UNION COVERAGE AND WORK-RELATED TRAINING IN THE CONSTRUCTION INDUSTRY

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Using data from the Survey of Income and Program Participation, the author estimates the impact of union coverage on training in the United States, comparing the construction industry with other broad industry sectors. The author finds no statistically significant union training effect in construction or other private-sector industries for employer-paid training. For a more broadly defined job-training measure, however, a large union effect is found in construction, and a smaller, yet statistically significant, effect is found in other private-sector industries. The results are not entirely consistent with either the standard human capital model or models of imperfect competition.

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Because job-related training plays a vital role in the development of an advanced economy's human capital stock, analysts and policymakers need a clear understanding of factors that determine the incidence of training. One such factor that has received attention in the literature is trade union activity. Theoretical arguments and empirical research have arrived at contradictory conclusions about the union training effect, which suggests that additional research may prove useful in clarifying its nature. In the present study, I focus on the impact of trade union coverage on the incidence of job-related training in the United States, with emphasis on addressing disparities in training experience among construction workers in union and nonunion settings, and comparing training experience in construction with that in the labor market more generally.

Although job training plays an important role in building the human capital stock across the industry structure, it is particularly important in construction, which faces unique challenges in producing and maintaining a skilled workforce. The organization of work in construction is typically characterized by smaller firms bidding for projects of relatively short duration. Firms require workers with high levels of general skills that can most efficiently be produced through training, a large component of which occurs

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on the job. One of the institutional responses to this organization of work, at least in the unionized sector, has been to form joint union-employer apprenticeship programs (Bilginsoy 2003). In essence, trade unions and employers coordinate to produce and maintain a pool of highly skilled and flexible workers who are available to the signatory contractors who happen to win work in a competitive bidding process. Given the organization of work and turbulent nature of labor demand from the perspective of an individual firm, any given employer would probably not find it economically feasible to invest in the skills of workers who may be employed by their competitors in the near future, when their current project ends. Moreover, history has demonstrated that competing contractors in nonunion settings have generally found it difficult to cooperate in establishing unilateral employer-sponsored training programs that rival the effectiveness of joint programs (Bilginsoy 2003).[1]

Although the present study is primarily empirical, it is informed by a well-developed theoretical literature. In this article, I first outline the approach of standard human capital theory (e.g., Becker 1962), which generally argues that union wage policies reduce firms' incentives to invest in job training, and compare this to newer models that take into account imperfect competition in markets and predict that union coverage can increase incentives for firms to invest in training (e.g., Acemoglu 1997; Booth and Chatterji 1998; Acemoglu and Pischke 1999). Then, after the theoretical approaches are applied to the construction labor market, I outline a number of hypotheses I address in the empirical section.

The empirical portion of the study addresses the union training effect using data from the Survey of Income and Program Participation (SIPP). Gathered and compiled by the U.S. Census Bureau, the SIPP is a multipanel data set that contains a wide array of variables related to government program participation. The SIPP is particularly useful for this study because it is the primary nationally representative U.S. data set that consistently observes job-training experience and is sufficiently large to provide samples of reasonable size even when the data are disaggregated by industry category and union coverage.

After describing the incidence of training in construction and other industries, I estimate several multivariate models of the incidence of job training, which yields results on the impact of trade union coverage while holding constant other factors that may affect training behavior. The empirical results indicate that, although the incidence of training in construction is low compared with that of other industries, union coverage significantly increases the likelihood that nonmanagerial construction workers reported they engaged in training in the previous year. A qualitatively similar positive

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[1]Other training not directly related to apprenticeships also provides an avenue for construction workers to update their skills and acquire additional qualifications. For example, some states require ongoing training in the form of continuing education credits in substantive skills to renew journeyman licenses. Such training is also captured in the empirical analysis.

union effect is observed among workers in private-sector industries outside the construction sector, although the magnitude is much smaller and is mostly attributable to a strong union training effect in education and public administration.

