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# A Green Industrial Relations System for Construction: Challenges and Opportunities

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## Abstract

Forecasts about future employment in “green construction” imply sizeable growth in the next decade. If growth is even half of that forecasted for a sector like home weatherization, companies that provide services will need to operate at a far larger scale and sophistication than is typical today. This article uses data on existing wages and benefits and the costs of typical contractors in the industry and the business demands facing future contractors to speculate on what models of business organization might become dominant. Different models of business, in turn, will affect the employment and workplace conditions that will emerge over time.

## Are Green Jobs Good Jobs?

I’m calling on Congress to consider a new program to provide incentives for consumers who retrofit their homes to become energy-efficient, which we know creates jobs, saves money for families, and reduces pollution that threatens our environment. And I’m proposing that we expand select Recovery Act initiatives to promote energy efficiency and clean energy jobs which have been proven to be particularly popular and effective.

President Barack Obama, December 2009 <sup>1</sup>

For some time, the expectations for employment arising from green construction have been high. As President Obama’s recent comment indicates, green jobs in construction—and in general—are seen as a remedy for a wide variety of ills: they address the need for consumers of green services, they offer reduced energy costs at a time when consumers face the specter of rising prices. For business, they offer a new frontier of services—a vast, emerging market for new types of residential, business, and government services. For society, they offer the twin benefits from reducing dependence on carbon-laden energy sources that substantially contribute to global warming through conservation and providing greater energy independence for the US with a variety of positive economic and national security benefits. And, in a time of economic crisis, green jobs provide an important source of economic stimulus that works its way through the economy quickly.

In this short essay, I take a micro-view of this macro-level set of impacts by focusing on the challenges (or perhaps more aptly questions) that arise as green employment develops in the construction sector. Rather than speaking in generalities about “green employment” or even “green construction employment” I will paint on a small canvas: thinking about the factors driving employment and workplace conditions in the nascent area of residential weatherization—that is the sub-sector of green construction devoted to retrofitting existing residences to improve their energy efficiencies through insulation, changes in heating and cooling systems, improving window and door seals, etc.<sup>2</sup> I sketch out what we know about the labor and product markets that currently make up this sector. I then speculate on how the sector may evolve

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given the scale of expansion described by the Obama administration and many of those currently discussing improved residential energy efficiency. The business pathway of evolution has profound implications for the industrial relations system that will emerge over time. My hope is that the challenges and opportunities arising in this corner of the green construction universe reveal larger questions that will unfold and need to be answered as green employment expands.

## **Residential Weatherization Markets**

The home weatherization market was targeted as an important part of the American Recovery and Reinvestment Act of 2009 (ARRA) stimulus spending. About \$4.7 billion has been allocated to it under the 2009 Recovery Act and by the end of October 2009, a little more than half—about \$2.4 billion—had been awarded to states or US territories.<sup>3</sup>

Presumably, the stimulus spending today represents only the beginning of inflow into the sector—a mere jump-start for weatherization provided by the economic stimulus that will be matched and exceeded over time from investments by the private sector. At the moment, the money for weatherization work is small relative to spending for other categories of residential remodeling (see below). Long established US Department of Energy programs such as the Weatherization Assistance Program have functioned at a level that is a fraction of what would be required for making major inroads in enhancing residential energy efficiency.<sup>4</sup>

A study by McKinsey (which should be read with some caution) suggests that to “unlock energy efficiency in the US economy” in terms of retrofitting, will require huge growth in the scale of the sector. They note that currently there are about 200,000 retrofits in the US each year. If one hoped to capture what the McKinsey study deems “full efficiency potential” arising from retrofitting roughly 70 million homes where substantial improvements could be made over a 10-year period, the number of certified providers would need to increase on the order of 30 to 40 times the current number of certified contractors, that is, from an estimated 40,000 currently to 1.5 million by 2020 (Granade et al. 2009, pp. 38-39). As we discuss below, it is hard to imagine this kind of scale given the way that such markets are currently organized.

