.
- Weeden, Kim A. (2002). "Why Do Some Occupations Pay More than Others? Social Closure and Earnings Inequality in the United States." American Journal of Sociology **108**(1): 55-101.
- White, S. (2010). Greener Skills: How Credential Create Value in the Clean Enery Economy, Center on Wisconsin Strategy.
- Wilensky, H. L. (1964). "The Professionalization of Everyone." American Journal of Sociology **70**(2): 137-158.

Chapter 4 - Social Movements and the Construction of Occupational Communities: Green Jobs and the Emerging Occupation of Home Energy Auditor

J: "Oh yes, we see them. At first it was HVAC type guys that got bored and wanted to do something different. Then there were people from the homebuilding sector when that started to go south. When the recession hit we started to see these white collar guys looking for any job and now we do see these younger kids who seem to want to save the planet."

Me: Of those who do you think are going to last in the industry? Do you think these green motivated are going to hang on?

J: "(Laughing) Nah, it will be the HVAC guys who know what this job is really like every day. The green guys are just going to move on to the next big thing."

Introduction

In 2009, in response to financial crisis in the United States, the economic recession and the high unemployment which followed, the US Congress passed the American Recovery and Reinvestment Act (ARRA). Designed to stimulate the economy and create jobs, ARRA contained a significant provision, including over \$8 billion in funding, to provide direct incentives and institutional supports to help spur the growth of the market for residential energy efficiency retrofit services. This market has traditionally faced many obstacles and market failures (Blumenstein et. al, 1980; Weber, 1997). The choice to make residential energy retrofits a central piece of the stimulus plan stemmed directly from the work of social movement activists and organizations such as the Apollo Alliance, The Blue-Green Alliance, and Green for All. Prior to the financial collapse, these groups had created a new narrative which built upon the fusion of the environmental movement's concerns regarding pollution and climate change with

organized labor and other worker advocates' fight for labor protection, employment, and job quality (Obach, 2004; Mayer, 2009; Jones, 2008). Their advocacy came to coalesce around the concept of green-collar jobs, a new frame which offered a solution to a number of currently salient social problems: climate change, unemployment, and national energy independence. As a consequence, occupations related to residential energy efficiency have come to be labeled and heavily promoted as green jobs.

To date, however, there is little systematic knowledge of whether and/or how the social movements' activities and green job frame are affecting individuals seeking and performing these jobs, or whether these forces will have a lasting imprint on the job incumbents, the ways the work is carried out, or the quality of the jobs. This chapter takes a first step in addressing these questions by analyzing whether the green job framing has influenced individuals' attitudes and the composition of the active members of the occupational community emerging within one specific new occupation: residential energy auditor. In particular, I focus on the core attitudes and beliefs related to occupational commitment and discretionary effort in contributing to occupational communities (Meyer, Allen and Smith, 1993; Blau 2003; Barley and Van Maanen, 1984). Are individuals who enter the field of residential energy efficiency more committed to the occupation when they are aligned with social- movement-propagated green job framing compared to those who enter for more opportunistic reasons? What forms does this commitment take and does it help explain differential activity within the occupations community?

For those interested in understanding the role that social movements play in influencing market activity and organizations, these questions are of critical importance. It has long been a core tenant of institutional theories that professions and occupations play a central role in both the reproduction (Dimaggio and Powell, 1983; Strang and Sine, 2002) and significant

transformation of markets, institutions, and the organizational forms which populate them (Rao, Monin and Durand, 2003; Lounsbury, 2004; Greenwood, Suddaby and Hinings, 2002; Scott et. al., 2000). Professional groups and occupational communities are important sites for doing the institutional work of theorizing, frame construction, and the creation and diffusion of new practices across organizations (Lawrence and Suddaby, 2006; Greenwood and Hinings, 2002; Lounsbury and Kaghan, 2001; Lounsbury, 2007; DiMaggio and Powell, 1983). Given the central role which professions and occupations play in shaping institutional arrangements, organizational forms, and specific organizations their emergence and development should be among the central concerns of scholars interested in the development of new fields and market activities (Dimaggio, 1991; Weber, Heinz and DeSoucey, 2008).

However, while there is a significant and growing body of work analyzing established professions as social-movement-like collective actors (Bucher and Strauss, 1961, Zald and Berger, 1978; Rao, Monin and Durand, 2003; Lounsbury and Crumley, 2007; Schneiberg and Lounsbury, 2008), research which investigates the impact of social movements and their institutional entrepreneurship directly on the structure of emerging occupations in a new market is far less developed. This gap is embedded in a larger scarcity of work on cultural dynamics of occupational emergence (Nelson and Barley, 1997; Sherman, 2010) and work which plies the boundaries of the sociology of occupations and sociology of organizations (Barley and Tolbert, 1991a, 1997; Lounsbury and Kaghan, 2001; Barley, 2008).

Occupations and professions provide a distinct vector along which social movements may imprint their norms, practices, and values on market activity. Because their communities and social structures span not only organizations, but often different organizational forms, their influence may continue to shape market activities independently of entrepreneurial actions and

intent. The dynamics of emerging occupations may be of special interest to those concerned with the emergence of new industries and organizational forms as they can be key building blocks in what renders the new services or organizations unique and novel. This is true of residential energy auditing as an activity.

The small amount of research on social movements which does directly address emerging occupations in new industries has been focused mostly on the actions and beliefs of the activists entering and trying to shape the occupation, or research has focused on the organizational level studying the decisions of organizations to create new positions (Lounsbury, 2001; Lounsbury and Kaghan, 2001; Weber, Heinze and DeSoucey, 2008). Consequently, we know especially little about the potentially broader impact of social movement framings, such as those now applied to green jobs, on the fuller cross-section of individuals entering emerging occupations - including those who are ambivalent or even hostile to these framings. We also have little or no evidence, outside of qualitative interviews of activists, regarding the relationship of social movement activities and shaping the meaning of new forms of work.

The need to focus on a broader range of actors is especially important during the critical moment in the development of any social-movement fostered occupation when its legitimacy and access to resources become significant enough to attract the interest of more opportunistic actors who lack alignment with the social movement's norms, values, and goals (Lounsbury, Ventresca and Hirsch, 2003; Hiatt, Sine and Tolbert, 2009). This critical period, when focused on the individual level of belief and action, highlights a key tension between framing and resource mobilization theories of social movement activity. Framing perspectives stress the importance of alignment between social movement frames and individual mobilization to act while resource mobilization views focused on the organizational level explicitly allow for decoupling between

the organizational and individual mobilization and alignment with social movement goals (McCarthy and Zald, 1977; Benford, 2000). The relationship between individual beliefs and occupational community involvement provide a natural place to observe this tension.

This study contributes theoretically and empirically to the literature on social movements and markets by bringing together theories of social movement frame alignment processes with work in sociology and psychology on occupational commitment and community participation to demonstrate a more direct connection between social movement activities and the shaping of a new occupation. This responds to the extant need for both multivariate research to augment the case study and historical approaches prevalent in the field as well as for research which better details the more micro-level mechanisms invoked by macro-level researchers to explain their findings (Schneiburg and Lounsbury, 2008; Powell and Colyvas, 2008).

The paper is organized as follows. The first section establishes how a group of social movement organizations constructed and propagated the green job frame and applied it directly to the activities related to residential energy efficiency, including the emerging occupation of home energy auditing which has taken a central role in attempts to reshape the industry. The second section reports on qualitative interviews with residential energy auditors which suggest that the green job framing of energy auditing is salient for individuals in the field and an active part of the discussion within the occupational community both for those aligned with, and ambivalent towards, its environmental concerns. The next section draws on the qualitative data and existing literature to create a number of hypotheses regarding the relationship between alignment with the environmentalist framing of the job, occupational commitment, and participation in the occupational communities. These hypotheses are then tested on a unique national sample of individuals who sought certification related to energy auditing.

The data demonstrate that those with strong environmentalist beliefs display higher levels of normative occupational commitment. In turn there is a positive relationship between alignment with the green framing of the occupation and participation in the occupational community. This stands in systematic contrast to commitment related to the past investment in related skills and limited alternative opportunities which show no such relationship. The positive relationship between environmental beliefs and participation is stronger for those who entered the field during the recent green job mobilization and who have jobs as auditors, while it is weaker for those still seeking to enter the occupation. Current membership in an environmental social movement organization is also robustly related to occupational participation for both those employed as auditors and those still seeking these jobs. The relationship is independent of the strength of environmental beliefs and is not mediated significantly by any of the forms of occupational commitment. Together these findings provide evidence that social movement organizations have shaped the underlying contours of meaning, commitment and community dynamics of an emerging occupation in ways that are likely to have persistent effects on the development of practice and the professionalization project within the occupation.

The Development of Residential Energy Auditing: Mobilizing Resources and the Framing of a Green Job

Residential Energy Auditing as an Emerging Occupation

The definition of exactly what constitutes residential energy auditing as a bundle of tasks and thus an occupation are still in flux (Hughes, 1971). However, a number of efforts to define its core elements have been underway. The most institutionally powerful and salient of these has been the definition developed by O*NET, which is currently the most detailed, official

occupational classification system used by United States government.⁷ In 2009, O*NET launched a major research effort to “investigate the impact of green economy activities and technologies on the occupational requirements in an effort to determine their impact on current O*NET-SOC occupations and to identify new and emerging (N&E) occupations that may be considered for inclusion into the O*NET-SOC system” (Deirdorf, et. al, 2009, p. 3). Energy auditing was chosen by O*NET as one of the new and emerging green occupations. It describes the core of energy auditing as “conduct(ing) energy audits of buildings, building systems, and process systems (and) may also conduct investment grade audits of buildings and systems” (ONET, 2011). The basic tasks include collecting and analyzing building data, calculating energy savings, recommending energy efficiency measures, and creating work scopes for the installation of the recommended measures. A typical technical home energy audit takes about three to four hours and will employ a number of diagnostic tools such as a blower-doors, infrared cameras and “duct-blasters” as well as in-depth inspections of a home’s mechanical and structural elements (Kriger, 2004).

The seeds for the occupation of residential energy auditing were sown in two pieces of legislation. The Energy Conservation and Production Act of 1976 was the first legislation to address residential energy efficiency at the federal level. It launched the effort to create new building standards and codes around energy efficiency and, importantly for the emergence of the field of energy efficiency retrofits, created the Weatherization Assistance Program (WAP). WAP was charged with making the homes of the elderly and poor energy efficient in order to reduce the hardship brought on by rapidly rising home heating and cooling costs. Two years later, the Public Utility and Regulatory Act of 1978 (PURPA) passed as part of a sweeping

⁷ O*NET replaced the long standing Dictionary of Occupational Titles in 1998. It provides more detailed breakdowns of the Standard Occupational Codes (SOC codes) with finer grained task definitions and job requirements.

package of new rules for utilities (see Sine and Lee (2007; 2009) for a neoinstitutionalist account of PURPA's impact on the market for wind-based power generation). One element of the law, the Residential Conservation Services Act (RCS), required utility companies to provide free energy audits for their customers (Hirst, 1983). The law, however, did not require the utilities to do any installation of energy efficiency measures. This created within many utilities a new job where the task of diagnosing a home's energy efficiency was intuitively separated from those that installed systems within the home, providing an early, legislatively-driven, occupational mandate for bundling the tasks of assessment separately from installation where previously any assessment was done by the various contractors looking to sell their services (Segerstrom, 2009; Hughes, 1971). Thus, a new jurisdiction for a potential expert occupation was created (Abbott, 1988).

After an initial flurry of activity following these state interventions the sector quickly collapsed following the election of Ronald Reagan, the subsequent deregulation of the utility industry, and a sharp decline in world-wide energy prices. In the face of the withdrawal of state support and collapsing consumer demand for energy efficiency services, nascent efforts at creating a robust market for residential retrofit services came to a halt and residential auditing failed to become a fully formed occupation. During the 1980s, 1990s and early 2000s residential energy retrofits - and consequently energy auditing of homes as an activity or job - continued to exist primarily in the small government WAP program, among a handful of utilities, and among a few private home contractors. These incarnations of the occupation remained limited despite the combined efforts of the national labs, some activists, and various trade associations to grow the industry. It is on this foundation and the current resurgence in interest and resources for

residential energy retrofits that residential energy auditing as an occupation is again emerging (Segerstrom, 2009).

The Creation of the Green Jobs Frame and Residential Energy Auditing

The concept of green collar jobs has been around in some form since 1976. The initial concept is credited to Patrick Hefferan and his study “The Coming Green Collar Revolution” which was produced for inclusion in government hearings on labor and employment issues (Hefferan, 1976). However, green jobs as a fully developed frame used and promoted by social movement organizations is of much more recent vintage. The green job mobilization began in the mid- and late 2000’s and residential energy retrofits were a significant focus of these early efforts (Pendergrass, 2006; Jones, 2008). Following the September 11th terrorist attacks on the United States, the beginning of wars in Iraq and Afghanistan, and the subsequent rise of energy prices, environmental and labor organizations once again targeted governmental support for residential energy efficiency along with renewable energy as viable strategies for both addressing climate change and producing high quality jobs. In 2007, they helped produce and pass the Energy Independence Act which directed a small amount of funding for training in the area of clean energy and energy efficiency - including funding for a few programs to train residential energy auditors. However, the environmentalists’ big success was making residential energy efficiency and renewable energy a core part of ARRA. This included over \$8 billion dollars in funding for state weatherization programs, private incentives, and training funds dedicated to invigorating the public and private spending on these services. Besides the significant amount of money, a number of large efforts were launched to create professional standards, certification, and training programs designed to overcome what have been recognized as persistent information barriers to creating a sizable private market for residential retrofit

services. The explosion of weatherization and retrofit programs created an opening for the occupation of residential energy auditing to again emerge as a significant and viable free-standing occupation. In the past two years, basic elements of an occupational structure have been developed. New professional associations and trade associations (such as Efficiency First and Home Energy Pros) have been launched that have been involved in activities ranging from the creation of online communities of practice to lobbying for local and national legislation in support of residential energy retrofits and the occupation of energy auditing. The number of certification programs has expanded, as well as courses offering classes or programs in these techniques (Goldman et. al, 2010).

The green job frame consists of coupling the problems of economic development, growth, and job quality with the core environmental concerns of pollution reduction and climate change. This coupling of concerns over economic growth and employment with environmental goals distinguishes energy auditing significantly from past environmental and labor movement frames which have often been at odds with one another. The relationship between environmental protection and the economy is a particularly salient schism. The schism between the environmental movement and labor was most notably symbolized by the fight in the Northwest between environmental activists seeking to save the spotted owl and organized labor seeking to save jobs in the timber industry (Obach, 2004).

The green job framing emerged from collaborations of some environmental SMOs with labor organizations coming from two primary sources. One strand is rooted in the environmental justice frame which views pollution as a problem that is disproportionately foisted upon the poor and vulnerable. The environmental justice movement grew out of collective action against the placement of landfills and chemical plants and in efforts to take action against poor

environmental conditions found in many economically disadvantaged urban and predominantly minority areas. One of the motivating grievances for environmental justice activists is the discriminatory nature of such environmental decisions. The other strand comes from efforts to bridge the interest of labor unions and environmentalists as is rooted in a loose coalition which developed between environmental and labor groups to protest the 1999 WTO meetings in Seattle, Washington (Obach, 2004; Mayer, 2009). The creation of common ground among some environmental and labor activists led to the inception of a set of new social movement organizations which sought to link their interests, a classic example of frame alignment between SMOs through the mechanism of bridging, bringing together two previously unrelated concerns within the same social movement (Snow et. al, 1986).

Due largely to the efforts of the politically-focused Apollo Alliance, green-collar jobs became a significant topic in the run-up to the 2008 election, especially among Democratic primary candidates. It was crystallized in the national discourse in 2008 with the publication of "The Green-Collar Economy" by Ella Baker Center for Human Rights activist Van Jones. In 2009 Van Jones accepted the position of Special Advisor for Green Jobs, Enterprise, and Innovation at the White House Council on Environmental Quality. All this activity was the product of the formation of a number of new social movement organizations which came to use green jobs as a central component. Three somewhat related environmental and environmental justice social movement organizations led the charge in pushing the green job frame: Green for All, the Apollo Alliance, and the Blue Green Alliance.