The results also have implications for theory. The lack of a negative union effect on the incidence of employer-paid training in the private sector calls into question Becker's notions of training, whereas the lack of a positive union effect in many industries composed of mostly private-sector employers is inconsistent with models of imperfect competition. Another important implication of the findings is that the union training effect varies significantly across industries, which suggests that the usefulness of broad interindustry estimates of the union training effect may be limited.

Literature Review: Union Coverage and Job Training

Previous studies have outlined a number of approaches to understanding the relationship between union coverage and firm-sponsored training.[2] Clear theoretical predictions about the incidence of training emerge from the standard human capital model, based on otherwise competitive labor markets. The theory suggests that firms will be reluctant to invest in general or transferable skills because of training externalities that make it difficult to obtain a return on such investments (Becker 1962).[3] The problem emerges when an incumbent firm provides general training to workers, who then take their newly acquired skills to a competing firm if their post-training wages at the incumbent firm are not commensurate with productivity. Without a wedge between post-training wages and productivity, the firm does not earn a return on its training investment, and according to the logic of the theory, competitive market forces ensure that no such wedge is possible.

One way to make employer-provided general training economically feasible is for firms to pass the costs on to trainees through low wages that are commensurate with their low productivity during training. To the extent that unions install a floor on wages early in the employment relationship, liquidity-constrained workers are precluded from paying for their training

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[2]See also Booth, Francesconi, and Zoega (2003), who provided a useful review of how theoretical differences in the link between unionism and training lead to variation in empirical expectations.

[3]The literature distinguishes between general/transferable training (training in skills that are useful in other workplaces) and firm-specific training (training in skills not useful elsewhere). Although no variable sheds light on this distinction in the SIPP data, Booth and Bryan (2005) found that 85% of respondents to the British Household Panel Survey who reported receiving training indicated that their training imparted skills that were transferable to other firms. Similarly, Loewenstein and Spletzer (1999) found that 89% of National Longitudinal Survey of Youth (NLSY) respondents believed that more than half the skills they acquired during training would be useful at other firms. Booth and Katic (2011) and Waddoups (2012) found similarly large percentages among workers in Australia. Thus, it is reasonable to assume that a large majority of the skills in question in the present study are, in some sense, general or transferable to other employers. Although the literature also distinguishes between general training and transferable training (e.g., Stevens 1994), I combine the two categories in the present study.

by taking lower wages during the training period. The combination of liquidity-constrained workers and institutional barriers preventing wages from falling reduces the likelihood that firms will find it economically feasible to provide general training. Thus the theory suggests that wage distortions arising from union bargaining reduce firms' ability to internalize externalities and thereby diminish their incentives to train workers, which is predicted to result in less training in the union than in the nonunion sector.

Consistent with standard human capital theory, Mincer (1993), using the 1976–79 Panel Survey of Income Dynamics (PSID) data, found a negative correlation between unionism and the length of time for workers to become fully trained. Although the training question in the PSID data did not ask directly about participation in training programs, the longer time period to become fully qualified suggests that more training occurred in the nonunion sector. More recent research used individual-level cross-sectional data from the Canadian Adult Education and Training Survey from 1997 to detect a small negative union training effect, which is also consistent with predictions of the human capital approach (Green and Lemieux 2007). Along similar lines, weaker evidence pointing to less training in unionized settings was reported by Barron, Black, and Loewenstein (1987). They used employer-level data from the Employment Opportunity Pilot Project (EOPP), sponsored by the U.S. Department of Labor, on the last person hired and found a negative, although statistically insignificant, coefficient on the union variable in a training-incidence equation. Note, however, that the EOPP data focused only on training early in the employment relationship.

Training with Imperfect Competition

The theoretical model based on a perfectly competitive labor market predicts that 1) although firms may provide general training they will not pay for it and 2) market distortions introduced by collective bargaining will reduce the likelihood that employer-sponsored general training will occur. A problem with the model is that empirical evidence suggests that firms actually do provide and pay for general training. In response, a number of researchers have developed models that relax assumptions about perfectly competitive labor markets to explain why firms might invest in such skills (e.g., Acemoglu 1997; Booth and Chatterji 1998; Acemoglu and Pischke 1999; Booth, Francesconi, and Zoega 2002).