## **Employment Conditions in Home Weatherization**

Green employment in residential weatherization is only emerging now, and the characteristics of the labor market are not yet captured in an industry classification. Some studies have begun to look at what workers in green employment actually do, but these studies also seem to be capturing the characteristics of jobs that are evolving (e.g. Green 2009).

Because of the requirement under the ARRA that contractors using stimulus funds pay workers according to prevailing wages under the Davis Bacon Act, we do have preliminary estimates of wages and benefits in the industry based on wage surveys conducted by the Department of Labor’s Wage and Hour Division. Table 1 presents the results from a recent (July 2009) area wage surveys regarding weatherization-related contractors for California.<sup>5</sup>

In general, hourly rates for the three categories of weatherization work are well below that of rates for similar crafts in the residential construction sector.<sup>6</sup> For several of the largest counties in California—Sacramento, San Francisco, San Diego—the hourly rates for basic weatherization work and replacement installers are over 40% lower than for carpenters working in the residential sector in those counties. Similarly, hourly rates for workers doing HVAC-related retrofitting are significantly below the hourly rate for plumbers in the same region (e.g. 31% lower in Sacramento and 53% lower in San Diego). Hourly rates for weatherization categories are only slightly below comparable residential rates in Los Angeles County, and in several cases in the tables (and small counties not included here) there are even some inversions, where weatherization-related trades actually make more than comparable residential rates. Still, the overall picture seems to be one where hourly wages are significantly below those in residential construction, which in turn are well below wage rates in commercial, industrial, and heavy and highway construction.<sup>7</sup> Benefit levels—where present—also seem to be below those provided to comparable crafts in residential (which, once again, are usually considerably below those in other crafts).

TABLE 1  
California Residential Weatherization Wage Determination (selected counties)

Counties	Weatherization Survey <sup>a</sup> Hourly rate and fringe benefit rate where prevailing			Existing Residential Wage Determination <sup>b</sup> Hourly rate and fringe benefit rate where prevailing		
	Weatherization Worker	Doors & Windows Replacement Worker	HVAC Furnace, Heating & Cooling Repair, Installation Replacement Worker	Carpenter <sup>c</sup>	Electrician <sup>d</sup>	Plumber <sup>e</sup>
Alameda	\$15.35+.50	\$24.73+10.34	\$20.00+.38	\$36.50+21.40	\$29.87+11.95 +3%	\$45.96+ 24.90
Contra Costa	\$17.12+.68	\$22.77+3.65	\$27.00+.52	\$36.50+21.40	\$29.87+11.95 +3%	\$33.66+ 14.69
Fresno	\$17.72+1.33	\$17.72+1.33	\$16.45+1.29	\$21.24+7.20	\$18.00+2.00 +3%	\$34.25+ 18.43
Humboldt	\$11.31+4.06	\$11.31+4.06	\$20.00	\$19.08+6.915	\$18.80+5.53 +3%	\$16.47+ 9.45
Imperial	\$10.00+2.77	\$10.00+2.77	\$24.00	\$21.00+10.58	\$32.45+11.08 +3%	\$29.97+ 12.91
Kern	\$27.39+1.51	\$27.39+1.51	\$26.91+5.62	\$21.24+7.20	\$32.15+15.09 +3%	\$29.97+ 12.91
Lake	\$13.00+2.78	\$18.00+3.55	\$20.00	\$7.76	\$7.47	\$7.47
Los Angeles	\$19.00+3.96	\$19.17+3.90	\$28.00+.39	\$21.00+10.58	\$20.20+7.74 +3%	\$29.97+ 12.91
Marin	\$15.46+1.07	\$18.00+3.55	\$27.00+.52	\$34.75+21.40	\$34.01+11.95 +3%	\$40.80+ 22.60
Mariposa	\$11.77+4.33	\$14.94+4.11	\$26.91+5.62	\$29.27+20.96	\$22.10+9.24 +3%	\$27.35+ 6.85
Mendocino	\$13.00+2.78	\$18.00+3.55	\$20.00	\$7.76	\$7.47	\$7.47
Mono	\$11.18+.69	\$11.18+.69	\$17.93+1.54	\$13.00	\$12.67	\$10.00+ 1.25
Monterey	\$15.39+.50	\$12.50+2.34	\$27.00+.52	\$30.62+20.96	\$29.87+11.94 +3%	\$39.00+ 17.93
Orange	\$21.15+4.13	\$28.55+.87	\$28.00+3.99	\$21.00+10.58	\$19.00+7.26 +3%	\$29.97+ 12.91
Riverside	\$15.00	\$20.00	\$24.00	\$21.00+10.58	\$18.00+7.45 +3%	\$29.97+ 12.91
Sacramento	\$17.04+3.55	\$17.53+4.94	\$18.88+5.14	\$29.77+21.40	\$38.43+11.40 +3%	\$27.35+ 6.85
San Bernardino	\$23.28+3.37	\$23.42+3.30	\$21.28+3.30	\$21.00+10.58	\$19.00+7.26 +3%	\$29.97+ 12.91
San Diego	\$16.62+10.27	\$16.62+10.27	\$17.10+1.43	\$37.28+10.58	\$37.35+11.08 +3%	\$35.97+ 15.86
San Francisco	\$17.08+.93	\$21.90+2.60	\$27.00+.57	\$36.50+21.40	\$29.87+11.95 +3%	\$40.80+ 22.60