The organization Green for All sprang directly from the activities of the Ella Baker Center for Human Rights. It began a number of local initiatives which under the rubric of green-collar jobs (including those led by Van Jones) began to receive national attention. Underpinning

these efforts was a coalition of environmental activists and labor unions seeking the dual goal of creating living wage jobs through activities that sought to conserve resources, especially in the energy sector. Publishing a number of reports on local community organizing initiatives in workforce training and job creation which focused on both residential and commercial renewable energy projects as well as residential energy efficiency, the activities of the Center became a template for other local, and soon national, programs. As more attention was given to the efforts of the Center it soon created Green For All, a non-profit organization dedicated to expanding these activities in localities across the country. Green for All was especially rooted in the larger frame of environmental justice and emphasized the inclusion of disadvantaged workers as a core part of its mission. Since its founding it has launched local residential energy efficiency related programs in over 30 cities including some of the more high profile projects. An example of the language the organization uses in framing residential energy efficiency as a green job and rooting it in the bigger issue of environmental justice comes from its 2009 annual report:

With leaders in city halls and labor halls, at for profits and non-profits, Green for All created unprecedented policy breakthroughs like Clean Energy Works Portland. This work is translating into real opportunity for those who live with unemployment and poor environmental quality as a daily reality, not numbers or abstractions. People like Tahalia Williams. Tahalia is a single mother from Brooklyn struggling to raise her child in today's shattered economy. Thanks to the green jobs training program that has worked not just to prepare her for a job, but for a career, Tahalia now works full time on residential weatherization projects. Such projects are just one aspect of our 2009 focus: creating jobs in energy efficiency.

Another set of non-profits, the Center for Wisconsin Strategy and the Campaign for America's Future, developed the Apollo Plan, which made the case for a heavy government investment in renewable energy and a slate of energy efficiency technologies including green construction and weatherization. Originally launched before the 2004 election in hopes of

securing support from a potential Democratic administration, the Apollo Plan was re-launched in the wake of the September 11 terrorist attacks and framed as an urgent plan for energy independence as well as environmental stewardship. It also heavily emphasized the economic benefits of the creation of high quality jobs. These progressive political organizations again invested heavily in promoting this plan during the run up to the 2008 US presidential election, getting high-profile Democratic candidates to endorse green job legislation as part of their political platforms. In 2007, the two non-profits spun off the Apollo Alliance organization to advocate for federal legislation to support the Apollo plan. By the end of 2008, the Apollo Alliance became the key organization in authoring the portions of ARRA which made an over \$12 billion dollar investment in renewable energy and energy efficiency measures. The organization also worked (and continues to work) at local levels, including sponsoring high-profile initiatives such as Newark Green Jobs Summit and pushing local officials all over the country to sign the Apollo Green-Collar Jobs Pledge. This “pledge” seeks to use public resources to support the creation of green jobs in localeconomies. As of the summer of 2011 Apollo has more than 20 projects underway at state and local levels.

The Blue-Green Alliance is an organization started in 2006 as a partnership between the Sierra Club and the United Steel Workers to advocate for a variety of legislation supporting the creation of jobs in the US through investments in renewable energy, especially in manufacturing. It came to be supported by the four largest environmental organizations in the US and a number of the largest unions. This legitimized the green job frame as a central new claim of some the United States’ strongest and most politically-connected social movement organizations. The Blue-Green Alliance also targeted the US presidential election and pushed for federal and state legislation that would support the creation of jobs which pursued environmental goals. The

Alliance organizes the annual “Good Jobs, Green Jobs Conference” to bring together policy makers, think tanks, labor unions, and academics to further the agenda by refining the policies and public rhetoric associated with green jobs. It also played an important role in shaping the ARRA legislation, for example, in successfully aiding the push for ARRA jobs paid for by weatherization funds to meet Davis-Bacon prevailing wage standards for federal contracting, a key union priority. In 2010, the Apollo Alliance and Blue-Green Alliance officially merged, speaking to both their dense organizational connections as well as their very similar agendas. The announcement of this change couches green jobs strongly in terms of its own “movement” with the continuation of specific social movement organizations focused solely on mobilizing around the green job frame.

Methods and Data

Studying the emergence of new occupations and markets presents unique challenges. Occupations struggling to find a foothold within the division of labor are often ill-defined and in flux. The boundaries and definitions in terms of both tasks and practitioners are contested and unclear even for those doing the work. The lack of institutional and organizational supports such as dedicated training programs, networks of practitioners, and professional associations makes defining a reasonable population for study problematic. Consequently, longitudinal data suitable for causal analysis usually only exists after an occupation has become successful - or at least successful enough - to build such supporting institutions. Such support is rarely available for the earliest periods of emergence (Wilensky, 1964; Nelson and Barley, 1997; Sherman, 2010). This is especially true for individual level data capturing attitudes and beliefs of the early entrants. These circumstances present inherent problems of either selection bias, studying only

successful cases, or difficulty in establishing causality without drawing on other methods. This helps explain why most of the work on the early stages of occupational emergence is qualitative, focused on process, and carried out at a few strategically chosen research sites or relies on archives of public documents. While these qualitative studies bring great richness and the ability to identify and untangle the important mechanisms and processes at play, generalization across an important representative population tends to be limited.

To study the dynamics of a relatively non-institutionalized and quickly evolving occupation such as residential energy auditing, which has been subject to rapid national growth, I chose a multiple-methods design and followed a four step process. First, I identified a relatively large and important population of individuals at risk of identifying with, entering into, and participating in the emerging occupation of residential energy auditing. I prepared a survey to measure each individual's alignment with the green framing of the job, their commitment to the occupation along a number of dimensions, and their reported levels of participation in a number of key occupational community activities, along with other demographic and employment-related variables. Second, to gain a more in-depth understanding of the processes and mechanisms which may link these variables, I used the survey to strategically, but randomly, select individuals to interview regarding their entrance into, identity with, and activities related to the occupation. Using the survey data I categorized each individual on their likelihood of being aligned or unaligned with the green job framing based on an index of their environmental attitudes as well having a high or low level of participation in the occupational community as indicated by their self-reported activity across 6 different measures. Based on these interviews I developed hypotheses which could be tested across the whole sample. Next, I tested these hypotheses against the survey data, allowing me to ascertain if the relationships held across the

broader population and after controlling for individual and organizational factors which might confound the relationship. Informed by the robust associations in the data, I then went back to interview more members of the occupation to further probe and flesh out the potential causal processes involved. By explicitly interpolating between the survey data and gathering qualitative data from those who had been surveyed I am able to provide a rich portrait of the relationship between the green job framing and its impact on residential energy auditing across a significant, national sample of individuals who identify themselves as involved in an emerging occupation. While the survey data is cross-sectional and therefore can only speak to associations, the interviews provide an interpretation of the association and suggest causal processes.

The population targeted for the study was individuals who sought certification in the tasks of whole home building analysis through the Building Performance Institute. The Building Performance Institute is the only organization which runs a national certification program related specifically to residential energy auditing and ISO certification.⁸ Given the quick ramp up in weatherization required by ARRA, BPI quickly became the central certification on which individuals were trained in residential energy auditing. While not everyone who practices energy auditing has applied for BPI certification, and it is not required for participation in some federal and state programs, it has become a central axis around which the occupation is organizing. In fact, energy auditing is still new enough that BPI had not yet developed a certification specific to energy auditing, but rather certified individuals in the more general category of “building analysts” and “envelope professionals”. These certifications were primarily geared towards

⁸ Another organization RESNet certifies Home Energy Raters (HERS raters). This is a related set of work which is predicated in providing standard energy ratings for homes which can be used in the mortgage industry. HERS ratings have mostly been applied to newly constructed homes not existing housing stock. While they use the same building science principles the software programs and emphasis are different. A significant percentage of individuals who apply for BPI certification already have HERS certification. BPI provides a shortened test for these individuals.

contractors for whom energy auditing was talk or extra service and not a stand-alone occupation or job. As such, the sample provides a reasonable national cross-section of individuals motivated to seek a basic foothold in the space capturing those who identify with energy auditing as their primary job as well as those who see it as an activity to supplement their existing occupations. By collecting data from those who fall on both sides of the boundary of occupational identity with the emerging occupation it ensures that I am capturing the full range of individuals entering the space.

This strategy helps limit the scope to people who have taken at least some significant step towards investing in the skills and knowledge relevant to the occupation. It also defines a population individual who has also been given a substantial opportunity to engage in the nascent occupational communities, as BPI offers a number of opportunities to become involved. This helps assure that findings aren't driven by capturing individuals not at risk of occupational community participation purely for lack of opportunity.

Social Movements, Resource Mobilization and Frame Alignment in an Emerging Occupation

The ability of organizations such as the Apollo Alliance or the Blue-Green Alliance to convince powerful governmental and institutional actors to create subsidies for residential retrofits using the frame of green jobs does not necessitate that the workers who perform those jobs need to have a particular stake in the environmental framing of the job. Indeed, studies of social movements and markets which have shown that when they are successful at opening new market opportunities, opportunists ambivalent or even hostile to the social movements' goals often enter quickly (Hiatt, Sine and Tolbert, 2009). Such a possibility was raised in the seminal

article developing the resource mobilization perspective as a central contrast to traditional approaches to understanding social movements:

Social movements may or may not be based on the grievances of the presumed beneficiaries. Conscience constituents, individual and organizational, may provide major support. And in some cases supporters—those who provide money, facilities, even labor—may have no commitment to the values that underlie a specific movement. (McCarthy and Zald, 1977 p. 1216)

Social movements which try and use the market to bring about their ends may often be one such case. As resources are made available through regulatory changes or new consumer demand shaped in accordance with social movement goals, there is little guaranty that those who take advantage of these new opportunities will be aligned with the social movements purpose, leaving it to fade or to be co-opted. However, social movements with frames and organizations powerful enough to mobilize significant resources into a relatively non-institutionalized market could also be expected to impact the occupations which develop within the market, especially emergent ones more open to imprinting, so that they might come to be identified with the social movement's normative and moral commitments. This tension, especially at the level of the occupation has been little explored empirically.

Like any occupation, residential energy auditing can contain a number of different logics and justifications, often with individual's shifting between then depending situation and need (Fine, 1996). Within residential energy auditing the rhetorics used to sell services as well as individuals to justify their work include customer service and comfort, financial savings, poverty alleviation, national energy security, and environmental protection. This begs the question then of whether the green job framing is significantly impacting the aggregate composition of attitudes, meanings and committed action to the occupation. Is residential a green job in more

than name only and can this be attributed to the green job frame or actions of the social movement organization?

To explore residential energy auditor's attitudes toward the green jobs framing of the occupation and how it relates with the meaning, commitment level, and activity level in the occupational community, I conducted interviews with 15 energy auditors. I sampled these interviews based on respondents from a survey sent out in December of 2011 to all individuals who sat for one of BPI's certification exams. Among the questions included was a series of 5 questions regarding the strength of the respondent's belief in the importance of environmental issues and basic environmental claims, as well as questions probing their participation level in a number of occupational activities. At the end of the survey, respondents could volunteer to be interviewed by the researcher and invited to leave their name and contact information. Before analyzing the whole of the survey data, I created a simple index of each of these sets of variables. I then randomly chose respondents who were 1.5 standard deviations above and below the mean on both indexes. This gave me a pool of interviewees who represented all four quadrants of the population – individuals who were highly active in the occupation and highly environmental, relatively inactive in the occupation and highly environmental, as well as those with low environmentalism scores with both high and low levels of activity. All individuals I interviewed indicated that their primary job in residential energy efficiency was that of energy auditor.

The interviews were semi-structured and roughly 45 minutes long. Basic topics covered were the respondent's work history, how they became interested in residential energy auditing, their current employment situation and their activity in different aspects of occupational life, and their current work and future plans relative to the occupation. Toward the end of the interview I would ask specifically about their attitude toward energy auditing being a "green job" if the

subject had not surfaced as well as about their perceptions of green versus non-green motivated auditors they had met in various settings. The purpose of the interviews was to look for basic evidence for or against the proposition that the green job framing was affecting people's underlying decision to enter the occupation, their commitment to it, and their activity level in the occupational community.

To code the interviews I chose to use Snow and colleagues (1986) classic description of frame alignment processes. Frame alignment as a lens is attractive in the context of this study because it is intended to describe an individual's meaning-making processes in relationship to the frames, such as green jobs, employed by social movement organizations. It also positions itself so as to "link together social psychological and structural/organizational factors" (p. 464). The purpose of the paper is to connect the more macro framing of green jobs precisely with the psychological measures of occupational commitment and its attendant outcomes. One of the strengths of frame alignment processes as conceptual tools for understanding the dynamics of commitment and activity is their application across different levels and a broad array of circumstances. It also recognizes the dynamic nature of adherence and commitment over time. Moving the target of commitment and activity from a social movement organization to an occupation is a logical extension for a frame predicated specifically on infusing meaning into a job.

Snow and colleagues identify four specific frame alignment processes that can bring individuals to commit and be active in social causes – frame bridging, frame amplification, frame extension, and frame transformation. Interviews with energy auditors displayed clear instance of frame bridging and frame amplification. Few if no clear instances of frame extension or frame transformation were found in my interviews. I describe frame bridging and frame amplification

as it pertains to connecting individuals with the meaning they provide their work and give examples from the interviews which display these processes. I then synthesize the insights gleaned in the interviews to propose specific hypotheses regarding how alignment with the environmental frame should be related to the pattern of occupational commitment and occupational activities for this occupation. I test these hypotheses with the full data from the survey.

Frame Bridging

Frame bridging refers to the basic process of social movement organizations reaching out finding individuals who already share their concerns and values to connect them with the activities of the organization. In the context of frame alignment between green jobs and the occupation of residential energy auditor this would primarily take the form of bringing the attention of environmentally-minded individuals to residential energy auditing as a viable green job where previously they had been unaware of the job or had not thought of it as being an extension of environmentalism's values. A clear example of the green job frame linking environmentally-minded individuals with the job come from Rob, a 27 year-old energy auditor who works for a WAP contractor but who had previously worked in what would be considered by most as another green job: writing grants for a community garden program. He described himself as one of those "who came in the wave of people who knew what weatherization is" in comparing himself to people who "didn't have a keen interest, motivation in what I called the environmental perspective on weatherization". Rob and his wife strongly identify as environmentalists and express these values at home. For example, they are "looking to getting solar panels on their house and experimenting with gray water recycling". Rob continues:

I always considered myself an environmentalist I suppose so I always had an attraction for this field, but never knew how to get involved in it. Basically, I was attracted. I did

have the intention of moving into general idea of environmental energy analysis and reduction within homes. Originally I was attracted to more elaborate stuff like solar panels and geothermal etc. but to get into that field it was geared toward engineers or at least 2 years at community college in that related field. It was very difficult a way into that field or world. So when this came about, I never heard of weatherization until I basically took a chance and did very well in the crew and moved up very quickly and then the opportunities to take BPI training in the weatherization program I took it.

Another informant, a 55 year old man, entered the field in 2005 before the major green job mobilization as a employee of one of the earliest and most well-known green-marketed entrepreneurial firms specializing in weatherization retrofits, then known as Sustainable Spaces. He leads wildflower walks with his partner, forages mushrooms, and is an active leader in a state sustainability group. He explained his entry into the job this way.

How I got here? It was wanting to start a new career, something helping the environment. Yeah it was a switch to a rather different field. So I started training myself for this in 2005 by taking lots and lots of classes. I have maybe have 200-300 hours of green building and energy classes.... That was about 6 or 7 years ago. I was working on the human genome project (as a computer analyst) and it was moving into small molecule and drug discovery and things I wasn't interested in.

For these individuals, the belief that residential energy auditing was a significant way to help the environment provided the major motivation for seeking training and employment that led to their positions as auditors. Many came from fields unrelated to weatherization, construction, HVAC or other technically related fields. The only link they had to the job was their belief that it would align their occupation with their environmental values. The fact that they perceive the job is aligned with their deeply held environmental values would lead us to expect that their commitment to the occupation will be weighted significantly toward normative reasons. Bringing in a significant number of individuals who otherwise would have remained ignorant or ambivalent is a direct way in which the SMOs green job framing into the occupation,

especially an emerging occupation more open to being imprinted with new values and meaning, could have important effects on the occupation's composition and development.