For example, Booth and Chatterji (1998) modeled the training decision as one in which unions at the enterprise level raise the bargaining power of trained workers, which reduces the firms' post-training oligopsonistic power and thereby increases wages. Because firms have oligopsony power, a wedge still appears between post-training wages and productivity, which theoretically must be present for firms to provide general skills training. The firms' return on the training investment, however, depends not only on the size of the wedge but on the length of job tenure after training. Union bargaining

in this model yields higher post-training wages (reduces the size of the wedge) but, by reducing quits, also implies longer worker tenure and thus a potentially larger return on the training investment. Union bargaining, by allowing firms to internalize training externalities through a reduction in quits, is thus predicted to result in higher equilibrium levels of training than would be expected in a nonunion setting (Booth, Francesconi, and Zoega 2003). The theoretical prediction here is that union bargaining leads to re-duced quits (longer job tenure), which paves the way for firms to invest in training.

Similarly, potential investment loss because of quits plays a role when union bargaining over training is conducted at an industry-wide level. In this model, the role of unions in coordinating the training activities of mul-tiple employers within an industry is emphasized. Left on their own without pressure from an industry-wide union, individual firms in an industry are predicted to provide less training than would otherwise be the case. Firms provide less training because of poaching externalities, in which the train-ing firm risks suffering a loss on its training investments if workers quit, fully trained, and become employed with a competitor. To the extent that an industry-wide union coordinates the actions of employers with common standards for training and wages across firms, however, the risk of such losses is reduced (Booth et al. 2002). This reduced risk occurs because the training firm's competitors are also covered by the union contract and are thus obligated to pay wages at the same level and conduct training at the same intensity. Union bargaining in this model acts as a mechanism to coor-dinate the training activities of competitors. Without bargaining as a coordi-nation mechanism, the system is predicted to devolve toward a low-skill growth path with small amounts of training, whereas with union bargaining and the accompanying coordination, the system is predicted to produce a high-skill, training-intensive growth path (Rodríguez-Clare 2005).

Acemoglu (1997) proposed another model of imperfect competition that is relevant to understanding the relationship between union bargain-ing and training. Instead of focusing on the behavior of firms, however, the model is cast in terms of workers' incentives to engage in training. In non-frictional labor markets, workers invest in training because market forces set in motion by mobility, or potential mobility, between firms guarantee wages consistent with an appropriate return on investment. In the presence of fric-tions, however, workers will be reluctant to invest in training because some of the returns may be captured by the firm because wages do not rise to the level of marginal product. An interesting aspect of Acemoglu's (ibid.: 451) model is that some, but not all, of the training externality can be internal-ized by establishing a contractual arrangement between the training worker and current employer. The remaining returns arising from the externality, however, accrue to future, and as yet unknown, employers. Because the identities of a worker's future employers are impossible to ascertain, a con-tract to internalize the training externality produced by frictions cannot be written. Such circumstances can also lead to a low-training, low-skill growth

equilibrium. Although the model is widely generalizable across industries, sectors such as construction (i.e., with short contracts and high skill requirements) would appear to be particularly vulnerable to this type of market imperfection. To the extent that union bargaining coordinates the wages and training activities of multiple firms in the market, however, the problem of identifying future employers and writing relevant contracts should be mitigated and thus provide employees with more incentive to invest in training.

The models of imperfect competition are consistent with the notion that union bargaining solves coordination problems that would otherwise reduce the likelihood of training. Thus, they predict a positive union training effect. Consistent with the theoretical literature on training and imperfect competition, empirical studies using data from the United Kingdom generally find a positive correlation between union coverage and training. For example in earlier work, Booth (1991) found that both male and female workers covered by unions were more likely to have participated in a training course during the previous two years, starting in 1987. Later, using the British Household Panel Survey (BHPS), Booth et al. (2003) reached a similar conclusion, finding that union-covered workers were approximately 9% more likely to receive training than their noncovered counterparts. The estimate of the union training effect fell to a little more than 5% but remained statistically significant after unobserved heterogeneity was controlled for using panel data methods.