Santa Barbara	\$18.52	\$15.00	\$20.19	\$21.00+10.58	\$17.50+0.50 +3%*	\$29.97+ 12.91
Santa Clara	\$17.00+5.45	\$17.00+5.45	\$27.00+.57	\$36.50+21.40	\$29.87+11.95 +3%	\$30.90+ 7.90
Sierra	\$21.55+9.15	\$21.55+9.15	\$20.00	\$8.50	\$10.00	\$7.25
Ventura	\$25.00+6.44	\$25.00+6.44	\$20.19	\$21.00+10.58	\$33.55+13.25 +3%	\$29.97+ 12.91

*Source:* U.S. Wage and Hour Division, California Residential Weatherization Wage Determination, S2009-CA-001, Issued 12/11/2009; Exp. Date: 3/6/2010. Available at <http://www.dol.gov/whd/recovery/dbsurvey/weatherCA.htm>. a [From the Wage and Hour Division website]: The three classifications listed under the Weatherization Survey Wage Determination column are the classifications and rates determined to be prevailing for weatherization work and are based on wage data submitted in response to the weatherization survey. Weatherization work, as well as the specific duties that may be performed by these three classifications, is defined on this project decision. The wage and benefit rates are based on California WHD survey (S2009-CA-001). b [From the Wage and Hour Division website]: The classifications listed under the Existing Residential Wage Determination column are those classifications and rates currently published as prevailing on the residential general wage determinations. These wage determinations may be found at [www.wdol.gov](http://www.wdol.gov). The classifications and rates listed under the Existing Residential Wage Determination column may be used on weatherization projects only in those situations where the work is different than that described for the three classifications listed under the Weatherization Survey Column. For example, when an electrician is needed to perform electrical work not associated with the installation, repair, or overhaul of furnace or cooling equipment, then the existing electrician classification and rate listed under this column may be used for that work. c Excludes Door and Window Replacement, and work listed as performed by weatherization worker. d Excludes electrical work associated with HVAC installation, overhaul, and work listed as performed by weatherization worker. e Excludes work associated with HVAC installation repair or overhaul and work listed as performed by a weatherization worker.

The survey data in Table 1 only provide a partial and early view of workplace conditions in these emerging job categories—we know little of employment volatility, availability of training, health and safety conditions, compliance with labor standards, and the longevity of employment opportunities / pathways in the industry. Those will emerge over time and will be shaped by the business organization of the sector. So to forecast whether green employment will be good employment in this sector, we need to think about how that sector will organize itself over time.