Frame Amplification

The process of frame amplification refers to SMOs ability to “clarify(y) and invigorat(e) an interpretive frame that bears on a particular issue or set of events” to help individuals overcome “indifference...ambiguity and uncertainty” (Snow et. Al, 1986, p. 469) This can be accomplished in two ways, either through raising an already held value higher within a person's priority or by more clearly linking a given action to a value. In terms of an occupation such as energy auditing, this might refer to a social movement's ability to change the priority order of rhetorics and meanings of a job through the framing. The rise of nouvelle cuisine within French cooking, the rise of active traders within mutual funds, and the contestation over work hour rules within surgical residencies are all examples of the use of framing processes to reorder the importance of different values within an existing occupation and field (Rao, Monin, and Durand, 2003; Lounsbury, 2007; Kellogg, 2011).

As discussed in the previous chapter, the link between environmental values and the work of residential retrofits has been part of the history of the activity since its inception in the 1970s. As such this justification for the activity has been available throughout its history. However, it has ebbed and waned in importance over time. The green job frame placed sharp focus back on the link between residential efficiency and environmental concerns. Gavin, a 34 year old former pastor and financial services employee, entered the weatherization field as an auditor and trainer in 2009. He places the environmental benefits of the occupation within the context of many of the other benefits that are commonly emphasized:

It was more of a personal networking connection in my case. There was not particular interest in this field over any other in my case. But now that I have gotten into it I have

learned to appreciate it...For one thing what weatherization can do for people. There are a number of benefits that I had never even been in my line of sight. The number one thing we hear from people is not about the environment, its not about saving on the utilities it is about comfort they receive from what we do. That was a surprise for me actually. It might have started out about saving on utilities. That is not about what they rave about afterwards. But then I did realize how much we are overpaying our utility companies due to poor house construction, poor air sealing, no insulation, old mechanicals and we are wasting a lot of money along with that energy...I have realized we can save people money, make them more comfortable, make them more healthy...and help protect the environment. It has made a big impact on me.

Unlike those where the green job frame helped motivate them to enter the occupation, Gavin, like many others, entered due to a combination of personal networks and a desire for a new opportunity. He didn't have particularly strong environmental leanings or associations with the job but has come to identify the job clearly with these benefits. He takes its efficacy in this realm for granted. However, it is also evident that he prioritizes other outcomes such as making people more comfortable in their homes and saving homeowners money. To the extent that the green job framing can increase - even incrementally - the importance and urgency of environmental concerns, and the clear link of residential energy auditing as a way to help address these problems, that framing helps align the occupation with the social movement's goals.

Frame Extension and Frame Transformation

Frame extension is the process of social movement efforts to find new constituents but incorporating new concerns into their repertoire and frames, especially when these concerns had not been previously linked. As discussed previously the green jobs frame is in and of itself a prime example of frame extension. It brings together the environmental frames of sustainability and environmental protections with union and labor advocates' concerns for the creation of quality jobs. Interestingly, in my interviews there were no examples of frame extension offered. A potential example might have been someone involved or drawn in through their labor

organizations or someone who emphasized the importance of the relationship between the economic benefits, job quality or the employing of disadvantage workers. This lack may be due to my sample selection strategy as it is quite possible that individuals drawn in through labor organizations or economic recovery motivations may have on average moderate alignment with green issues. It may also be because the green job frame's societal-level economic concerns do not translate well to individual motivations for the job making frame extension in this particular context rare.

Frame transformation was also not observed in the interviews. Frame transformation refers to a social movement's ability to fundamentally shift the beliefs and values of an individual. Frame transformation is often associated with conversion. In this context, I would interpret it as someone who began in opposition to basic environmental claims and values or who was skeptical of the relationship of the occupation or industry to effectuate change who then came to embrace it. The interviews did produce quite a bit of evidence of individuals who rejected or were unaffected by the basic green job framing of the industry and the job.

For example, Mitch, a home appraiser who sought certification so that he could try adding energy auditing as a service attached to his appraising business, describes his alignment with auditing as a green job thus:

Its not really of interest to me. The thing is you don't want to come out and sound so ignorant and say screw it, but when it comes down to for me to be sold on it I would need to be convinced that I would want to do something. That is just what it is. For my part my home is 18 years old and I haven't even done a blower-door on my house. I am realizing I could afford some insulation in the attic and of course when the furnace comes in I could replace it, but to say that I am going to do this for the environment I don't think so. My wife recycles. That's enough.

A common theme among environmentally-aligned informants was how most of the people they met they perceived as being "opportunists" and "only in it for the money" and "not

caring about the environmental aspects”. Ash, a young college-trained engineer in his 20s who works for a commercial auditing firm but who is trying to start his own residential energy auditing business, recounts:

I think most people are getting into this business due to the money and the opportunity right now. I got into at around the same time but I know since college I was into the energy stuff and my full time job is also there. These other contractors that are doing HVAC and ventilation they got into this, they went and got their certification just because the state required it and they had to do this to get the incentives. This starts growing really fast there were only a few people doing home energy auditors in Delaware before the legislation. Now there are like 50.

Gavin, previously quoted, who, in addition to performing audits, also provides training to others on energy auditing and selling weatherization services across the country,’ tells this story which evokes how contested the green jobs frame can be among potential entrants to energy auditing.

I would say that most the contractors I train, I mean it is a group of people – white, small business owners – that are not particularly the most green people. You know what I mean. In our training we put a clip of President Obama saying “insulation is sexy”. It was just a small clip, but it caused so many problems that we learned quickly that we had to pull it out. They don’t want to hear about green anything.

So while the interviews revealed evidence that the green job framing has worked to attract some new entrants into the occupation, there are also a good number who actively reject the green job framing of the work. Many of these seem to come from the fields that are technically adjacent to energy auditing such as HVAC technicians. They show less willingness to identify with the new occupation of energy auditing. Environmentally—minded auditors consider them opportunists and are skeptical of their commitment to the project of building the occupation. Similar tension between movement-aligned entrants and opportunists has been observed in studies of entrepreneurs (Hiatt, Sine and Tolbert 2009; Morton and Podolny, 2002;

Gimeno et.al, 1997). In the context of a developing occupational community, the introduction or amplification of one particular meaning for the job can lead to profound impacts on important dynamics within the occupation, not only by attracting adherents, but also by dissuading those who do not align with the social movement framing from higher levels of participation. I turn now to developing and testing a specific set of hypotheses on how the bridging and amplification of the green job frame is affecting the occupational community in aggregate.

Hypotheses

Archival and qualitative evidence have established a link between the activities of social movements to promote residential energy efficiency work as green jobs and suggested that this environmental framing has become salient for individuals in residential energy auditing. It has led to environmentally-minded individuals entering the field as a way to align their work lives with their environmentalist values. It also suggests that it has amplified the environmental rhetoric and meaning of the job among some incumbents, leading to positive associations for those who hold positive views toward environmentalist preservation. However, this amplification can lead to negative reactions among those who are ambivalent or even hostile to environmentalist concerns. The question is whether and how these framing effects broadly shape substantive elements within the occupational community. I focus on two important aspects which help define any occupational community, the nature of individual commitment to the occupation and participation in the formal and informal activities of the occupational community. I develop hypotheses for each of these elements as well as the relationship between them.

Frame Alignment and Occupational Commitment

Sociological and psychological research has long established that in the realm of work occupations and professions provide a distinct focus for an individual's commitment (Becker, 1960; Blau, 1985, 1988, 1994; London, 1983; Wallace, 1995). However, occupational commitment has received far less systematic attention than organizational commitment and has lagged behind in theoretical development and empirical study (Lee, Carswell and Allen, 2000; Blau, 2006; Snape and Redman, 2003). Sociologists tended to focus on the process of becoming identified with an occupation and with the process of accumulating investments within an occupation which made it hard to leave, later termed continuance commitment (Becker, 1960; Ritzer and Trice, 1969). Early efforts by psychologists revolved around measuring levels of self-identification and affect towards first, one's career, and later, using occupations as more defined and salient foci (Lee, Carswell and Allen, 2000; Allen, Meyer and Smith 1993; Blau 1987, 2003). In much of this research occupational commitment remained either a one dimensional construct or it made a single distinction between affective commitment and continuance commitment to an occupation. More recently there has been a recognition that occupational commitment, like organizational commitment, is a more multi-dimensional construct. The most current and widely used conceptualization for measuring commitment came from those developed for organizational commitment (Allen and Meyer, 1990; Meyer, Allen and Smith, 1993; see Klein, Becker, and Meyer 2009 for a comprehensive review) that have been applied to occupations (Meyer, Allen and Smith, 1993; Carson, Carson, and Bedeian, 1995). This model recognizes three distinct types of occupational commitment – affective commitment based on self-identification and positive affect toward the job, normative commitment based on feeling a moral obligation to do the job, and continuance commitment rooted in having sunk costs in terms

of training, experience, and relationships, which make it difficult to leave the occupation. Recent refinements to this three-factor model have proposed and validated a fourth factor for occupations breaking apart continuance commitment into two distinct elements – one based on the accumulated investment in skills and training and another based on limited available alternatives due to external factors (Blau, 2003; 2006). This four-factor version is especially apt for the current context as high unemployment and the suggested solution of green jobs means there is likely a significant contingent of individuals attracted and committed to the job due to the absence of other alternatives. This is very different than commitment based on past skills accumulated in adjacent fields or past investment in training and work experience. There is little psychological work to draw on which directly considers how the foci of commitment develop or change within an occupation, and none to my knowledge which uses these contemporary multi-dimensional individual-level measures. However, these measures, with their vetted reliability, discriminate validity, and contextual relevance provide a solid basis for investigating the relationship between frame alignment and occupational commitment of energy auditors at the individual level.

Frame Alignment and Affective Commitment

Affective commitment and its scales are rooted in two basic concepts which have been shown to be highly correlated in practice. One is in a basic positive attitude toward or liking of an occupation, its tasks and work. The other is the extent to which an individual's personal identity is bound to their work. As individuals enter an occupation they begin a process of developing attitudes and identification with the occupation (Van Maanen and Barley, 1984; Becker and Carper, 1956). Basic findings are that the amount of time spent in an occupation and

affective commitment are positively related. This process can also be influenced by organizational context such as the structure of the particular job and affect toward the organization in which the person is employed. However, there tends to be a wide degree of variation in how affectively committed individuals come to be towards their occupation.

One powerful aspect of social movements is their ability to bring individuals to identify with causes, organizations, and frames. Qualitative research related to social movements and occupations specifically have shown how they can help create and change identification with an occupation. For example, Weber, Heinz and DeSoucey (2008) showed how social movements helped to create the initial underlying semiotic structure for the grass-fed beef industry, and were integral to the creation of a cohesive identity and community for producers. This prefigures the more detailed division of labor and expertise which would presumably accompany industry growth. Lounsbury's (2001; Lounsbury and Kaghan, 2001) study of recycling coordinators draws a direct link between the environmental movement's recycling efforts and the infusion of a new occupation with both resources and meaning for their work. Rao, Monin, and Durand (2003) characterized occupation-led insurgent movements in the profession of French cooking as "identity-movements" because occupational roles and identity were central to both the motivation and shape of insurgent efforts to change the field. Framing efforts such as those undertaken by the social movement organizations promoting green jobs, if influential, can be expected to become tied to core elements of occupational identity.

In the case of residential energy auditors and green jobs, the qualitative evidence suggests that individuals with strong self-identification as environmentalist became attracted to the job once its relationship to environmental conservation was clearly articulated by social movement organizations. Beyond self-identity the amplification of the environmental benefits of the job

provided another legitimate reason for individuals to feel proud about their job and simply increase their positive association with the occupation. Conversely, for individuals who are apathetic or antagonistic toward environmentalist values and claims, it should weaken their desire to identify with or hold positive associations with the occupation. This should especially be true for those for whom environmentalism and green beliefs conflict with other important political identities. Applying these observations over a larger sample lead to the hypothesis:

Hypothesis 1a: Among certification seekers stronger environmentalist attitudes aligned with the “green job” framing of residential energy auditing will be positively associated with affective occupational commitment.

Frame Alignment and Normative Occupational Commitment

Normative occupation commitment refers to the level of moral obligation that an individual feels to continue in an occupation. The green job frame combines both diagnostic and prognostic elements which stress the moral obligation of individuals toward the planet and the externalities of pollution and climate change on others. Doing so provides a well-developed logic for a normative obligation to stay in the job.

An example of articulating such a commitment comes from Rob, previously quoted when asked why he was committed to the occupation of residential energy auditing:

I do think that I have a keen ethical motivation. I mean we are at these houses lets really, truly do this correct, in a sense by the book, in creating an insulation barrier, vapor barrier, an air barrier when we leave this house we, but also nobody else, will never touch this house again. Whereas I do kind of keep an eye on if we do 100% and really spend the time on this we can really do reduce the amount of energy use in this house...I am active. I do go to them (occupation-related activities). It goes back to what I was saying earlier about the big picture for my career down the road it's a great opportunity to make

the energy auditors in the state of NY that you are making an environmental impact how do we keep this going and go the extra step. A little bit a part of me, if I keep moving up, thinks I can get into a position where I can help people see that it is not just a job but you can make an impact.

I think the most important thing is and I think about this all the time is that I have 150 opportunities per year, and that is number of units. I get to, to hit a homerun with each and every single house since I can't go to my neighbors to this. So every house I go to I take extremely seriously and analyze the best that I can. Defintiely 100% I take very seriously. There are opportunities in every household that may or may not be clearly evident to the homeowners or even my coworkers, but like I said I have 150 oppotunities to make an impact.

These types of comments are not uncommon among newer entrants into energy auditing and even casual investigation of the blogs, internet chat sites, and other venues related to the occupational community show this as significant conversation taking place within the occupation. Those who reject the normative claims of the environmental movement chafe when confronted with the expression of such normative beliefs. Gavin for example, who expresses a high-level of affect for the job and has come to accept some of the environmental benefits related to the job as important, draws a personal distinction between this affect and those who treat the job with strong moral obligation rooted in environmental protection:

I do see some differences actually, having coming up not through the environment educational area. Coming as a novice myself I can relate to this. Those that come into this field from another field tend to be I am going to be quite honest I am going to say arrogant, but they are a little less arrogant than those that come up through the environmental training. There are a lot of auditors that think they know everything and they see energy auditing as an exact science and are hung up on details of things that in my opinion are not an exact science. There aren't agreed upon things even with BPI. You can get a little Nazi like you know. You can be so green that you can be over the edge.

The strong normative commitment in residential energy auditing appears to mostly be expressed by those with strong environmental convictions who have been bridged into the job

through the high-profile and public push to define it as a green job. If this is true across a broad sample it leads to a straightforward prediction regarding the relationship between the strength of environmental belief and normative commitment to the occupation:

Hypothesis 1b) Among certification seekers, stronger environmentalist attitudes aligned with the “green job” framing of residential energy auditing will be positively associated with normative occupational commitment.

Frame Alignment and Continuance Commitment

In contrast to normative and affective commitment, there is little reason to believe that the more structural forms of continuance commitment, accumulated cost and limited alternative commitment should be associated with the an individual’s alignment with the green job frame. Higher levels of affective and normative commitment can lead to higher levels of investment over time. Indeed, these have been shown to be positively correlated in past studies of occupational commitment (Meyer, Allen and Smith, 1993; Blau, 2003). However, in an emerging occupation like residential energy auditing, many incumbents and job seekers have had little time to make longterm investments. Additionally, individuals coming from technically adjacent fields like construction and HVAC contracting bring relevant skills that might make them more committed to the new occupation – a commitment completely unrelated to their beliefs and attitudes toward the green job framing. Investment commitment, net of its correlation with affective and normative commitment, in this context should not be predicated on alignment with the green job framing.

Similarly, limited alternative commitment should not be related to an individual's alignment with the green job frame. Limited alternative commitment is especially salient in the current environment due to the high unemployment level, especially among the construction trades. Because green jobs have been offered up as one of the major solutions to the current crisis there are large incentives for many individuals both with relevant construction experience and without to seek jobs as energy auditors. Training for these jobs is being subsidized by federal and state money in many areas. Pursuit of energy auditing as a job due to long periods of unemployment and limited alternatives in other fields should not be associated with individual beliefs about the environment. From environmentally-driven actors these individuals are opportunists whose commitment should be unrelated to environmentalist goals.

Hypotheses 1c and d) Among certification seekers stronger environmentalist attitudes aligned with the "green job" framing of residential energy auditing will not be positively associated with investment or limited alternative occupational commitment.