A number of empirical studies based on data from the United States also found a positive impact of union coverage on the probability of training. Lynch (1992) reported a positive impact when estimating incidence equations in the National Longitudinal Survey of Youth (NLSY), but because only training periods lasting longer than a month were observed, many shorter training periods were likely to have been missed. Veum (1995) continued the research using later waves of the NLSY that observed all training periods, regardless of duration, and still found a positive correlation between union coverage and the incidence of training. A potential drawback in using the NLSY, however, is that the age cohort limits the generalizability of the study; the respondents were 21–29 in 1986 and 25–33 in 1990. In other research, Osterman (1995) used establishment-level data, which were randomly drawn from U.S. establishments, to observe training among nonmanagerial, nonsupervisory employees; he reported a positive relationship between training and union presence in the establishment. Finally, Waddoups (2012) found that Australian workers who reported union membership were roughly 7.5 percentage points more likely to report structured job-related training than were their nonunion counterparts.[4]

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[4]Interestingly, the probability that an Australian worker engaged in a structured job-related training course during the previous year was approximately 56% in 2005, which is substantially higher than the findings in the present study. Determining whether the disparity in training incidence originates from variations in how training is defined or represents real differences in training investments is an interesting avenue for further research.

Training as a Component of the Compensation Package

Another way to explain why union bargaining may lead to more training is to think about it not as an investment by the firm but as another component of the compensation package. The assumption is that trained workers whose skills remain current have more job security and perhaps higher wages than their untrained counterparts (Booth et al. 2003; Booth and Bryan 2005). Thus, if a surplus exists, unions may bargain for more training to be paid for by employers because their members prefer a workplace where training opportunities are available. A corollary is that an overall reduction in bargaining power may reduce the incidence of training more generally as firms reduce compensation. Recent research pointed to a marked reduction in training opportunities during the last several years (e.g., Cappelli 2012), which has also been characterized by substantial slack in labor markets. If training is usefully understood as a component of the compensation package, then, as bargaining power diminishes due to slack labor-market conditions, we would expect downward pressure on all forms of compensation, including training.

Training in Construction

How do theories connecting collective bargaining and training fit with the construction industry? As previously mentioned, the organization of work in construction is typically characterized by smaller firms bidding on projects of relatively short duration for which firms require workers with high levels of general skills that are most efficiently produced with a large component of direct on-the-job training. Such a market structure creates significant barriers to unilateral training investments in the form of externalities and diseconomies of scale in the production of training. For example, Booth et al.'s (2002) model of union training effects in the case of an industry-wide union bargaining with multiple firms simultaneously over wages and training intensity provides some insights into the union training effect in construction. In the unionized segment of construction, unions bargain with a group of competing signatory contractors to develop a common wage scale and training curriculum. The coordination provided by union bargaining helps to create and maintain a pool of skilled construction labor on which the signatory firms can draw when demand warrants. The result is that training externalities are internalized within the group of unionized contractors, which should, other things equal, increase the incidence of training.

Similarly, for Acemoglu's (1997) model, the coordinating role of a construction union allows potential trainees to reasonably identify future employers (i.e., the signatory contractors). The labor agreement becomes a method of contractually binding present and future employers to pay a wage commensurate with a reasonable return on their training investment. The result of the union's coordinating activities should, therefore, be to increase the likelihood that training investments will be profitable in the long

run from the workers' perspective and, thus, should also increase the incidence of training in a union setting.

The coordination function of union bargaining in construction, however, goes beyond establishing uniform training standards across employers in the industry and ensuring more complete contracting to reduce market failures. Joint union-employer programs actually deliver the training to apprentices who are employed by multiple competing employers. Thus, another coordinating activity in a unionized setting is the creation of economies of scale, which relatively small construction firms may not achieve on their own. We expect that the realization of economies of scale in training reduces costs and thereby increases its incidence in the union segment of the industry.