## Current Industry Structure

What do we know about the business organization of the emerging green weatherization industry? As with the labor market, the outlines of the industry are unclear, but its basic contours can be best understood by looking at the residential remodeler industry since there is not a distinct NAICs category covering the sector.<sup>8</sup>

The residential remodeling sector is made up of a large number of very small contractors. Using published and unpublished data from the 2002 Census of Construction, researchers from the Harvard Joint Center for Housing Studies, estimate that there were a total of 530,200 businesses in the professional remodeling industry.<sup>9</sup> This total was composed of two main groups: 200,100 remodelers with payrolls and 330,100 self-employed contractors (that is contractors with no employees).<sup>10</sup>

While remodelers with employees made up less than 40 percent of the total number of establishments in the remodeling industry, they constitute the majority of all remodeling revenues. More than three-quarters of all self-employed contractors reported revenues of less than \$100,000. On the other hand, remodeling contractors with payroll are still for the most part very small contractors, with 58 percent reporting revenues below \$250,000 annually, and only 0.1% with annual receipts above \$5 million (Will and

Baker 2007). Most contractors with payroll employ a small number of workers—about 3.9 workers overall and only 2.4 construction workers per establishment.<sup>11</sup>

Table 2 presents the major elements of remodelers income statement, based on preliminary results from the 2007 Economic Census of Construction. As is true in other sectors of construction, the balance sheet is dominated by payroll (12 percent of expenses for construction payroll and 10% for non-construction payroll), payments to other firms for subcontracted work (29 percent) and materials and supplies (37 percent).<sup>12</sup> Although the category “cost of construction work subcontracted to others” (e.g. ventilation work subcontracted out by a general remodeler) includes labor, materials, and overhead costs, if one groups the categories of subcontracted work and payroll together, it shows that the majority of remodelers expenses are directly related to the costs of labor.

TABLE 2  
Residential Remodeling Income Statement, 2007 Economic Census

		Value (\$000s)	Percent of total
Revenues	Value of construction work on private projects (Federal, state, and local)	1,362,392	2.50%
	Value of construction work on public projects	53,431,523	97.50%
	TOTAL	54,793,915	100.00%
Expenses	Payroll non- construction	4,714,465	9.90%
	Payroll, construction	5,609,127	11.80%
	Materials components and supplies	17,752,882	37.30%
	Cost of construction work subcontracted to others	13,589,775	28.50%
	Fuels and energy	1,102,218	2.30%
	Rental (all)	561,460	1.20%
	Other expenses	4,306,437	9.00%
	TOTAL	47,636,364	100.00%
Labor-related expenses	Payroll, all types	10,323,592	21.70%
	Cost of construction work subcontracted to others	13,589,775	28.50%
	Payroll and sub work	23,913,367	50.20%

*Source:* U.S. Census Department, Preliminary Economic Census of Construction, Residential Remodelers, 2007. For information on confidentiality protection, sampling error, non-sampling error, and definitions, see Survey Methodology. Data in this file represent those available when this file was created; data may not be available for all NAICS industries or geographies. Data in this table may be subject to employment- and/or sales-size minimums that vary by industry.

As one might expect given the small scale of enterprises in the industry, the rate of business entry and exit is high. Will and Baker report that “Almost 13 percent of general remodelers identified in 2003 were no longer operating in 2004, while the entire construction sector had a failure rate of 11.0 percent and all U.S. businesses with payrolls had a failure rate of only 9.1 percent over the same time period” (p.22). Even further, the smallest contractors with payroll had a failure rate of almost 22 percent.

Finally, despite considerable growth in the sector during the housing boom, the industry remained remarkably unconcentrated. The top 4 firms (with payroll) in the general remodeling business accounted for just 1.5 percent of all revenues; the 20 only 3.3 percent. Even the top 50 combined constitute only 5.2 percent of all revenues for the sector (Will and Baker 2007, p.11).

The portrait of an industry composed of small, competitive, and volatile employers—with a large segment of contractors acting as independent contractors with no payroll—fits with the wage survey results in Table 1. Contractors operate in highly competitive markets with low barriers to entry and exit. Although some standard-setting efforts are present (including a system promulgated by the Department of Energy), there are no clear quality guidelines among consumers and judging the abilities of the contractor is difficult since they—like auto mechanics and heart surgeons—provide both the diagnosis and treatment for a problem. Hence, the small contractor trying to win weatherization work in a geographic area competes against a multitude of other small contractors, creating intense pressure to both lower price and shape consumer preferences. Since a remodeler's income statement is dominated by labor-related costs, pricing pressure quickly translates into pressure to reduce labor costs. This creates a steep product market gradient where contractor's set their workplace policies (Weil 2010).