These two structural forms of commitment provide a check on the association between frame alignment and affective and normative commitment. The theory of frame alignment works through beliefs, values and individual cognition. Finding that alignment with the social-movement-driven green job is associated with these structural forms of commitment would call into question whether there other structural factors, not controlled for, in the models which account for the relationship, and if so, this would decrease confidence that framing processes are driving the association between environmental beliefs and occupational commitment.

Alignment with Social Movement Framing, SMO Membership and Participation in Occupational Communities

The effect of an individual's alignment with the social movement framing of a job and their commitment toward it is an important step in demonstrating the influence that social movements can have in shaping an occupational community. However, commitment to the occupation should also lead to concrete behaviors and actions by the individual. If such beliefs and attitudes do not mobilize workers in relation to their occupational activities, then the social movement framing of the job would have a limited, and potentially transitory effect. In such a case it is unlikely that the norms, beliefs, and practices associated with the green job framing would become institutionalized within the occupation to a significant degree. Alternatively, if frame alignment processes of bridging are not only bringing significant numbers of new environmentally-motivated individuals into the occupation, but are also associated with differential levels of community participation by individuals, then we can more confidently draw a direct link between social movement frames and their influence on community-level outcomes and processes.

Social movement organizations have been linked to nascent forms of occupational community organization in emerging occupations (Lounsbury and Kagan, 2001; Weber, Heinze and DeSoucey, 2010). They can act as convenient organizational proxies for collective action and identity among emerging occupation incumbents. The networks which build up within and between social movement organizations are also a natural recruiting tool for new occupational organizational efforts. In the field of residential energy auditing the social movement organizations like Green For All and the Blue Green Alliance have pushed for resources for expanded training and occupational standards. They have helped organize panels and

conferences that have brought together the relatively few experienced practitioners and new entrants. They have used their publications and networks to market and recruit for all these activities. Therefore, membership in environmental organizations can lead directly to more information and opportunities to participate in the communities growing up to support residential energy retrofits, including auditing. The effect should remain strong and positive even after controlling for an individual level of environmentalism as well as different forms of occupational commitment.

Hypothesis 2a) Current membership in an organization dedicated to protecting the environment will be positively associated with the level of participation in the occupational community.

Membership in environmental organizations is not the only way in which social movement activities might affect individual participation in the occupational community. Alignment with the green job frame and its emphasis on the seriousness of the problem, as well as its optimistic outlook on the future of residential energy efficiency as an industry with the potential, even inevitability, of significant growth, will may make people more likely to commit time and resources to community participation. This is especially true for participation which requires discretionary effort outside of an individual's work place. Advocacy and development of occupational communities often occur outside the workplace and in informal as well as formal settings (Barley and Van Maanen, 1984; Abbott, 1988). It is often unpaid, though it can sometimes be converted into better career prospects and mobility within the field. Since at least some of the opportunities are being sponsored or backed by the green jobs movement, it is also more likely that those who align with the movement's mission and values will feel more

comfortable attending at least certain types of events. And to the extent that community activities become seeded with individuals highly committed to the green job frame it could act as a deterrent to those apathetic toward the frame. Thus, I expect:

Hypotheses 2b) Stronger environmentalist attitudes aligned with the “green job” framing of residential energy auditing will be positively associated with the level of participation in occupational communities.

Further, if the green job framing for the occupation is largely responsible for motivating and mobilizing individuals within their occupation through their commitment to the occupation, then entering direct measures for their normative and affective commitment should mediate the relationship between environmental attitudes and community participation. A limited amount of research has been done on the relationship between occupational commitment and participation in professional associations. In established occupations, the affective commitment is the strongest of willingness to participate in formal associations while normative and continuance commitment have not been found to be related (Snape and Redman, 2003). However, given the strength of the moral claims being made through the green job frame, normative commitment might be more salient than affective commitment in this context. Because normative and affective commitment both directly relate to the cognitive and normative mechanisms neoinstitutional theory makes related to occupations and professions, I will compare them against both forms of continuance commitment. Evidence for the cognitive bases of the framing mechanisms would be strengthened if the more structural reasons for committing to the occupation, represented by accumulated cost and limited alternative commitment, do not show

such mediating effects. These are also the forms of commitment that are most naturally associated with the opportunistic actors – those coming from related industries with accumulated skills that can be applied to the new occupation and those who enter the occupation due to lack of other alternatives.

Hypothesis 2c) Normative and affective occupational commitment will mediate the relationship between environmental organization membership and participation in the occupational community.

Hypothesis 2d) Accumulated Cost and Limited Alternative occupational commitment will not mediate the positive relationship between environmental attitudes and participation in the occupational community.

Finally, the sharp rise in the connection between home energy auditing and the green job frame provides an interesting opportunity to test how powerful the framing is relative to the mobilization of resources to draw into the occupational community actors who are more ambivalent about the green job frame. While thus far I have argued that there should be a generally positive association between alignment with the green job framing and occupational commitment and activity, it is entirely plausible that the resource mobilization around the occupation could swamp the effect of the green job framing. If the money available provided incentives for a wide array of actors with dispersed beliefs about the validity of the frame to enter and participate in these communities, we would expect to see a weakening of the relationship between environmental attitudes and participation in the occupational community.

On the other hand, if the framing was successful in selecting in individuals amenable to the framing and/or amplifying the beliefs of those who entered to align with the framing, we would expect to see the relationship strengthened. I look for evidence empirically by whether the interaction effect between entering during the green job mobilization and environmental attitudes was positively or negatively significant. Consistent with the argument that the green job framing does matter to the construction of the occupation community more than opportunistic entry dilutes it, I hypothesize:

Hypothesis 3) The positive relationship between environmental attitudes and participation in the occupational community will be stronger for those who entered during the green job mobilization than those that entered before.

Data and Results

To test these hypotheses, the paper relies on a unique nationwide survey of individuals seeking certification in residential energy retrofits. The survey was administered to individuals who took one or more of the certification exams offered by the Building Performance Institute. BPI is the largest national organization currently certifying workers specifically in tasks related to residential energy auditing, and is recognized as the most influential standard-setting organization for residential retrofit certification. Its training and certification have been used as the basis for workforce training guidelines developed and disseminated by the US Department of Energy and Department of Labor. BPI, for example, was chosen as the certification organization for the HomeStar legislation which narrowly failed in Congress and which was designed to

extend federal incentives for residential retrofits using the performance contracting model. However, this bill is being used as a blueprint for a number of similar state-level initiatives.

Each individual who sits a BPI exam must fill in the email contact. I used the list of emails generated by all individuals who sat one or more BPI exams between January 1st and November 30th, 2010. The survey was conducted online and respondents were sought by sending out the link to the survey to 10,787 unique email addresses in December with a one follow up reminder two weeks after the initial email. The email was sent from a BPI email address. In the introductory letter respondents were told the survey was sponsored by BPI but administered by MIT. Respondents were guaranteed anonymity by the MIT researcher. An incentive to enter a drawing for a piece of equipment used in residential energy retrofit work valued at \$500 was offered for completing the survey. The survey was in the field for a total of 4 weeks with two reminders. 500 emails were either invalid or discontinued. Of the 10,287 emails successfully delivered, 2,119 individuals responded for a base response rate of 21%. Of the 2,119 – 1,1776 finished the survey for a final response rate of 17%.

While this response rate is comparable to other email-based surveys, there is a legitimate concern regarding response bias. To date, the organization had not systematically collected basic demographic variables from those seeking certification or becoming certified, which provided some of the motivation for working with the researcher. However, it is possible to compare a particularly critical characteristic between respondents and non-respondents: the distribution of the type of test taken and the scores they received on the certification exams they sat in the last year. Marked differences between the types of test taken and scores on the test provide a reasonable check for selection bias on along two important dimensions. In particular, the ability to measure differences in respondents and non-respondents in their underlying knowledge and

aptitude for the job as measured by test score is a selection check often not available in survey research.

Table 1 contains the mean scores and distribution of tests between respondents and non-respondents for any exam that was taken by 500 people or more during the period sampled. This represents 84% of all exams taken. First, comparing the distribution of types of test taken reveals only very small differences between the two groups. Among the five exams that make up the core of the organization's certification practice, only 1 exam was over- or under-represented by more than 3% points in the respondent sample. The biggest absolute deviance was for one of the organization's field exams which was overrepresented in the respondent group by just under 4%. Comparing the mean scores of each test for respondents and non-respondents reveals that respondents scored higher by a statistically significant margin on most tests. However, the absolute differences in test scores is still quite small, within 1 or 2 points, which translates directly to respondents getting 1 to 2 more questions than non-respondents correct on their standard 100 question tests. In the most highly taken exam, the difference is 3.7 questions. This upward bias in scores is not surprising since individuals who failed the exam are probably more likely to have moved out of this market and are less likely to take a survey associated with the organization.

Table 1: Test Distribution and Test Scores for Respondents and Non-Respondents

Test	Total Tests	Mean Score	% of All		Mean Score	% of All		Difference in Means***
			Tests by Responde	# Tests		Tests by Non-	# Tests	
Exam 1	7951	81.3	32.1%	629	77.6	31.0%	7322	3.7
Exam 2 (Field Exam)	7331	94.4	32.2%	632	94.0	28.3%	6699	0.4
Exam 3 (Field Exam)	2593	97.3	11.1%	218	96.5	10.1%	2375	0.8
Exam 4	2104	80.9	9.6%	189	79.4	8.1%	1915	1.5
Exam 5	943	79.2	2.3%	46	77.6	3.8%	897	1.6
Exam 6	572	67.5	0.1%	2	71.3	2.4%	570	-3.8

*** all differences are significant at $p < .001$

So while response bias directly cannot be ruled out, bias based on skill or motivation related to the sector appears to be very modest at best. It appears that more committed individuals are more likely to take the time to fill out the survey. However, great care was taken to present the survey in way that was neutral to the green job framing understudy. Importantly, BPI as the focal organization did not self-identify or project itself as a green or environmental organization during this period. The quote at the beginning of the paper expressing deep skepticism regarding the wave of environmentally-minded entrants into the field comes from a BPI staffer in charge of the organization’s external relations. This attitude was shared broadly among the staff and leadership with whom I interacted within the organization.

To better focus on emerging occupations and to control for unobserved occupation characteristics, I restricted my analysis to those who indicate their primary job or desired job in residential energy retrofit market is that of a home energy auditor – the newest and most distinctive of the occupations in the sector. BPI’s training is also represents the largest certification specifically available to residential auditors. 810 of the finished surveys fall into this category of home energy auditing and represent the core occupation serviced by the

organization, and 602 of these filled out every question used in the most extensive models in the paper. I restrict all further analysis to this sample of complete responses.⁹

Key Variables

The survey asked respondents between 20-50 questions depending on whether a person was employed and the type of job they held. It took an average of 12 minutes for respondents to complete the survey. It included basic demographic questions around gender, age, location and education. It also included questions regarding other relevant certifications, employment status, current job or job seeking. For those employed information regarding wages, lengths of employment, job satisfaction, size and type of employer, and job quality were also collected.

Among the demographic questions was a battery of sixteen questions regarding occupational commitment. The questions were adapted from the established scales which measure the four types of occupational commitment – affective commitment, normative commitment, investment commitment and limited alternative commitment as operationalized by Blau. (Carsen, Carsen, and Bedian, 1995; Blau, 2003, 2006). Four questions for each type of commitment were chosen from the set of six questions used by Blau. The criteria for choosing the questions were based on taking those which loaded most highly onto factors as calculated from Blau's sample. The sixteen questions were asked in a single block with all commitment questions randomized within the block. Factor analysis confirmed a four factor solution with questions loading on the anticipated factors. Data for three of the scales – normative (alpha .70), investment (.86), and limited alternative commitment (alpha .77) were normally distributed. The

⁹ Analysis which is more lenient and keeps all cases for each model in which there is complete data show similar results to the final models.

distribution for affective commitment (alpha .79) is skewed to the right with a significant group of respondents answering at the top of the range for all questions.

To measure an individual's alignment with the green job frame, the respondent's views regarding environmental protection were measured. A five-item scale drawing four questions from established GSS items on environmental attitudes included two reverse-coded items to balance the scale, particularly important for measuring attitudes on controversial social topics. The fifth question asked specifically about the importance of holding a job related to protecting the environment to more directly link environmental beliefs to the context of the study. The data for the scale (alpha = .76) came back normally distributed with a mean of 3.64, indicating it did a good job of distinguishing between those who are aligned with the basic environmental frame and those who are not. This speaks directly to the heterogeneous beliefs and value structures in the field even with the strong environmental rhetoric which has been applied to it in recent years.

To better capture some of the dynamics related to the social movement organization's mobilization of resources and the application of the green job frame to residential energy efficiency, I created one dummy variable for all individuals who reported entering or seeking to enter residential energy efficiency in 2009 or 2010. I chose 2009 as a cut-off based on the publication of Van Jones "The Green-Collar Economy" in October of 2008, which was key to crystallizing the green job frame for a mass audience. It was also late in 2008 and early 2009 when it was clear that residential energy efficiency would be a key component of ARRA, leading to a rapid influx of individuals applying for certification. The number of people receiving BPI certification or recertification as building analysts, for example, rose from just 682 individuals nationwide for all of 2007 to over 4,000 in 2009 and 10,000 in 2010.

Current participation in an environmental organization was determined by series of two questions regarding “membership in any organizations whose primary purposes to protect or preserve the environment.” The first asked whether the respondent has ever belonged to such an organization. The second asked those who responded in the affirmative whether they currently belong to such an organization. To better gauge what membership meant to these respondents, a follow-up question regarding the environmental organization in which they were most active. “On average, how often do you take actions on behalf of this group? These may include things such as attending a meeting/activity, exchanging emails about group activities, doing work on behalf of the group etc.” Only 5% reported never taking action. 28% reported taking action less than once a month. 66% reported taking action once a month or more. Thus, membership appears to include fairly regular activity for the majority of this subset.

Participation in the occupational community was measured by asking respondents the frequency with which they engaged in six different activities. The question used a customary seven category measure of frequency which ranged from “Never” to “Daily”.

- Networking in professional settings (conferences, workshops etc.) outside your workplace with others working in residential energy efficiency.
- Spending time socially, outside of work, with others involved with residential energy efficiency.
- Participating in chat rooms or online communities focused on residential energy efficiency.
- Donating your time and skills in residential energy efficiency without pay to local organizations or groups
- Donating your time and skills in residential energy efficiency without pay to national or regional organizations or groups.
- Working to influence local or national legislation that affects your occupation.

These activities span the range from very informal and local – socializing outside of work - to more formal and wide reaching – working on legislation. All these elements have been emphasized as critical components to building the culture and practices that define occupational

communities (Van Maanen and Barley, 1984; Gerstl, 1960; Adler, Heckscher and Kwon, 2008). The measures emphasize its activities outside of paid work time to better capture discretionary effort on part of the respondent and closely align with their underlying level of engagement. I made a simple additive index with these six components and adjusted the index so that 0 represented individuals who report never participating in any of the activities and 36 was the maximum score for anyone participating daily in all activities (alpha .81).

Controls

Important controls for both individual level attributes, the organizational context known to affect occupational commitment, as well as participation in professional associations were also collected. Individual controls included gender, age, education measured, number of years since they first worked in residential energy efficiency, whether they hold certifications from related trades and field such as HVAC, contracting licenses, insulation-related certifications (usually offered by the manufacturer) and HERS certification. Importantly, each of these elements is potentially correlated with the opportunities presented to individuals to participate in the occupational communities, as well as to different factors of occupational commitment. I also used these data to create a variable which represented the total number of different certificates an individual has received. The more different types of certificates the more exposure they are likely to have to occupational communities related to energy auditing.

Organizational variables regarding the workplace were collected only for respondents who were currently employed in the field of residential energy. I controlled for the type of organization in which they are employed (generalist residential contractors, utilities, WAP and other government programs, self-employed, utilities or in education). The base category was contractors who specialize in residential energy efficiency. The controls also included the size of

their employer represented by categorical variables for six different intervals, the tenure with their current employer in five different intervals, and the level of satisfaction with their current job (standard four-item scale), and whether they belong to a union (yes = 1) and whether they receive retirement benefits (yes = 1), a widely used control for job quality. Organizational context has been found to be correlated with all different forms of occupational commitment and can also be expected to be correlated with access to and participation in occupational communities. Together, these individual and workplace variables represent the most extensive controls applied to these measures of occupational commitment as well as the relationship between these measures and participation in occupational communities (Blau, 2003; Snape and Redman, 2003).