Moreover, the typical apprenticeship program also provides an avenue whereby a significant portion of the general training costs are passed on to workers, which is consistent with Becker's (1962) training model (Bilginsoy 2003). During the apprenticeship period, wages are held relatively low by contractual agreement, which passes some of the expense of training on to the workers undergoing the training. In addition, experienced workers and firms pay for training through an hourly training assessment that is deducted from their paychecks. Throughout their careers, trained journey-workers are thus repaying through payroll deductions the subsidies they received when they were apprentices. In addition to sharing costs with workers, unionized firms pay a premium for skilled labor. Such a premium can arguably be seen as the firms' investment in the institutional structure that helps maintain training programs, which produce the pool of skilled labor from which they can draw as their demand for labor warrants.

Empirical evidence of union training effects in the construction industry has generally focused on apprenticeship training. Notably, Bilginsoy (2003) found that a majority of apprentices were trained in joint union-employer programs and that a greater percentage of apprentices in joint programs successfully attained journey-worker status than was the case for unilateral employer-sponsored programs (58% compared to 30%). Such results are consistent with the contention that unions help construction firms internalize training externalities through their coordination efforts. Because the nonunion sector has not generally developed training programs that rival the union sector's joint apprenticeship training programs, we would expect less training in the nonunion construction sector, other things being equal.

Expectations Based on Theory

Based on the review of the theoretical literature on the union training effect, several hypotheses are indicated.

1. The organization of work in the construction sector suggests that construction employers should be particularly reluctant to pay unilaterally for training compared to firms in other industry sectors.

2. Because of the coordinating activities in the form of joint union-employer apprenticeship programs to remedy market failures in the union segment of the construction industry, the incidence of job training is expected to be higher in the union sector than in the nonunion sector of the construction industry.
3. Because of the coordinating activities in the form of joint union-employer apprenticeship programs, the union training effect is expected to be particularly strong in the construction industry compared with other industries.
4. For the labor market more generally, union coverage is expected to be negatively correlated with the incidence of employer-paid training if standard human capital theory (e.g., Becker 1962) holds and positively correlated with union coverage if theories of imperfect competition (e.g., Booth and Chatterji 1998; Booth et al. 2002) hold.
5. If the theory holds that job training is a component of the compensation package, then, as workers' overall bargaining power declines (perhaps because of a slack labor market), the incidence of training is predicted to also decline over time, even after we control for union coverage and job tenure.
6. If the union training effect as envisaged by models of imperfect competition holds, then the union effect will occur mainly by reducing quits (or increasing job tenure). Thus, controlling for job tenure in a regression equation should significantly weaken the observed union training effect (Booth and Chatterji 1998).

Discussion of SIPP Data and Summary Statistics

The data originate from the 2001, 2004, and 2008 installments of the SIPP. Conducted by the U.S. Census Bureau, the SIPP is a multipanel, nationally representative data set designed to study the economic well-being and program participation of the U.S. population. Starting with Wave 1 in each of the three years, the survey tracked a set of individuals in successive waves three times per year for approximately four years. Each interview wave generated core data on demographic, labor force, and program participation variables. In addition, during each wave, ancillary questions in the form of topical modules were added to the survey. For example, Topical Module 2 accompanies Wave 2 in each of the three SIPP data installments used here and was conducted during the periods June to September 2001, June to September 2004, and January to April 2009. Among other topics, Topical Module 2 asked respondents a series of questions about work-related training.

Even though the sample sizes are quite large in each of the three SIPP installments, when we focus on a small subgroup, such as construction workers or unionized workers in the construction industry, the cell sizes become relatively small. Fortunately, the data and structure of the questions remained the same during each of the three SIPP installments, which made it

possible to combine the data from 2001, 2004, and 2008 to increase the sample size.[5] Thus the Wave 2 core data for each of the three SIPP installments was merged with the corresponding Topical Module 2 data and then stacked to create a multiyear cross-sectional data set.