## Future Organization of the Sector

The end users in the construction play a major role in shaping the industrial relations system that forms in the industry over time. For example, the industrial relations system in the major residential sector has been changing in recent years, in part because the sector is driven by large-scale homebuilders who have been increasing their market share in many metropolitan markets (Abernathy et al. 2009). Major homebuilders act as construction managers, directly employing few of the basic trades in residential construction, while coordinating all phases of development, construction, marketing, and sales. Their strategies of managing risk (arising from holding land, deciding when to move it into development phase to how many homes to build on a speculative versus pre-sold basis) ripple through to the many subcontractors who are responsible for building homes.

To forecast what might happen to the industrial relations system for “green contractors” in the weatherization / retrofitting industry requires speculating on what will shape the product market. It seems reasonable that as the industry emerges, its organization will require it to address several major factors:

*Find a solution to the imbalance in the timing of the costs and benefits of weatherization:* in particular that costs are born up front by the home owner but benefits accrue over time (in the form of energy savings). This will require a financial intermediation demanding a level of risk management capability and access to significant capital.

*Deal with the complexities of multi-sector funding:* Even after stimulus money is exhausted, it seems probable that financing in the industry will come from a combination of public / non-profit / and private sources. Currently the industry has very little experience with work from this sector. As Table 2 indicates, a tiny fraction (2.5 percent) of project work completed in 2007 came from the public sector—and the majority of that work (63 percent of the \$1.36 billion) was from state and local, not federal, sources. Administering the flows from public and non-profit sources will require enhanced administrative and managerial capacities.

*Operate under quality standards and regulations:* The potential for fraud is significant in this industry (have you heard the one about the vinyl siding salesman...?). Given the presence of public money, certification and standards will play probably an important role both for the regulation of the industry and for competitive success of players within the system.

*Serve a large, decentralized customer base with varying needs, resources, and homes of highly varied condition:* While each of the above factors would favor larger, more sophisticated players over time, the actual production process—what it takes to weatherize a home—does not lend itself easily to a cookie cutter approach. This makes gaining economies of scale more difficult.

*Find and deploy a skilled- or semi-skilled workforce:* Related to the above, the workforce required to provide varied services for weatherization (even putting aside the different skill and craft needs for heating / cooling work) requires a trained workforce with diverse skills.

If the sector grows at even a quarter of the rate described in the 2009 McKinsey report cited above, it is hard to imagine doing so given its current informal organizational structure given the competitive and production demands described above. One can imagine several different industry / business models emerging over time:

*Renovation redux:* Like the homebuilding sector, the remodeling sector experienced a boom in the first part of the 2000s, tracking the rise of big box retailers Home Depot and Loews. Over that time, larger remodeling contractors emerged in local markets, but the industry remained remarkably unconcentrated and is still dominated by small local players. This pathway seems most likely if the forecasts for exponential growth prove wrong and industry remains on its present, or slightly higher, growth path.

*Emergence of regional “all-in-one” players:* The factors shaping the industry push for greater sophistication by providers. One model would be for specialized contractors to gain traction and scale in the market and the emergence of larger, regional players capable of playing an “all-in-one” role in the industry. Alternatively, financial intermediaries—who may take the form of public, non-profit, or private capital—or energy companies are already playing an important role in moving weatherization efforts forward. These players could assume the role of providers, or perhaps as major investors behind regional players. If they are able to structure deals and undertake renovations more efficiently than the installed base of competitors, major regional players could emerge who directly employ the labor force.