Due to the recession and particularly to the collapse of the home building sector, a large number of people were still unemployed or employed out of the sector. They make up a sizable subgroup in the population. It is important to include them as they also represent a large percentage of potential participants in the occupational communities springing up around residential energy retrofits. Though the hypotheses are not specific to employed or unemployed members of the occupation the dynamics surrounding participation in the occupational communities might be quite different as they have different motivations, resources, and access to these communities. Consequently, I ran two separate sets of models - one for respondents that are unemployed or currently employed outside of residential energy efficiency, which controls only for individual level characteristics, and a second for those employed in residential energy efficiency that also takes into account relevant job and organizational variables. I expect the basic relationships between frame alignment and participation in the occupational community for both groups to support the hypothesis. Table 2 contains the means, standard deviations and

correlations between the dependent, independent and individual control variables along with the alpha coefficients, all of which are in the normally acceptable range, for all composite scales. Table 3 contains the same information on the subset of employed individuals and includes the organizational control variables.

Table 2: Descriptive Statistics and Correlations – Unemployed and Employed Outside of Residential Energy Auditors

Variable	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9
1 Occ Comm Participation	8.74	6.18	0	35	1								
2 Normative Comm	3.23	0.83	1	5	0.27	1							
3 Limited Alternative Comm	2.31	0.72	1	5	-0.12	-0.03	1						
4 Accumulated Cost Comm	3.06	0.8	1	5	0.09	0.52	0.16	1					
5 Affective Comm	4.27	0.66	1	5	0.21	0.51	-0.15	0.33	1				
6 Environmental Attitude	3.57	0.75	1	5	0.24	0.27	-0.02	0.07	0.22	1			
7 Years Since First Enter REE	12.39	12.11	0	51	0.14	0.13	0.00	0.11	0.04	0.01	1		
8 Age	45.32	11.58	18	72	0.03	0.09	0.07	0.02	0.04	0.01	0.49	1	
9 # of Related Certifs	1.29	1.1	0	6	0.2	0.08	-0.1	0.07	0.05	0.06	0.21	0.14	1
10 Entry During Green Job Mob	0.32	0.47	0	1	-0.2	-0.08	0.00	-0.11	-0.02	0.01	-0.62	-0.23	-0.25
11 Female	0.07	0.26	0	1	0.00	0.06	-0.02	-0.01	0.05	0.12	-0.12	-0.12	-0.09
12 Part time	0.16	0.37	0	1	-0.04	-0.04	0.05	-0.06	-0.05	0.1	-0.02	0.13	-0.07
13 HS or Less	0.09	0.29	0	1	-0.1	0.00	0.05	0.05	0.00	-0.1	0.00	-0.03	-0.04
14 Bachelors	0.38	0.49	0	1	0.03	-0.07	0.03	-0.09	0.01	0.06	-0.09	-0.13	-0.05
15 Masters	0.13	0.33	0	1	0.08	-0.09	-0.11	-0.11	-0.02	0.06	0.00	0.06	-0.06
16 PhD/JD	0.02	0.13	0	1	0.01	-0.01	-0.03	-0.02	-0.03	0.07	0.13	0.12	0.11
17 HERS	0.36	0.48	0	1	0.17	-0.01	-0.01	0.04	0.03	0.05	0.01	0.07	0.46
18 NATE	0.05	0.21	0	1	-0.07	0.00	0.00	0.08	-0.03	-0.11	0.16	0.05	0.31
19 HVACM	0.13	0.34	0	1	0.02	0.05	-0.1	0.1	0.01	-0.09	0.25	0.09	0.46
20 INSM	0.07	0.26	0	1	0.1	0.12	-0.06	0.04	0.07	0.00	0.15	0.04	0.44
21 LEED	0.09	0.29	0	1	0.07	-0.09	-0.07	-0.12	-0.02	0.09	-0.06	-0.07	0.28
22 GENCON	0.28	0.45	0	1	0.14	0.05	-0.02	0.04	0.03	0.07	0.13	0.14	0.52
23 LOCCERT	0.33	0.47	0	1	0.1	0.09	-0.04	0.01	0.04	0.1	0.07	0.05	0.48

Table 2: Descriptive Statistics and Correlations – Unemployed and Employed Residential Energy Auditors continued

Variable	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1 Occ Comm Participation														
2 Normative Comm														
3 Limited Alternative Comm														
4 Accumulated Cost Comm														
5 Affective Comm														
6 Environmental Attitude														
7 Years Since First Enter REE														
8 Age														
9 # of Related Certifs														
10 Entry During Green Job Mob	1													
11 Female	0.09	1												
12 Part time	0.1	-0.04	1											
13 HS or Less	-0.02	-0.06	-0.06	1										
14 Bachelors	0.04	0.08	0.02	-0.25	1									
15 Masters	0.01	0.00	0.03	-0.12	-0.3	1								
16 PhD/JD	-0.04	-0.01	0.03	-0.04	-0.11	-0.05	1							
17 HERS	-0.08	-0.05	0.05	-0.08	0.04	0.04	0.06	1						
18 NATE	-0.12	-0.06	-0.1	0.08	-0.12	-0.05	0.01	-0.08	1					
19 HVACM	-0.2	-0.09	-0.12	0.05	-0.1	-0.07	0.08	-0.04	0.39	1				
20 INSM	-0.13	-0.03	-0.06	0.00	-0.05	-0.02	0.06	0.06	0.11	0.19	1			
21 LEED	0.02	0.03	-0.02	-0.06	0.03	0.11	0.01	0.11	-0.02	-0.05	-0.03	1		
22 GENCON	-0.17	-0.07	0.01	-0.06	0.04	-0.06	0.03	0.1	-0.01	0.03	0.1	0.03	1	
23 LOCCERT	-0.09	0.01	-0.05	-0.01	-0.07	-0.09	0.07	-0.07	0.03	0.12	0.15	-0.06	0.05	1

Table 3: Descriptive Statistics and Correlations –Employed Home Energy Auditors

	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12
1 Occ Comm Participation	8.74	6.18	0	32	1											
2 Normative Comm	3.23	0.83	1	5	0.27	1										
3 Limited Alternative Comm	4.27	0.66	1	5	0.21	0.51	1									
4 Accumulated Cost Comm	3.06	0.8	1	5	0.09	0.52	0.33	1								
5 Affective Comm	2.31	0.72	1	5	-0.12	-0.03	-0.15	0.16	1							
6 Environmental Attitude	3.57	0.75	1	5	0.24	0.27	0.22	0.07	-0.02	1						
7 Years Since First Enter REE	12.39	12.11	0	51	0.14	0.13	0.04	0.11	0.00	0.01	1					
8 Age	45.32	11.58	18	72	0.03	0.09	0.04	0.02	0.07	0.01	0.49	1				
9 # of Related Certifs	1.29	1.1	0	6	0.2	0.08	0.05	0.07	-0.1	0.06	0.21	0.14	1			
10 Entry During Green Job Mob	0.32	0.47	0	1	-0.2	-0.08	-0.02	-0.11	0.00	0.01	-0.62	-0.23	-0.25	1		
11 Female	0.07	0.26	0	1	0.00	0.06	0.05	-0.01	-0.02	0.12	-0.12	-0.12	-0.09	0.09	1	
12 Part time	0.16	0.37	0	1	-0.04	-0.04	-0.05	-0.06	0.05	0.1	-0.02	0.13	-0.07	0.1	-0.04	1
13 HS or Less	0.09	0.29	0	1	-0.1	0.00	0.00	0.05	0.05	-0.1	0.00	-0.03	-0.04	-0.02	-0.06	-0.06
14 Assoc Degree	0.38	0.49	0	1	-0.03	0.13	0.01	0.14	0.02	-0.06	0.05	0.08	0.08	-0.02	-0.03	-0.01
15 Bachelors	0.38	0.49	0	1	0.03	-0.07	0.01	-0.09	0.03	0.06	-0.09	-0.13	-0.05	0.04	0.08	0.02
16 Masters	0.13	0.33	0	1	0.08	-0.09	-0.02	-0.11	-0.11	0.06	0.00	0.06	-0.06	0.01	0.00	0.03
17 PhD/JD	0.02	0.13	0	1	0.01	-0.01	-0.03	-0.02	-0.03	0.07	0.13	0.12	0.11	-0.04	-0.01	0.03
18 Eer Tenure < 1 year	0.25	0.43	0	1	-0.01	-0.02	0.04	-0.09	0.01	0.13	-0.2	-0.11	-0.16	0.35	-0.01	0.06
19 Eer Tenure: 1-2 yrs	0.23	0.42	0	1	-0.02	-0.01	0.04	-0.01	-0.02	0.06	-0.16	-0.13	-0.1	0.15	0.00	0.01
20 Eer Tenure: 3-5 yrs	0.17	0.38	0	1	0.07	-0.01	-0.03	0.02	-0.03	-0.05	-0.01	-0.07	0.07	-0.22	0.03	-0.01
21 Eer Tenure: 5-10 yrs	0.13	0.33	0	1	-0.01	0.04	0.00	0.08	0.06	-0.08	0.03	0.05	0.05	-0.11	0.02	-0.01
22 Eer Tenure: 10+ yrs	0.22	0.42	0	1	-0.02	0.00	-0.05	0.02	-0.01	-0.08	0.34	0.28	0.16	-0.23	-0.04	-0.04
23 Res Contr Specialist	0.25	0.43	0	1	0.03	0.04	0.02	0.08	0.03	-0.06	-0.01	-0.03	0.06	0.02	-0.01	-0.09
24 Res Contr Generalist	0.13	0.34	0	1	-0.06	-0.09	-0.12	-0.02	0.01	-0.03	0.00	-0.05	0.04	0.01	-0.03	-0.03
25 Utility	0.04	0.19	0	1	-0.04	-0.07	-0.01	-0.07	-0.01	-0.08	0.01	0.03	-0.07	-0.05	0.01	-0.07
26 Non-Profit	0.16	0.36	0	1	0.03	0.06	0.07	-0.04	-0.05	0.06	0.00	-0.05	-0.03	0.01	0.05	-0.04
27 Gov	0.09	0.29	0	1	-0.12	0.00	-0.02	-0.03	-0.01	0.00	-0.05	-0.05	-0.1	0.06	0.03	-0.08
28 Other For Profit	0.23	0.42	0	1	0.06	-0.01	0.01	0.03	0.06	0.04	0.04	0.19	0.08	-0.06	-0.08	0.25
29 University	0.09	0.29	0	1	0.02	0.03	0.04	0.00	-0.05	0.04	0.01	-0.05	-0.07	0.00	0.08	-0.02
30 Self Emp	0.01	0.1	0	1	0.03	-0.04	-0.02	-0.03	-0.04	0.01	-0.05	-0.04	-0.01	0.03	0.01	-0.01
31 Past SMO	0.11	0.31	0	1	0.06	0.04	0.05	0.03	0.01	0.13	-0.04	-0.02	-0.03	0.06	0.09	0.06
32 Current SMO	0.24	0.43	0	1	0.23	0.05	0.04	-0.08	-0.02	0.39	-0.04	-0.01	0.08	-0.03	0.07	0.06
33 No SMO	0.11	0.31	0	1	0.06	0.04	0.05	0.03	0.01	0.13	-0.04	-0.02	-0.03	0.06	0.09	0.06
34 # ees: < 5	0.36	0.48	0	1	0.07	0.00	0.00	-0.02	0.00	0.12	0.00	0.19	0.09	-0.02	0.00	0.35
35 # ees: 5-10	0.15	0.36	0	1	0.03	0.05	0.02	0.07	0.02	0.03	-0.07	-0.08	0.06	0.05	-0.03	-0.05
36 # ees: 11-50	0.26	0.44	0	1	-0.03	-0.04	-0.04	-0.02	0.01	-0.14	0.05	-0.1	-0.09	-0.04	-0.02	-0.16
37 # ees: 51-100	0.09	0.29	0	1	-0.01	0.05	0.02	-0.01	-0.02	-0.05	0.00	-0.05	-0.04	0.02	0.05	-0.1
38 # ees: 100-1000	0.12	0.33	0	1	-0.09	-0.03	0.03	-0.02	0.01	0.00	0.01	-0.02	-0.02	0.01	0.02	-0.12
39 # ees: 1001-	0.02	0.15	0	1	0.00	-0.03	-0.05	-0.01	-0.05	0.02	0.00	0.03	-0.03	-0.01	0.01	-0.07

Table 3: Descriptive Statistics and Correlations –Employed Home Energy Auditors Continued

	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
24 Res Contr Generalist	24															
25 Utility	1															
26 Non-Profit	-0.08	1														
27 Gov	-0.17	-0.08	1													
28 Other For Profit	-0.12	-0.06	-0.14	1												
29 University	-0.21	-0.11	-0.24	-0.17	1											
30 Self Emp	-0.12	-0.06	-0.14	-0.1	-0.17	1										
31 Past SMO	-0.04	-0.02	-0.04	-0.03	-0.06	-0.03	1									
32 Current SMO	0.03	0.03	-0.06	0.02	0	0.06	-0.04	1								
33 No SMO	-0.06	-0.04	0.08	-0.08	0.04	0.02	0.02	-0.2	1							
34 # ees: < 5	0.03	0.03	-0.06	0.02	0	0.06	-0.04	1	-0.2	1						
35 # ees: 5-10	-0.04	-0.13	-0.19	-0.21	0.57	-0.09	-0.03	0.04	0.06	0.04	1					
36 # ees: 11-50	0.09	-0.06	-0.07	-0.05	-0.11	-0.04	-0.04	0.01	0	0.01	-0.31	1				
37 # ees: 51-100	0.06	-0.06	0.00	0.16	-0.26	0.09	0.02	0.02	-0.05	0.02	-0.44	-0.25	1			
38 # ees: 100-1000	-0.03	0.04	0.07	0.07	-0.15	0.07	-0.03	-0.06	0.01	-0.06	-0.24	-0.13	-0.19	1		
39 # ees: 1001+	-0.08	0.19	0.28	0.1	-0.19	-0.01	0.03	-0.04	-0.02	-0.04	-0.28	-0.15	-0.22	-0.12	1	
	-0.04	0.26	0.04	0.00	-0.08	0.03	0.14	0.00	-0.02	0.00	-0.11	-0.06	-0.09	-0.05	-0.06	1

To test hypotheses 1a-1d, I ran a standard OLS regression model predicting the level of each kind of occupational commitment using robust standard errors to correct for any heteroskedasticity. I limited the analysis to individuals with complete data for all the variables. Each model was first run with the set of controls and then the environmentalism variable was entered to judge its affect on each particular type of occupational commitment. To further isolate the effect on a given type of occupational commitment I then controlled for the other types of occupational commitment which are moderately correlated with each other as expected. For those who are currently employed in residential energy retrofit work I then included the full set of organizational controls on top of the individual ones. Due to the large number of models I simplified the results by omitting the coefficients on the control variables to focus on the relationship between frame alignment with the different forms of occupational commitment.

As shown in Table 4, hypothesis 1a is supported across the models. Positive environmental attitudes are strongly associated with higher levels of normative commitment to the occupation of residential energy auditing ($p < .001$). This is true for individuals currently in the job and for those seeking to enter the occupation ($p < .001$). The relationship remains robust even after controlling for other forms of occupational commitment. It is also worth noting that there does not appear to be a significant difference in the levels of normative commitment between those that entered prior to the green job mobilization and those which entered during. This speaks to the overall heterogeneity of individuals entering the occupation for diverse motivations.