Summary Statistics

In either the core or topical module surveys, information was gathered about each household member's employment status, job training, other human capital investments, union status, employing-firm size, and other variables generally controlled for in labor market analyses. After excluding individuals who were not participating in the labor force, who were younger than 15 or older than 65, who did not report having a job or reported only contingent work during the reference period, or who reported a managerial occupation, the sample of construction workers equals 6,785, with 5,418 of those reporting nonunion status and 1,367 reporting coverage under a union contract. Focusing just on the craft workers, for whom apprenticeship training is most applicable, the nonunion sample size is 3,580 and the union sample is 1,021. The nonunion and union sample sizes for all industries combined are 92,866 and 16,574, respectively.

Table 1 contains summary statistics of the variables used in the analysis weighted by the relevant population weights. Results indicate that nonmanagerial construction workers were somewhat younger than workers in general and that nonunion workers were several years younger than their union-covered counterparts. Not surprisingly, the results on education show that construction workers were more likely to report a high school diploma as their highest level of education than workers in general but were less likely to report having attained a bachelor's or graduate degree. Unionized nonmanagerial construction workers were much more likely to report having attended a technical school than their nonunion counterparts (20.9% compared to 7.9%) and were more likely to have technical school training than those employed in other industries. The construction workforce contained a greater proportion of Hispanic workers in both the union and nonunion sectors than the labor market as a whole. The results also show that construction work was highly male-dominated compared to the labor market more generally.

Other interesting results show that construction workers, especially those reporting nonunion status, tended to work in smaller firms than workers more generally. The disparity in health insurance coverage by union status is also starkly represented in Table 1. Whereas approximately 58% of nonunion construction workers reported having health insurance coverage, more than 92% of unionized workers reported coverage.

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[5]Recall that the questions from the 2008 SIPP Topical Module 2 were actually asked at the beginning of 2009.

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Table 1. Summary Statistics for Construction Workers and All Workers

	Construction (all)		Construction craft		All industries	
	Nonunion	*Union*	*Nonunion*	*Union*	*Nonunion*	*Union*
Training to upgrade skills	0.089	0.194	0.072	0.182	0.181	0.287
Any training in the past 10 years	0.213	0.395	0.170	0.382	0.346	0.470
Years in current job	4.9	7.7	4.7	7.4	5.8	11.2
Age	35.4	40.0	34.7	39.7	37.3	42.6
Year = 2001	0.308	0.314	0.250	0.249	0.324	0.324
Year = 2004	0.364	0.332	0.391	0.353	0.337	0.343
Year = 2008	0.328	0.354	0.360	0.398	0.339	0.333
Less than high school	0.268	0.093	0.322	0.091	0.131	0.062
High school	0.393	0.397	0.417	0.392	0.279	0.267
Some college	0.136	0.165	0.113	0.163	0.188	0.168
Technical school	0.079	0.209	0.073	0.231	0.075	0.094
Associates degree	0.051	0.086	0.038	0.087	0.086	0.093
Bachelors degree	0.061	0.046	0.033	0.035	0.167	0.182
Graduate degree	0.011	0.004	0.004	0.001	0.073	0.135
Female	0.109	0.036	0.021	0.019	0.497	0.444
African American	0.074	0.063	0.076	0.059	0.118	0.142
Hispanic	0.294	0.147	0.354	0.165	0.145	0.116
Migrated to U.S. from foreign country	0.266	0.125	0.320	0.135	0.156	0.119
Migrated × Hispanic	0.207	0.073	0.259	0.083	0.073	0.045
Fewer than 25 employees	0.637	0.396	0.684	0.413	0.393	0.143
25 to 99 employees	0.222	0.303	0.205	0.305	0.232	0.266
100 or more employees	0.141	0.300	0.111	0.282	0.375	0.591
Part-time employment	0.206	0.098	0.217	0.107	0.271	0.144
West	0.227	0.228	0.233	0.232	0.220	0.256
Midwest	0.181	0.364	0.172	0.372	0.230	0.278
South	0.457	0.158	0.464	0.146	0.380	0.191
Northeast	0.135	0.250	0.131	0.250	0.170	0.275
Disabled	0.040	0.039	0.040	0.034	0.049	0.047
Married	0.515	0.642	0.505	0.641	0.517	0.622
No children	0.535	0.553	0.529	0.540	0.543	0.568
Any health insurance coverage	0.577	0.916	0.487	0.907	0.817	0.957
Health insurance from employer	0.497	0.892	0.410	0.884	0.712	0.923
Professional/technical occupation	0.052	0.033	—	—	0.274	0.344
Craft occupation	0.663	0.741	1.0	1.0	0.050	0.085
Production occupation	0.113	0.036	—	—	0.493	0.327
Operator occupation	0.172	0.190	—	—	0.183	0.244
n	5,418	1,367	3,580	1,021	92,866	16,574