*Weatherization construction managers (Home building redux):* An alternative to the above would be the residential construction model, where major players emerge who organize the market, but still subcontract work. On one hand, the employment statistics for this industry look similar to those in the renovation sector: the average number of workers per establishment in residential home building is 4.7.<sup>13</sup> However, this ratio masks the emergence of large scale homebuilders during the housing boom. A wave of consolidation began in the early 1990s that continued throughout the boom (and continues even during the present slump). Over this time, the share of new homes sold by the top ten builders in the country grew from under 10 percent in 1991 to almost 30 percent by 2006 (Apgar and Baker 2007). This figure understates the extent of consolidation given that a great deal of competition in the industry occurs in large metropolitan markets. By 2006, the Top 5 builders accounted for more than 35 percent of new homes built in metro areas like Denver (48%), Austin (46%), Sacramento (39%), and Las Vegas (38%).<sup>14</sup>

As a result, top 10 builders at the height of the housing boom (e.g. companies like Beazer and Pulte Homes) built more than 45,000 new homes a year. However, these builders acted almost entirely as construction managers, directly employing very few workers. While a typical division<sup>15</sup> of one of the major homebuilders built about 6900 new homes and employed about 50 construction managers / supervisors to oversee construction, it directly employed only an average of 12 carpenters, 3 plumbers, and 3 electricians on direct payroll (Abernathy et al 2008). Instead, it draws on a large number of contractors and subcontractors to undertake the work on building sites.

*McWeatherize: A Franchise Model.* A different way to think about the future path for the sector is to take a “business opportunity” perspective: How could a player make major inroads into this market with its complexities, need for quality assurances and capture to the extent possible scale and scope economies—while not having to deal directly with employment? Franchising could provide an answer: By establishing a recognizable “brand” built around reputation and / or association with a particular certification procedure could both surmount problems on the consumer demand side and make buying franchises attractive to prospective contractors. The franchised company could establish standards of performance; provide a funnel for making deals with third party finance and quality standards and the government; while avoiding the need to directly employ the labor force (which would become the task of franchisees).

## **Green Employment: Future Choices**

Like other segments of construction, it would be reasonable to assume that one of the industry pathways will co-evolve with the development of contractors and their associations and with how the workforce is organized to undertake weatherization work on the ground. This means that the different players that will emerge under one of the scenarios sketched above will set policies regarding who funds and provides training; how career paths are handled; the organization of work itself including the provision of health and safety practices. The involvement of the Building and Construction Trades Council nationally and regionally and of many of the leading building trades unions in early experiments reflects awareness of the potential for affecting this co-evolution of business models and industrial relations system practices. But labor unions, community groups, and the public sector are not alone in that awareness.

Over the past few decades, the nonunion sector in many parts of construction has evolved its own forms of training, advancement, and practices. Increasingly, non-union industrial relations systems have taken their own distinctive form and characteristics, particularly where there has been little history of a union sector (Iskander, Lowe, and Riordan 2009; Iskander, Hagen, and Lowe 2009). It would be analytically naïve to assume that the kind of sophistication demanded by an emergent green sector of construction employment along the lines described above would give an inherent advantage to the established unionized industrial relations system.

The industrial relations systems in private markets for construction will be shaped by the new networks that will form between end users, project managers, and subcontractors along lines that no longer include significant players of the traditional system. Gaining a clear understanding of the nature of those emerging networks is essential to understanding who will be bidding, winning, and setting conditions of work on construction sites.

One dominant trend from other sectors of construction—and trends in the workplace in many other sectors—is that employers will seek to “fissure” the employment relationship, separating the creation of profit margins from the actual undertaking of work at the construction sites. From fast food to hotels to logistics to construction, employment relations have been fissured in this way between players at the top of value chains who in turn contract to a complex network of smaller employers (Weil 2010). These lower level employers typically operate in more competitive markets and therefore operate on steeper gradients. Hence, the small contractor trying to win weatherization work in a small geographic area competes against a multitude of other small contractors, creating intense pressure to lower costs, particularly the one that most dominates its income statement and it is most able to control: labor. On the other hand, the parties that set many of the conditions of competition—for example home builders or major fast food franchisors—operate in an environment that affords it more options with which to pursue profitability.

If this plays out in green construction, workplace conditions may have many of the problems associated with employment in the residential construction sector, including high levels of safety and health problems, violation of labor standards, and misclassification of workers (Bernhardt et al. 2009). On the other hand, if key parties understand the forces that will shape the sector upfront and consciously try to shape the industrial relations system as it coevolves with emerging business models, the future of green employment could take a very different pathway and provide some of the “win-win” gains touted by advocates not only for business, consumers, and the public but also for the people who undertake the work.