By contrast Hypothesis 1b is not supported. Higher levels of environmentalism show little relationship with affective commitment for individuals not currently employed in the occupation. For those who are employed in the emerging occupation alignment with the

Table 4 – OLS Regression for Normative and Affective Commitment Selected Results

Outcome Variable	Normative Commitment				
Employed	N	N	N	N	N
Individual Controls	Y	Y	Y	Y	Y
Organizational Controls	N	N	N	N	N
Entry During Green Mobilization		-0.0153	0.0122	0.0564	0.126
Env. Attitude			0.191***	0.159**	0.140**
Limited Alt Commitment				-0.160**	-0.100
Accumulated Cost Commitment				0.493***	0.383***
Affective Commitment					0.394***
Normative Commitment					
Constant	2.963***	2.975***	2.250***	1.328***	-0.159
Observations	202	202	202	202	202
R-squared	0.100	0.100	0.137	0.331	0.443
Log likelihood	-185.8	-185.8	-181.5	-155.8	-137.2

Outcome Variable	Affective Commitment				
Entry During Green Mobilization		-0.210	-0.202	-0.177	-0.201
Env. Attitude			0.0574	0.0470	-0.0205
Limited Alt Commitment				-0.152*	-0.0843
Accumulated Cost Commitment				0.279***	0.0688
Affective Commitment					
Normative Commitment					0.426***
Constant	4.237***	4.400***	4.183***	3.771***	3.206***
Observations	202	202	202	202	202
R-squared	0.105	0.113	0.117	0.190	0.326
Log likelihood	-173.4	-172.6	-172.1	-163.4	-144.9

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

**Table 4 – OLS Regression for Normative and Affective Commitment Selected Results
Continued**

Outcome Variable	Normative Commitment				
Employed	Y	Y	Y	Y	Y
Individual Controls	Y	Y	Y	Y	Y
Organizational Controls	Y	Y	Y	Y	Y
Entry During Green Mobilization		-0.0694	0.00649	-0.0509	-0.00543
Env. Attitude			0.357***	0.282***	0.215***
Limited Alt Commitment				-0.128**	-0.0670
Accumulated Cost Commitment				0.541***	0.431***
Affective Commitment					0.471***
Normative Commitment					
Constant	2.929***	2.988***	1.492***	0.823**	-0.628*
Observations	400	400	400	400	400
R-squared	0.126	0.127	0.210	0.424	0.521
Log likelihood	-455.1	-454.9	-434.9	-371.7	-334.7
Outcome Variable	Affective Commitment				
Entry During Green Mobilization		-0.0998	-0.0622	-0.0965	-0.0782
Env. Attitude			0.177***	0.144***	0.0426
Limited Alt Commitment				-0.129**	-0.0832*
Accumulated Cost Commitment				0.233***	0.0390
Affective Commitment					
Normative Commitment					0.359***
Constant	3.838***	3.923***	3.182***	3.080***	2.785***
Observations	400	400	400	400	400
R-squared	0.169	0.172	0.205	0.275	0.397
Log likelihood	-344.6	-344.0	-335.7	-317.4	-280.3

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

environmentalist frame is positively related to affective commitment, but the effect disappears when normative commitment is controlled for. The coefficient for the relationship between environmentalist attitudes and affective commitment drops roughly by two-thirds from above .15 to around .05

Hypothesis 1c and 1d are also supported. Across all the models only accumulated cost commitment is marginally positively associated with the environmental beliefs and this association disappears when affective and normative commitment are controlled for.

Now I turn to the second set of hypotheses regarding participation in the occupational community. Individuals in occupations must decide how active to be in the communities organized around the occupation. This choice is especially poignant for those involved in emerging occupations where the occupational community is less well established and its future prospects uncertain. For newer and emerging occupations struggling to carve out a niche within the division of labor it is crucial for its members to actively organize. Yet, it requires a more discretionary and proactive effort to do so.

To test the hypotheses related to participation I analyzed the data using tobit regression. The additive index of frequencies of involvement across six activities was left truncated with a significant portion of the sample reporting never participating in any of the 6 activities measured in the survey. Because the activities chosen were not exhaustive of the different ways in which an individual might participate in the occupational community and preferences discretionary and organized activities, it is less able to distinguish differences among low activity individuals. To address this issue I used standard left-censored tobit regression models designed to take into account such truncation in the data.¹⁰

¹⁰ Alternative specifications such as simple OLS regression and ordinal logit models provide similar substantive results.

Model 1 in Table 5 was restricted to individuals not currently employed in residential energy efficiency. It contains the demographic controls and includes the variable which distinguishes those who entered in the 2009-2010 period which included the passage of ARRA and heavy promotion of residential energy efficiency work as “green jobs”. The coefficient is strongly negative which I believe reflects in part the fact that new entrants into the industry begin with fewer connections and opportunities to participate in the occupational community. They need to build networks, get trained, and otherwise connect. Those who were in residential energy efficiency before this ramp-up period reported having been in residential energy efficiency for an average of 15 years. Next, I added the variable proxying frame alignment, the strength of an individual’s environmental attitude. It is positive and marginally significant at the .1 level. In model 3 I directly test Hypothesis 2a – that current involvement in an environmental social movement organization is positively associated with participation in occupational communities. It is highly statistically significant and indicates that individuals who participate in the community move up the index by 3 points. This is equivalent to either becoming somewhat active in 3 different activities or going from being inactive to being frequently active in at least one of the measured activities. Hypothesis 2a is similarly supported in the models restricted to individuals who are currently employed as residential energy auditors. Current membership in an environmental SMO is positive and significant across models 11-20.

Table 5: Tobit Regression Level of Participation in the Occupational Community

	1	2	3	4	5	6
	model	model	model	model	model	model
Demographics						
Female	1.581	1.132	0.943	1.103	1.421	1.637
Age	-0.0603	-0.0549	-0.0649	-0.0515	-0.0423	-0.0359
HS or less	-1.011	-0.320	-0.744	-0.862	-0.481	-0.553
BA	-1.315	-1.404	-1.425	-1.462	-0.804	-0.929
MA/MS/MBA	1.253	0.974	0.860	0.550	1.289	1.058
PhD	4.300	3.920	3.386	2.664	5.372	4.450
# of Certifications	0.797	0.601	0.666	0.498	0.473	0.419
Unemployed	1.508	1.423	1.347	1.450	1.119	1.252
Part Time						
Employer						
Res Contractor (General st)						
Utility						
Non-profit						
Government (WAP)						
For-profit (not residential contractor)						
CC/University						
Self-employed						
# ees: 5-10						
# ees: 11-50						
# ees: 51-100						
# ees: 100-1000						
# ees: 1001+						
Eer Tenure: 1-2 yrs						
Eer Tenure: 3-5 yrs						
Eer Tenure: 6-10 yrs						
Eer Tenure: 10+ yrs						
Job Quality						
Union						
Retirement Benefits						
Jcb Satisfact on						
Years Since First Entry n REE	-0.0962	-0.0944	-0.0818	-0.0917	-0.0915	-0.0998
Entry During Green Mobilization	-5.936***	-5.790***	-5.215***	-5.218***	-4.736***	-4.817***
Env. Attitude		1.139*	0.427	0.519	0.0770	0.159
Env. Attitude x Entry During GM						
Past Member of Env. SMO			-0.449	-0.601	-0.368	-0.411
Current Member of Env SMO			3.092**	3.009**	3.175***	3.091**
Accumulated Cost Commitment				0.936		-0.288
Limited Alt Commitment				-1.138		-0.572
Affective Commitment					2.325***	2.267***
Normative Commitment					1.087	1.233
Constant	13.23***	8.945**	10.90***	10.45**	-1.765	-0.167
Sigma	6.541***	6.493***	5.367***	6.317***	6.115***	6.097***
Observations	202	202	202	202	202	202
Log likelihood	-635.8	-634.5	-630.7	-629.2	-622.8	-622.2

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Tobit Regression Level of Participation in the Occupational Community Cont.

	7 model	8 model	9 model	10 model
Demographics				
Female	1.161	1.340	1.564	1.819
Age	-0.0680	-0.0546	-0.0456	-0.0391
HS or less	-0.642	-0.771	-0.418	-0.487
BA	-1.541	-1.606	-0.929	-1.070
MA/MS/MBA	0.909	0.584	1.310	1.080
PhD	3.098	2.403	5.031	4.002
# of Certifications	0.708	0.547	0.512	0.463
Unemployed	1.314	1.436	1.101	1.246
Part Time				
Employer				
Res Contractor (Generalist)				
Utility				
Non-profit				
Government (WAP)				
For-profit (not residential contractor)				
CC/University				
Self-employed				
# ees: 5-10				
# ees: 11-50				
# ees: 51-100				
# ees: 100-1000				
# ees: 1001+				
Eer Tenure: 1-2 yrs				
Eer Tenure: 3-5 yrs				
Eer Tenure: 5-10 yrs				
Eer Tenure: 10+ yrs				
Job Quality				
Union				
Retirement Benefits				
Job Satisfaction				
Years Since First Entry in REE	-0.0634	-0.0749	-0.0770	-0.0851
Entry During Green Mobilization	5.640	5.165	3.664	4.067
Env. Attitude	2.455**	2.477**	1.667	1.856
Env. Attitude x Entry During GM	-2.810**	-2.692**	-2.178*	-2.306*
Past Member of Env. SMO	-0.495	-0.629	-0.400	-0.442
Current Member of Env SMO	3.132**	3.039**	3.204***	3.115***
Accumulated Cost Commitment		0.744		-0.411
Limited Alt Commitment		-1.128		-0.582
Affective Commitment			2.251***	2.192***
Normative Commitment			0.997	1.190
Constant	3.003	3.369	-7.327	-5.872
Sigma	6.299***	6.255***	6.073***	6.049***
Observations	202	202	202	202
Log likelihood	-628.8	-627.5	-621.6	-620.9

Robust standard errors in parentheses:

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Tobit Regression Level of Participation in the Occupational Community Cont.

	11 model	12 model	13 Model	14 model	15 model
Demographics					
Female	2.870***	2.022**	1.794**	1.594*	1.367
Age	-0.0528**	-0.0378	-0.0371	-0.0288	-0.0429*
HS or less	-1.421	-1.208	-1.214	-1.281	-1.265
BA	-0.466	-0.466	-0.715	-0.533	-0.275
MA/MS/MBA	-0.162	-0.699	-0.994	-1.091	-0.148
PhD	-3.683***	-4.771***	-4.919***	-5.009***	-3.864***
# of Certifications	0.751***	0.718**	0.662**	0.587**	0.670**
Unemployed					
Part Time	0.0837	-0.360	-0.490	-0.373	-0.302
Employer					
Res Contractor (Generalist)	-1.159	-1.236	-1.110	-1.270	-0.604
Utility	-1.111	-0.908	-0.791	-0.722	-0.881
Non-profit	1.493	1.362	1.349	1.049	1.082
Government (WAP)	-0.788	-0.924	-0.749	-0.874	-0.895
For-profit (not residential contractor)	2.260**	2.204**	2.358**	2.199**	2.362**
CC/University	0.145	-0.342	-0.323	0.0318	-0.244
Self-employed	6.241*	4.944**	4.314*	4.687**	4.738**
# ees: 5-10	1.906*	2.158**	2.423**	2.383**	2.150**
# ees: 11-50	0.218	0.968	1.005	1.107	0.936
# ees: 51-100	0.224	0.501	0.514	0.410	0.480
# ees: 100-1000	-1.662	-1.084	-1.039	-0.900	-0.871
# ees: 1001+	2.939	3.836*	3.658*	3.966**	5.123***
Eer Tenure: 1-2 yrs	-1.219*	-1.037	-1.175	-1.466**	-1.259*
Eer Tenure: 3-5 yrs	0.520	1.203	0.889	0.475	0.888
Eer Tenure: 5-10 yrs	-0.561	0.706	0.723	0.276	0.522
Eer Tenure: 10+ yrs	-1.471	-0.319	-0.342	-0.647	-0.423
Job Quality					
Union	-2.063*	-2.631**	-2.530**	-2.417**	-1.611
Retirement Benefits	-0.307	-0.318	-0.170	-0.215	-0.207
Job Satisfaction	-0.319	-0.274	-0.328	-0.505	-0.570*
Years Since First Entry in REE	0.0598	0.0527	0.0557	0.0436	0.0545
Entry During Green Mobilization	-1.792**	-1.396*	-1.298*	-1.540**	-1.324*
Env. Attitude		2.168***	1.800***	1.645***	1.243***
Env. Attitude x Entry During GM					
Past Member of Env. SMO			0.348	0.0556	0.0755
Current Member of Env SMO			1.934***	2.068***	2.112***
Accumulated Cost Commitment				1.102***	
Limited Alt Commitment				-1.131***	
Affective Commitment					1.103**
Normative Commitment					1.052***
Constant	10.74***	1.546		3.428	-2.407
Sigma	5.389***	5.200***		5.070***	5.017***
Observations	400	400		400	400
Log likelihood	-1238	-1224		-1213	-1209

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Tobit Regression Level of Participation in the Occupational Community Cont.

	16 model	17 model	18 model	19 model	20 model
Demographics					
Female	1.332	1.777**	1.593*	1.355	1.329
Age	-0.0347	-0.0366	-0.0285	-0.0423*	-0.0345
HS or less	-1.286*	-1.251	-1.304	-1.300	-1.311*
BA	-0.305	-0.752	-0.572	-0.312	-0.343
MA/MS/MBA	-0.463	-0.747	-0.918	0.0691	-0.254
PhD	-4.266***	-4.793***	-4.929***	-3.760***	-4.159***
# of Certifications	0.597**	0.657**	0.584**	0.665**	0.594**
Unemployed					
Part Time	-0.215	-0.437	-0.337	-0.256	-0.173
Employer					
Res Contractor (Generalist)	-0.782	-1.169	-1.310	-0.663	-0.821
Utility	-0.901	-1.126	-0.971	-1.183	-1.179
Non-profit	0.989	1.354	1.068	1.088	1.011
Government (WAP)	-1.000	-0.665	-0.811	-0.816	-0.933
For-profit (not residential contractor)	2.280**	2.514**	2.321**	2.505**	2.420**
CC/University	-0.0815	-0.380	-0.0258	-0.297	-0.146
Self-employed	4.738**	3.965*	4.407**	4.414**	4.430**
# ees: 5-10	2.253**	2.550**	2.485**	2.269**	2.366**
# ees: 11-50	1.077	1.048	1.138	0.976	1.111
# ees: 51-100	0.453	0.637	0.505	0.594	0.560
# ees: 100-1000	-0.731	-0.925	-0.816	-0.765	-0.632
# ees: 1001+	5.091***	4.091*	4.263**	5.507***	5.436***
Eer Tenure: 1-2 yrs	-1.368*	-1.113	-1.407*	-1.202*	-1.298*
Eer Tenure: 3-5 yrs	0.679	1.039	0.601	1.022	0.824
Eer Tenure: 5-10 yrs	0.376	0.740	0.313	0.542	0.419
Eer Tenure: 10+ yrs	-0.604	-0.399	-0.680	-0.474	-0.642
Job Quality					
Union	-1.626	-2.438**	-2.352**	-1.532	-1.544
Retirement Benefits	-0.265	-0.171	-0.216	-0.209	-0.267
Job Satisfaction	-0.633**	-0.298	-0.475	-0.540*	-0.600**
Years Since First Entry in REE	0.0472	0.0560	0.0443	0.0548	0.0480
Entry During Green Mobilization	-1.458**	-5.771**	-4.815*	-5.416**	-5.153**
Env. Attitude	1.253***	1.196**	1.211**	0.696	0.755
Env. Attitude x Entry During GM		1.251*	0.918	1.144	1.036
Past Member of Env. SMO	0.0319	0.169	-0.0575	-0.0855	-0.0951
Current Member of Env SMO	2.141***	2.029***	2.130***	2.199***	2.212***
Accumulated Cost Commitment	0.380		1.040***		0.296
Limited Alt Commitment	-0.895**		-1.103***		-0.859**
Affective Commitment	1.022*			1.099**	1.024*
Normative Commitment	0.910**			1.037***	0.936**
Constant	-0.426	4.490	4.844	-0.666	1.144
Sigma	4.983***	5.137***	5.063***	5.004***	4.974***
Observations	400	400	400	400	400
Log likelihood	-1206	-1218	-1212	-1207	-1205

Robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Across all the models magnitude and statistical significance for the coefficient were stable when controlling for all forms of occupational commitment. Wald tests comparing the coefficient for current membership in Model 3 and Model 5 and then again in Model 13 and 15 confirmed they were not reduced even when normative and affective commitment were added to the model. This provides support to the arguments and findings by those such as Lounsbury as well as Weber and colleagues that social movement organizations provide a social lattice (and other resources) for creating and connecting individuals to the occupational community, above and beyond the fact that commitment to the cause is likely to be correlated with both SMO and occupational community participation. Adding further support to this interpretation is the fact that for individuals who belonged to an environmental social movement organization in the past, but do not currently do so, there is a much weaker and non-statically significant effect. Like for recycling coordinators and producers of grass-fed beef, SMO's appear to be playing an active role in connecting current and aspiring residential energy auditors to the emerging occupational community activities.