Sources: Survey of Income and Program Participation, 2001, 2004, and 2008.
Notes: Excluded are those not currently working, contingent workers, those under 15 and older than 65 years of age, and managerial workers.

Statistics on Work-Related Training

As previously mentioned, a unique aspect of the SIPP data is that it contains information on job training. In particular, the survey asks: "During the past year has [the respondent] received any kind of training intended to im-prove skill in one's current or recent job?" Table 2 presents results from the answer to that question for nonmanagerial workers in the categories Con-struction, Construction craft, Other industries (which excludes construction, education, and public administration), and, finally, All industries combined.

Table 2. Proportion of Nonmanagerial Workers Who Report Training

	Construction	Construction craft	Other industries[a]	All industries
Skills training in previous 12 months				
Any skills training				
Union	0.191	0.179	0.197	0.285
Nonunion	0.088	0.071	0.174	0.179
Employer-paid				
Union	0.130	0.113	0.172	0.227
Nonunion	0.072	0.056	0.151	0.150
Employer-, Government-, or Other-paid				
Union	0.175	0.160	0.187	0.266
Nonunion	0.079	0.062	0.159	0.165
Self-paid				
Union	0.016	0.019	0.010	0.018
Nonunion	0.009	0.009	0.014	0.014
Any training in previous 10 years				
Union	0.395	0.382	0.383	0.470
Nonunion	0.213	0.170	0.342	0.346
Number in union sample	1,367	1,021	8,630	16,574
Number in nonunion sample	5,418	3,580	76,666	92,866

Sources: Survey of Income and Program Participation, 2001, 2004, and 2008.
Notes: Excluded are those not currently working, contingent workers, those under 15 and older than 65 years of age, and managerial workers.
[a]Excludes construction, education, and public administration.

The SIPP data also observe who paid for the training: employer, government, self, or other. The category Other-paid for construction workers includes jointly administered union-employer training programs. The SIPP questionnaire also observes a training variable in which training is directed toward searching for, or becoming qualified for, a new job. Although the present analysis does not focus on this type of training, the results on the incidence of training over a 10-year period do incorporate the measure.

The results indicate that 19.1% of union-covered construction workers reported training to improve skills in their present jobs during the previous year. The training rate among craft workers in construction is slightly lower, at 17.9%. The union sector reported a substantially higher training incidence than the nonunion sector, where the numbers are just 8.8 and 7.1%, respectively. The table also reveals substantial differences in employer-paid training by union status among construction workers. Union-covered construction craft workers were twice as likely to get employer-paid training than nonunion workers (0.113 compared to 0.056), which stands in contrast to the only slight difference in training incidence by union status among workers in the Other industries category (0.172 compared to 0.151). Notice in the last column of Table 2 that, when all nonmanagerial workers are included in the sample, the unadjusted difference in union training appears relatively large (0.227 compared to 0.150). Such a result suggests that the union training effect tends to vary across industry sectors.