## Author’s Note

This is a preliminary draft of this paper, revised January 30; 2010; comments, suggestions, and murmuring welcome.

## Notes

<sup>1</sup> Speech at the Brookings Institution, Washington, DC, December 8, 2009.

<sup>2</sup> And I will paint on an even smaller canvas than that, focusing on single-family residential weatherization. Multi-unit residences (in particular apartments, condominiums and other high-rise residences) tend to have characteristics more closely associated with commercial rather than residential construction, including the type of construction methods and the types of construction contractors who undertake the work. The U.S. Department of Labor, Wage and Hour Division has recognized this distinction in making wage determinations as required by the Davis-Bacon Act (prevailing wage legislation for public construction). Accordingly, wage rates residential structures that are five stories or more are subject to “building construction” rates rather than the newly established residential weatherization wage rates.

<sup>3</sup> U.S. Department of Energy, Weatherization Assistance Program: Recover Act Funding to the States, ([http://apps1.eere.energy.gov/weatherization/recovery\\_act\\_awards.cfm](http://apps1.eere.energy.gov/weatherization/recovery_act_awards.cfm), accessed December 15, 2009).

<sup>4</sup> The Weatherization Assistance Program (WAP) was created in 1976 to assist low-income families who lacked resources to invest in energy efficiency. It has funded weatherization efforts in all 50 states and assisted a reported 6.2 million homes since 1976. In 2008 (prior to the stimulus effort), it estimated 100,000 homes will be weatherized with DOE funds. See <http://www.waptac.org/sp.asp?mc=what>.

<sup>5</sup> Wage and benefit survey estimates for weatherization work were released by the Wage and Hour Division in mid-December 2009 and are available at <http://www.dol.gov/whd/recovery/dbsurvey/>.

<sup>6</sup> The definition of “weatherization” craft is also in a state of flux and varies across the states surveyed.

<sup>7</sup> A review of wage rates in Massachusetts and New York show similar trends. It is not possible to estimate an average comparison for the state as a whole from this data because of the absence of employment estimates for these sectors.

<sup>8</sup> Residential Remodelers represent a unique industry group in the 2007 NAICS industry codes (236118). This industry comprises establishments primarily responsible for the remodeling construction (including additions, alterations, reconstruction, maintenance, and repair work) of houses and other residential buildings, single-family, and multifamily. Included in this industry are remodeling general contractors, operative remodelers, remodeling design-build firms, and remodeling project construction management firms. There are other industries that serve as subcontractors to this sector—such as weather stripping installation (NAICS 238390), but they also do not completely align with this emerging sector.

<sup>9</sup> The study defines professional remodelers as general and special trade construction businesses earning more than 50 percent of receipts that year from remodeling activities (including maintenance and repair). See Will and Baker 2007, p. 3.

<sup>10</sup> Remodeling contractors with payroll were made up of 82,900 general remodeling contractors and 117,200 specialty trade contractors (contractors providing specific types of construction services in the remodeling business such as plumbing, electrical work, heating and ventilation, painting, finish carpentry, and roofing). Self-employed contractors were made up of 127,200 general remodelers and 202,900 self-employed special trade contractors (Will and Baker, p.4).

<sup>11</sup> Calculated from figures in “Construction: Industry Series: Preliminary Detailed Statistics for Establishments: 2007” (EC072311: NAICS 236118).

<sup>12</sup> The Census figures only pertain to businesses with payroll and not to the large number of businesses where contractors are self-employed.

<sup>13</sup> This estimate is based on 2002 Census of Construction figures for New Single-Family Housing Construction (NAICS 236115). This U.S. industry comprises general contractor establishments primarily responsible for the entire construction of new single-family housing, such as single-family detached houses and town houses or row houses.

<sup>14</sup> Estimates from Hanley Wood Market Intelligence 2008.

<sup>15</sup> Most national homebuilders are organized around geographic divisions. A division is typically be restricted to a single metropolitan region. Homebuilders’ divisions are responsible for all the steps of home building beginning with obtaining permits from the local government to building specific homes on given plots of land.

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