Hypothesis 2b posits that stronger alignment with green job frame applied to residential energy auditing, as measured by the strength of one's environmentalist beliefs, will lead people to higher levels of participation in the occupational community. Models 1-3 show that for those not currently employed as auditors, there is little evidence of a direct effect. Alignment was weakly positively associated with participation at the .1 level, but after controlling for their involvement in environmental SMOs there was no statistically-significant effect. However, Models 11, 12 and 13 revealed that for those who are currently employed as auditors, their alignment with the green job frame is robustly associated with higher levels of participation, even after controlling for current and past participation in environmental SMOs.

A final piece of supporting evidence for frame alignment as an important social psychological mechanism that can help explain SMOs impact on an occupation is whether the relationship between participation and alignment can be shown to be mediated by such things normative and affective commitment, feelings and beliefs, but unaffected by largely non-psychological commitment which may also drive participation. As with testing for a mediation effect in the relationship between SMO membership and participation I use a Wald test to compare whether the coefficient for the proxy for alignment with the green job frame is significantly reduced when normative and affective commitment are added to the model and whether it is unaffected when accumulated cost and limited alternative commitment are added. I restricted my analysis to employed auditors since it was only among this subset that alignment was significantly related to participation. While the coefficient for the direct effect on frame alignment on occupational community participation dropped by almost one third from 1.8 to 1.24 between model 13 and model 15, the difference was not statistically significant with a p-value of .16. Similar tests for the direct and interaction effects in models 7 and 9 and models 17 and 19 showed similar non-significant results. So while including measures of normative and affective commitment reduced the alignment-related coefficients, and did so more than entering the two forms of continuance commitment, the data did not support the hypothesis 2c.

The final hypothesis predicted a positive interaction effect between entering during the green job mobilization, alignment with the green job frame, and participation in the occupational community for the emerging occupation. The results show a stark difference between those employed as energy auditors and those seeking to enter the occupation. Among those who are employed as energy auditors there was marginal support for the hypothesis. Model 17 shows that the interaction effect was positive and significant at the .1 level. For the unemployed and

those employed outside of the residential energy efficiency, however, the interaction effect was significantly negative. The main effect remained positive, as did the coefficient for entry during the green job mobilization period, appearing to indicate that while the relationship between alignment with the green job frame and participation in the occupational community remained positive, it was less so for those who had entered recently.

Discussion

The underlying purpose of this chapter is to take a first step towards linking conceptually and empirically the activities of social movement organizations to the organization of new occupations within markets. Scholars of social movements have frequently lamented that conceptual development and theory have outstripped basic empirical study, especially studies which reach across levels of analysis from organizational action to individual belief and behaviors, leaving little guidance for its further development (Powell and Colyvas, 2008; Benford, 1997; Schneiberg and Lounsbury, 2008). This study provides basic multivariate evidence for the mechanism of frame alignment and social movement membership as distinct and independent drivers of participation in newly-emerging occupational communities. Taking the qualitative and quantitative evidence as a whole, the study validates the ability of SMOs to frame an occupation and imbue it with a specific meaning in the mind of individuals. The green job framing of residential energy auditing has helped bridge individuals into the occupation, bringing with them their values and beliefs. These individuals are more likely to display higher levels of normative occupational commitment to the occupation and to report higher levels of participation in the occupational community. The lack of a relationship between the strength of frame alignment and measures of continuance commitment indicate that belief and values linked

to the social-movement-propagated frames are having an effect not simply correlated with attributes leading to more generalized commitment. Qualitative evidence further supports the interpretation of these relationships and suggests that frame alignment is valid and useful in conceptually and empirically bridging levels of analysis. It also shows the possibility and importance of disentangling more structural effects that SMOs may have on occupational communities by directly connecting people to networks or resources and more diffuse framing effects as distinct measures for each of these mechanisms simultaneously explain variation in both commitment and community participation.

The findings also provide potential guidance in further developing the linkages between social movements and occupations. Past research which has approached social movements and emerging occupations, has tended to focus on the activists or occupational entrepreneurs related to social movements (Lounsbury and Kaghan, 2001). The interviews indicate that it is important to focus attention not only on activists aligned with social movement frames but also on their effect on those who may resist them (Kellogg, 2009). Systematically differential involvement in the cultural and institutional building activities within the occupational community can magnify or dampen the penetration of social movement norms, perspectives and influence on a new occupation. In this case, it appears that the occupational communities around residential energy auditing are more likely to incorporate environmentalist perspectives and goals than a simple look at the distribution of auditors' demographics and attitudes would suggest. It also suggests that a social movement's effort and success to specifically shape identity and normative meaning to an occupation is an important consideration in the depth and persistence of its influence in a market niche over time. This could help explain why some occupations remain aligned with the movements that help give them birth while others become decoupled more quickly.

Another question raised by this study is the need to distinguish between mechanisms based on social movements to effect who selects in to a new occupation and their ability to help transform the views of people once in the job. In this case the green job frame appears to be more adept at attracting individuals naturally aligned with its rhetoric and amplifying (rendering more salient) an individual's pre-existing values and beliefs rather than transforming an individual's values. In the qualitative data there is little indication that being involved in the green job of residential energy auditing is substantially transforming individuals' views to become significantly more "green". It is notable that in all the interviews of individuals no one told a narrative where involvement in the job led to a strong change in their environmental beliefs. However, because the quantitative data in the study is cross-sectional this cannot be definitively demonstrated across the larger sample. It is possible that both the relationship between stronger environmental attitudes and higher levels of normative commitment and more occupational community participation could be at least in part endogenous. Individuals who are naturally more likely to be normatively committed to the job might come to adopt environmentalist beliefs that have become tied to a job. Similarly, participation in the occupational community might lead individuals to justify their actions by transforming their beliefs. Stronger data are still needed to draw any definitive conclusions. Additionally, because the green job framing itself is of recent vintage it may be that more time is required for involvement in the occupation to affect the underlying values of individuals initially resistant to the frame. This process would be aided on the margin by increasing the critical mass of individuals in the occupation, especially active individuals, to whom they may be exposed to its rhetoric. However, this study would suggest that selection and homophily mechanisms might be more important when social movements are involved in early occupational dynamics.

If residential energy auditing is any guide, then many other occupations effectively tagged as “green jobs” could see similar dynamics. From solar panel installers and wind turbine maintenance workers to other potential emerging occupations in areas such as biofuel, organic farming, and corporate sustainability efforts, environmental activism might help shape the meaning and practices of these jobs to the extent that it is successful in systematically drawing in individuals aligned with environmentalist values and beliefs and increasing their commitment and participation in the communities.

Limitations and Future Research

The study does contain important limitations. First, it relies on cross-sectional data from a single survey. As discussed, this makes it impossible to identify the direction of causality among the different variables. While the qualitative data indicates that selection effects are a large part of the story as green individuals select into the occupation, the quantitative data cannot sort out to what extent the relationships are primarily due to selection affects, or identification processes. Future research could help more definitely sort out these effects and the different conditions in which they may vary. Looking directly at the variation in the density of individuals carrying the social movement’s diagnostic and prognostic frames over time would seem a fruitful path for future research as would following individuals longitudinally over time to investigate to what extent their attitudes and beliefs changed with exposure to the green job occupational rhetoric.

The cross-sectional nature also raises the questions whether these attitudes are transitory or longer lasting and can only speak to the ideals individuals held during the mobilization in 2011. Ideally, we would also like data on participation that went beyond self-reports to measurement of actual behavior over time. For example, the organization which certified the

individuals in this study requires certifications to be renewed every three years. Whether the frame alignment, commitment, and activity levels reported in the survey translate into something as concrete as certification renewal would be stronger evidence of the basic mechanisms claimed in the paper. Because the survey contained both the dependent and independent variable this study may also suffer from single-instrument bias which can inflate relationships between the variables artificially.

Secondly, while a significant set of controls were used there are a number of potential confounding factors which were not controlled for. The most important of these was the lack of a direct measure for the total amount of time individuals had worked in the field or as an energy auditor. While the year they first entered the field is a partial proxy it is not ideal. Additionally, it would have been nice to more directly measure an individual's alignment with competing frames for the job, for example, poverty reduction, energy independence, and consumer comfort. The study also was limited in its ability to gather data on psychological constructs that co-vary with occupational commitment. The inclusion of scales of organizational commitment, for example, might dampen the effects occupational commitment. Future studies could do a better job more directly comparing competing occupational value structures and other foci of commitment as a way to further inform the relationship between social movements, occupations and the organizational forms in which they reside.

References

- Abbott, A. 1988. The System of Professions: An Essay on the Division of Expert Labor. University of Chicago Press.
- Adler, P.S., K. Seok-Woo, H. Charles. 2008. Professional Work: The Emergence of Collaborative Community. Organization Science 19(2) 359-376.
- Allen, N.J., J.P. Meyer. 1990. The Measurement and Antecedents of Affective, Continuance and Normative Commitment to the Organization. Journal of Occupational Psychology 63.
- Barley, S.R. 1986. Technology as an Occasion for Structuring: Evidence from Observations of Ct Scanners and the Social Order of Radiology Departments. Administrative Science Quarterly 78-108.
- Barley, S.R. 2008. Coalface Institutionalism. Handbook of Organizational Institutionalism 491-518.
- Barley, S.R., P.S. Tolbert. 1991. Introduction: At the Intersection of Organizations and Occupations. S.R. Barley, P.S. Tolbert, eds. Research in the Sociology of Occupations. JAI Press, Greenwich, CT, 1-13.
- Barley, S.R., P.S. Tolbert. 1997. Institutionalization and Structuration: Studying the Links Between Action and Institution. Organization Studies 18(1) 93-117.
- Becker, H.S. 1960. Notes on the Concept of Commitment. American Journal of Sociology 66(1) 32-40.
- Becker, H.S., J.W. Carper. 1956. The Development of Identification with an Occupation. American Journal of Sociology 61(4) 289-298.
- Benford, R.D. 1997. An Insider's Critique of the Social Movement Framing Perspective. Sociological Inquiry 67(4) 409-430.
- Benford, R.D., D.A. Snow. 2000. Framing Processes and Social Movements: An Overview and Assessment. Annual Review of Sociology 26 611-639.
- Blau, G. 1994. Further Evidence for the Discriminant Validity of 4 Facets of Work Commitment- Occupation, Value, Organization, and Job. *Perceptual and Motor Skills* 79(3) 1617-1618.
- Blau, G. 2001. On Assessing the Construct Validity of Two Multidimensional Constructs: Occupational Commitment and Occupational Entrenchment. Human resource Management Review 11(3) 279-298.
- Blau, G. 2003. Testing for a Four-Dimensional Structure of Occupational Commitment. Journal of Occupational and Organizational Psychology 76(4) 469-488.
- Blau, G., E.B. Holladay. 2006. Testing the Discriminant Validity of a Four-Dimensional Occupational Commitment Measure. Journal of Occupational and Organizational Psychology 79 691-704.
- Blau, G.J. 1985. The Measurement and Prediction of Career Commitment. Journal of Occupational Psychology 58(4) 277-288.

- Blau, G.J. 1988. Further Exploring the Meaning and Measurement of Career Commitment. Journal of Vocational Behavior **32**(3) 284-297.
- Blumstein, C., B. Krieg, L. Schipper, C. York. 1980. Overcoming Social and Institutional Barriers to Energy-Conservation. Energy **5**(4) 355-371.
- Bucher, R., A. Strauss. 1961. Professions in Process. American Journal of Sociology **66**(4) 325-334.
- Carson, K.D., P.P. Carson, A.G. Bedeian. 1995. Development and Construct Validation of a Career Entrenchment Measure. Journal of Occupational and Organizational Psychology **68**(4) 301-320.
- Dierdorff, E.C., J.J. Norton, D.W. Drewes, C.M. Kroustalis, D. Rivkin, P. Lewis. 2009. Greening of the World of Work: Implications for O* Net for New and Emerging Occupations. Raleigh, NC: National Center for O*NET Development. Retrieved July 30 2009.
- DiMaggio, P.J. 1991. Constructing an Organizational Field as a Professional Project: Us Art Museum, 1920-140. P.J. DiMaggio, W.W. Powell, eds. The New Institutional Analysis. University of Chicago Press, 267-292.
- DiMaggio, P.J., W.W. Powell. 1983. The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. American Sociological Review **48**(2) 147-160.
- Fine, G.A. 1996. Justifying Work: Occupational Rhetorics as Resources in Restaurant Kitchens. Administrative Science Quarterly 90-115.
- Gerstl, J.E. 1961. Determinants of Occupational Community in High Status Occupations. Sociological Quarterly **2**(1) 37-48.
- Gimeno, J., T.B. Folta, A.C. Cooper, C.Y. Woo. 1997. Survival of the Fittest? Entrepreneurial Human Capital and the Persistence of Underperforming Firms. Administrative Science Quarterly **42**(4).
- Goldman, C., J. Peters, N. Albers, S. E, M. Fuller. 2010. Energy Efficiency Services Sector: Workforce Education and Training Needs. Lawrence Berkly National Laboratory. August, 2010.
- Green For All. 2009. Making the Dream Real. Green For All.
- Greenwood, R., R. Suddaby, C.R. Hinings. 2002. Theorizing Change: The Role of Professional Associations in the Transformation of Institutionalized Fields. Academy of Management Journal **45**(1) 58-80.
- Heffernan, P. 1976. Jobs for the Environment: The Coming of the Green Collar Revolution in Jobs and Prices in The West Coast Region. *Joint Economic Committee, Congress of the United States, Second Session*.
- Hiatt, S.R., W.D. Sine, P.S. Tolbert. 2009. From Pabst to Pepsi: The Deinstitutionalization of Social Practices and the Creation of Entrepreneurial Opportunities. Administrative Science Quarterly **54**(4) 635-667.
- Hirst, E., R. Marlay, D. Greene, R. Barnes. 1983. Recent Changes in United-States Energy-

- Consumption - What Happened and Why. Annual Review of Energy 8 193-245.
- Hughes, E.C. 1971. *The Sociological Eye: Selected Papers*. Aldine, Chicago.
- Jones, V. 2008. The Green Collar Economy: How One Solution Can Fix Our Two Biggest Problems. New York: HarperCollins Publishers.
- Kaufman, L. 2011. In Kansas, Climate Skeptics Embrace Green Energy *The New York Times*.
- Klein, H.J., T.E. Becker, J.P. Meyer. 2009. Commitment in Organizations: Accumulated Wisdom and New Directions. Routledge/Taylor and Francis.
- Krigger, J., C. Dorsi. 2004. Residential Energy: Cost Savings and Comfort for Existing Buildings. Saturn Resource Management, Inc.
- Lawrence, T.B., R. Suddaby. 2006. Institutions and Institutional Work. Handbook of Organization Studies 2 215-254.
- Lee, B., W. Sine. 2007. Constructing Entrepreneurial Opportunity: Environmental Movements and the Transformation of Regional Regulatory Regimes. Applied Evolutionary Economics and Economic Geography 93-120.
- Lee, K., J.J. Carswell, N.J. Allen. 2000. A Meta-Analytic Review of Occupational Commitment: Relations with Person-and Work-Related Variables. Journal of Applied Psychology 85(5) 799-811.
- London, M. 1983. Toward a Theory of Career Motivation. Academy of Management Review 8(4) 620-630.
- Lounsbury, M. 2001. Institutional Sources of Practice Variation: Staffing College and University Recycling Programs. Administrative Science Quarterly 46(1) 29-56.
- Lounsbury, M., E.T. Crumley. 2007. New Practice Creation: An Institutional Perspective on Innovation. Organization Studies 28(7) 993-1012.
- Lounsbury, M., W.N. Kaghan. 2001. Organizations, Occupations and the Structuration of Work. S.P. Vallas, ed. Research in the Sociology of Work, 25-50.
- Lounsbury, M., M. Ventresca, P.M. Hirsch. 2003. Social Movements, Field Frames and Industry Emergence: A Cultural–Political Perspective on Us Recycling. Socio-Economic Review 1 71-104.
- Mayer, B. 2009. Blue-Green Coalitions : Fighting for Safe Workplaces and Healthy Communities. ILR Press, Ithaca.
- McCarthy, J.D., M.N. Zald. 1977. Resource Mobilization and Social Movements: A Partial Theory. American Journal of Sociology 1212-1241.
- Meyer, J.P., N.J. Allen, C.A. Smith. 1993. Commitment to Organizations and Occupations: Extension and Test of a Three-Component Conceptualization. Journal of Applied Psychology 78(4) 538-551.
- Morton, F.M.S., J.M. Podolny. 2002. Love or Money? The Effects of Owner Motivation in the California Wine Industry. Journal of Industrial Economics 50(4) 431-456.
- Nelsen, B.J., S.R. Barley. 1997. For Love or Money? Commodification and the Construction of an Occupational Mandate. Administrative Science Quarterly 42(4) 619-653.
- Obach, B.K. 2004. Labor and the Environmental Movement: The Quest for Common Ground.

MIT Press.

- Powell, W.W., J.A. Colyvas. 2008. Microfoundations of Institutional Theory. The Handbook of Organizational Institutionalism 276-298.
- Rao, H., P. Monin, R. Durand. 2003. Institutional Change in Toque Ville: Nouvelle Cuisine as an Identity Movement in French Gastronomy. American Journal of Sociology 795-843.
- Ritzer, G., H.M. Trice. 1969. Empirical Study of Becker's Side-Bet Theory. Social Forces 47(4) 475-478.
- Schneiberg, M., M. Lounsbury. 2008. Social Movements and Institutional Analysis. The Handbook of Organizational Institutionalism 648-670.
- Scott, W.R. 2000. Institutional Change and Healthcare Organizations: From Professional Dominance to Managed Care. University of Chicago Press.
- Segerstrom, C. 2009. Thirty Years Later. Home Energy Magazine (May/June 2009).
- Sherman, R. 2010. "Time Is Our Commodity": Gender and the Struggle for Occupational Legitimacy among Personal Concierges. Work and Occupations 37(1) 81-81.
- Sine, W.D., B.H. Lee. 2009. Tilting at Windmills? The Environmental Movement and the Emergence of the U.S. Wind Energy Sector. Administrative Science Quarterly 54(1) 123-155.
- Snape, E., T. Redman. 2003. An Evaluation of a Three-Component Model of Occupational Commitment: Dimensionality and Consequences among United Kingdom Human Resource Management Specialists. Journal of Applied Psychology 88(1) 152-152.
- Snow, D.A., E.B. Rochford, Jr., S.K. Worden, R.D. Benford. 1986. Frame Alignment Processes, Micromobilization, and Movement Participation. American Sociological Review 51(4) 464-481.
- Strang, D., W. Sine. 2002. Interorganizational Institutions. J. Baum, ed. Blackwell Companion to Organizations. Blackwell Scientific Publications, London.
- Van Maanen, J., S.R. Barley. 1984. Occupational Communities: Culture and Control in Organizations. Research in Organizational Behavior 6(1) 287-365.
- Wallace, J.E. 1995. Organizational and Professional Commitment in Professional and Nonprofessional Organizations. Administrative Science Quarterly 40(2) 228-255.
- Weber, K., K.L. Heinze, M. DeSoucey. 2008. Forage for Thought: Mobilizing Codes in the Movement for Grass-Fed Meat and Dairy Products. Administrative Science Quarterly 53(3) 529-567.
- Weber, L. 1997. Some Reflections on Barriers to the Efficient Use of Energy. Energy Policy 25(10) 833-835.
- Wilensky, H.L. 1964. The Professionalization of Everyone. American Journal of Sociology 70(2) 137-158.
- Zald, M.N., M.A. Berger. 1978. Social Movements in Organizations: Coup D'etat, Insurgency, and Mass Movements. American Journal of Sociology 83(4) 823-861.

Chapter 5 - Signs of Spring: Conclusions and New Directions

The efforts to create a viable market for residential energy retrofits provide a clear case where persistent market failures have created an opportunity for social movement activism which has led to contested regulatory and industry intervention during periods in last four decades. When new political opportunities have arisen, social movement organizations and actors have pressed for governmental and industry supports in the form of incentives, mandates and programs. Within the context of these efforts was the struggle to develop a new expert occupation, residential energy auditor, composed of tasks central to this market activity, the diagnosis of individual home's potential for increased energy efficiency. In three different studies which range from a historical field analysis, to state-level longitudinal data on certification within the occupation and finally individual survey and interview data with a new crop of residential energy auditors, I have been able demonstrate a number of ways in which the activities of social movements ranging have impacted the development of the occupation. Drawing these links responds directly to calls among sociologically-oriented scholars of markets to specify and document specific mechanisms by which social movements can shape markets by bringing occupations and division of labor back under consideration as outcomes of social movement influences (Barley, 2008; King & Pearce, 2010; Powell & Colyvas, 2008; Schneiberg & Lounsbury, 2008).

The field analysis in chapter 2 demonstrates how deeply dependent the development of residential energy auditing as a distinct occupation has been on the environmental movement. Identifying three core processes in the early stages of occupational formation, creating new

knowledge and practices, task bundling and driving market demand to the occupation, I show specific links between social movement activities and the emergence of the occupation. From its technical origins in the labs of environmentally conscious scientists to its birth in practice and legislation shaped by environmental activists such as Amory Lovins and S. David Freeman, residential energy auditing has been connected to social movement organizations and actors. In this case, the occupation did not spring from local practitioners or as an offshoot from an existing trade, but it was invented whole cloth and institutionalized in such things as the Residential Conservation Services Act before there were more than a handful of individuals who could be identified as energy auditors. One of their most fundamental impacts was making residential energy auditing as a task a responsibility of utility companies, embedding energy conservation among organizations predicated on energy production. The reliance of the potential occupation on the power and influence of the environmental social movement was underscored by its struggles when environmentalists saw their efforts at remaking the utility industry to embrace energy conservation stall in the face of hostile political and market pressures. The bones of an occupational community were kept alive by environmentally minded activists from the original period until a new crop of social movement organizations, in the form of coalition between environmental and labor groups, were again successful in bringing residential energy efficiency back into public discourse not only creating general demand for the service but becoming integrally involved in defining, and institutionalizing the occupation through certification, training and legislative efforts.

This analysis provides a beginning of a complementary narrative to that found in the already scant literature on early occupational emergence which has tended to focus on the collective action and advocacy of individuals in a job to solidify an occupational mandate and

structure (Abbott, 1988; Anteby, 2010; Lounsbury, 2001; Lounsbury & Kaghan, 2001; Nelsen & Barley, 1997; Sherman, 2010). It also builds on work by scholars of social movements and markets by extending field analysis past organizational forms to the occupational structure which undergirds them (Lounsbury, Ventresca, & Hirsch, 2003; Powell et al., 2008). In continuing to develop this analysis I hope to draw these scholars attention to field level dynamics of the development new occupations as a core outcome of social movement activism within the market.

Chapter 3 compliments the broad historical view by examining more narrowly a key component of occupational development, the use of voluntary worker certification within the most recent period of resource mobilization within the industry. It is among only a handful of studies that consider voluntary worker certification specifically (Carter, 2005; Kleiner, 2006; Weeden, 2002). The major finding corroborates the field analysis of Chapter 2. State and utility support for residential energy efficiency remains key to the continued development of residential energy auditing and such support is more likely to be found where environmental movements are more culturally and politically salient. While direct social movement organizations activities to organize retrofit projects were not shown to have a direct effect on increases in voluntary worker certification after controlling for latent and institutional demand as hypothesized, states which showed more support for energy efficiency and in which utilities spent more on residential energy efficiency are seeing higher numbers of workers becoming certified in residential energy auditing tasks. Even controlling for these direct demand effects, states with more environmentally conscious residents and an electorate which supports environmental policies are seeing higher certification rates. This indicates, I believe, that in the next, post-ARRA phase of industry development, that residential energy retrofits and auditing as an occupation will become fragmented across these states based on their institutional and cultural characteristics as opposed

to the latent market demand represented by the housing stock, heating cooling needs and energy prices. Residential energy auditing as an occupation is more likely to grow and become institutionalized in “green” states, potentially reinforcing an occupational cultural and rhetoric which plays heavily on its potential impact to the environment. It is also in these states that I predict we are more likely to see voluntary worker certification lead to stronger forms of social closure such as licensing, with its attendant benefits for workers, as the concentration of certified workers grows (Kleiner, 2006; Weeden, 2002).

Chapter 4 represents the best opportunity for the most pointed and immediate contribution. It finds unique evidence of a strong link between an individual’s alignment with environmentalist goals and values with increased normative occupational commitment to the occupation. This normative commitment in turn is associated with higher levels of participation in the nascent occupational community activities critical to organizing the collective action on behalf of the occupation that is recognized as so critical in other occupational studies. Along with strategically sample interviews which help interpret the relationships found in the qualitative data this provides evidence of direct micro-level mechanism by which social movements, through framing an activity, can have an extended effect on the development of a nascent market, an area widely recognized as lacking in the scholarship on social movements and markets (Barley, 2008; King et al., 2010; Powell et al., 2008; Schneiberg et al., 2008). . Even as a broad cross-section of individuals entered the occupation due to the financial resources mobilized through ARRA and now maybe through state and utility programs, the occupational community committed to the hard work of professional advocacy is likely to be constituted of individuals aligned with its environmental goals. This will in effect help keep residential energy auditing a “green job” more than in name only.

There are two logical and primary extensions of the work in this dissertation. The first is in documenting the level of persistence in the influence of social movement activism on the occupation. The second is extending analysis to whether the social benefits of sustained job creation and job quality sought in the green job movement have been attained in whole or in part. Due to the emergent nature of the occupation and the finalization of the dissertation only a few months after the ARRA funding has been spent, time will be needed before it is possible to measure either of these outcomes. One of the strengths of this dissertation will be in setting the groundwork for ongoing collection of data which will be powerful in addressing these issues. I will briefly discuss my plans to address these topics in the future.

One of the limitations in studying an emerging occupation *in situ* is that there is no guarantee that the occupation itself or forces currently observed to be at play in the occupation will persist. One of the most natural and important extensions of the work in this dissertation is to continue to collect evidence on whether and how long the green job mobilization will continue to affect the industry and occupation. It is quite possible, for example, that now that the large influx of federal funding has run dry and as environmental advocacy and policy continue to be contested that a repeat of the collapse in the 1980s and 1990s is possible. Another possibility is that the surviving retrofit industry will be absorbed into the more traditional and less environmentally driven residential construction market. There is an open question about who will persist, the green entrepreneurs and workers attracted to the space when environmental social movement organizations made it symbolically salient or those with deeper backgrounds in the related fields who leveraging their skills to chase the resources mobilized with the help of these movements.

I have multiple concrete avenues to pursue this question. The field analysis can be extended through more interviews and documentation of the organizations related to the occupation in the post ARRA-period. This next period will provide a second instance where resources again will be on the decline to at least some extent. This will furnish this case with two periods of ascent and decline making for a more robust comparative longitudinal field analysis. Also, important is more fully developing the responses across all time periods of the potentially competing occupations, HVAC and insulation installers. Coding their trade journals and documenting their actions in relation to legislation and other field level events would help strengthen the overall argument.

In relation to Chapter 3, BPI, now as the selected vendor of the US Department of Labor, is launching in one month a series of completely new certifications for newly categorized jobs within the industry including weatherization installer, crew chief, energy auditor and quality control assessor. My continued relationship with BPI allows me to follow these new certifications from their launch. This includes the ability to connect to individuals' past certifications. Thus I can study who among those with building analyst certificates now seek more specific certification as an auditor. This will help me tie the analysis in chapter 2 more directly to the occupation of auditing. Additionally, there is the possibility of now extending the longitudinal certification model through 2011 giving me one more year post-ARRA as well as potentially clearing up the data issues which made a metropolitan-level model unworkable in the dissertation chapter.

Direct extensions to Chapter 4 include tracking the strength of the key measures and findings over time. I continue to collect survey information from a survey administered to every individual who sits a certification exam at BPI. I am close to having one full year of data under

this sampling scheme which opens the door to measuring relatively accurately changes the attributes and attitudes of whom is becoming certified in the industry. For example, I should be able to answer questions about whether individuals aligned with the environmental framing of the occupation enter at higher or lower rates now that the ARRA money has run out. Alternatively, I can test whether the patterns of occupational commitment and community participation fluctuate across different states and their institutional contexts. Finally, in 2013 the certifications of the individuals I survey in 2010 lapse. With BPI, I have the data necessary to know who becomes recertified giving me a clear and unique measure of persistence in investing in the occupation. Coupled with my previous data on occupational commitment this would give me a unique and powerful sample on which to test the relationship between social movement framing, occupational commitment using a behavior based measure of persistence not tied to the survey. This data would make more compelling analysis of the current hypotheses possible as well as allow for new tests concerning occupational persistence.

The second major opportunity lies in studying the second major social outcome explicitly sought by the green jobs movement – job creation and job quality. My dissertation has focused mostly on the environmental movement-related aspects of the green job movement. This was in part due to the lack of reliable and representative data on the number of jobs and the quality of these jobs. Since many of these jobs were created with stimulus money we are now only beginning to see how many of these jobs will be sustained in the absence of the direct federal funding. While large strides have been made toward structuring and institutionalizing potential markets for residential energy retrofits and the occupations it would support, it is unclear whether to what extent this will be sufficient to create good, sustainable jobs. Similarly, because

the job of energy auditing was so new there were no available data on the distribution of its wages or other job characteristics.

However, the anticipated data from the Bureau of Labor Statistics which has been attempting over the last year to collect nationally representative count and wage data for residential energy auditors as part of its emerging occupations and green jobs initiative should change this. I hope to combine the state and metropolitan-level market data and an expanded measure of local social movement activities that I gathered in chapter 2 with the BLS data to investigate its association with job creation and job quality. This will allow me to have a much better measure of the concentration of certified versus uncertified workers at either the state or metropolitan level, depending on the granularity of data available (Weeden, 2002). I can then examine such questions as whether the concentration of certification in an area leads to increased wages and whether activities of the social movement organizations in trying to spur the creation of retrofit jobs are being successful and under what conditions. I could also expand analysis into other job categories besides auditing.

References

- Abbott, A. 1988. The System of Professions: an Essay on the Division of Expert Labor: University of Chicago Press.
- Anteby, M. 2010. Markets, Morals, and Practices of Trade: Jurisdictional Disputes in the US Commerce in Cadavers. Administrative Science Quarterly, 55(4): 606-638.
- Barley, S. R. 2008. Coalface institutionalism. Handbook of organizational institutionalism: 491-518.
- Carter, S. D. 2005. The growth of supply and demand of occupational-based training and certification in the United States, 1990-2003, Vol. 16: 33-54: Wiley Online Library.
- King, B. G. & Pearce, N. A. 2010. The Contentiousness of Markets: Politics, Social Movements, and Institutional Change in Markets. Annual Review of Sociology, 36(1): 249-267.
- Kleiner, M. M. 2006. Licensing occupations : ensuring quality or restricting competition? Kalamazoo, Mich.: W.E. Upjohn Institute for Employment Research.
- Lounsbury, M. 2001. Institutional Sources of Practice Variation: Staffing College and University Recycling Programs. Administrative Science Quarterly, 46(1): 29-56.
- Lounsbury, M. & Kaghan, W. N. 2001. Organizations, occupations and the structuration of work. In S. P. Vallas (Ed.), Research in the Sociology of Work, Vol. 10: 25-50.
- Lounsbury, M., Ventresca, M., & Hirsch, P. M. 2003. Social movements, field frames and industry emergence: a cultural-political perspective on US recycling. Socio-Economic Review, 1: 71-104.
- Nelsen, B. J. & Barley, S. R. 1997. For Love or Money? Commodification and the Construction of an Occupational Mandate. Administrative Science Quarterly, 42(4): 619-653.
- Powell, W. & Colyvas, J. 2008. Microfoundations of institutional theory. In G. Royston & C. Oliver & K. Shalin & R. Suddaby (Eds.), The SAGE handbook of organizational insitutionalism. London, England: JAI Press.
- Schneiberg, M. & Lounsbury, M. 2008. Social movements and institutional analysis. The Handbook of Organizational Institutionalism: 648-670.
- Sherman, R. 2010. " Time Is Our Commodity": Gender and the Struggle for Occupational Legitimacy Among Personal Concierges. Work and Occupations, 37(1): 81-81.
- Weeden, Kim A. 2002. Why Do Some Occupations Pay More than Others? Social Closure and Earnings Inequality in the United States. American Journal of Sociology, 108(1): 55-101.