When training incidence is measured by whether training was paid for by employers, government, or other sources, the figures increase substantially for unionized construction workers. The increase occurs because the category Other-paid includes joint union-employer apprenticeship programs. Indeed, 83% of construction workers in the sample who reported Other-paid training were also covered by a union contract. Although adding the categories Government-paid and Other-paid to the training incidence measure for nonunion construction workers results in an increase in training, the rise is much smaller than for workers covered by a union contract. The Table 2 also shows that for upgrade training the category Self-paid is very small for both union and nonunion workers across the spectrum of industries. For the purposes of this analysis, I do not incorporate Self-paid training into the more broadly defined measure of job training.[6]

Another interesting training question in the SIPP asks whether the respondent engaged in either type of training during the previous 10 years: training to upgrade skills or training to search for or qualify for a new job. This is a particularly relevant question for construction workers because of the front-loading of job training in the industry through apprenticeship training. We must be cautious about reading too much into the data generated from this question, however, because workers may have received job training several years in the past, relevant to some other industry, and thus could plausibly answer in the affirmative even though such training would logically have little bearing on their work in the current industry of employment. Furthermore, younger workers would not have been at risk for job training for 10 years, unlike their more mature counterparts, and conversely, more mature workers, especially in the construction sector, may have received their training more than 10 years before. Given these caveats, and because of the 10-year window and a more expansive definition of training, the results, as expected, reveal a substantially higher incidence of training. The differences by union status and industry, however, remain roughly proportional to the previous results, which found that unionized construction workers were roughly twice as likely to undergo training as their nonunion counterparts.

Econometric Model of the Incidence of Training

By estimating a model of the determinants of training while controlling for Union coverage and other variables, we can gain a better understanding of the relationship between unionism and training, and can shed light on some of the theoretical propositions raised in the literature review. The empirical strategy is to estimate the probability of training using a linear probability model:

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[6]Based on estimates not presented here, adding Self-paid to the broader training measure does not change the pattern of results.

Table 3. Probability of Training to Upgrade Skills for Current Job during Previous Year
(Construction Industry)

	Construction				Construction craft			
	Employer-paid		Any but self-paid		Employer-paid		Any but self-paid	
Variable	Coefficient	t statistic	Coefficient	t statistic	Coefficient	t statistic	Coefficient	t statistic
Union	0.0204	(1.79)	0.0602	(4.72)	0.0112	(0.88)	0.0533	(3.69)
Tenure with em-								
ployer	0.0052	(3.45)	0.0048	(3.00)	0.0041	(2.31)	0.0039	(2.10)
Tenure squared	–0.0002	(3.00)	–0.0002	(2.75)	–0.0001	(1.74)	–0.0001	(1.66)
Age	–0.0007	(0.36)	–0.0005	(0.25)	–0.0029	(1.28)	–0.0025	(1.00)
Age squared	0.0000	(0.00)	0.0000	(0.15)	0.0000	(0.95)	0.0000	(0.62)
Year = 2004	–0.0282	(3.01)	–0.0379	(3.78)	–0.0350	(3.16)	–0.0439	(3.67)
Year = 2008	–0.0121	(1.20)	–0.0168	(1.56)	–0.0098	(0.82)	–0.0095	(0.74)
Black	–0.0129	(1.06)	–0.0095	(0.70)	–0.0142	(1.08)	–0.0118	(0.80)
Female	–0.0242	(1.31)	–0.0127	(0.61)	–0.0067	(0.24)	0.0291	(0.88)
Hispanic	–0.0314	(2.48)	–0.0402	(3.00)	–0.0239	(1.73)	–0.0353	(2.41)
Migrated from for-								
eign country	–0.0410	(3.28)	–0.0407	(2.76)	–0.0316	(2.27)	–0.0278	(1.62)
Hispanic × Migrated	0.0226	(1.27)	0.0229	(1.15)	0.0155	(0.79)	0.0147	(0.65)
Firm size fewer than								
25 workers	–0.0599	(5.00)	–0.0507	(4.05)	–0.0528	(3.59)	–0.0421	(2.71)
Firm size 25 to 99								
workers	–0.0228	(1.67)	–0.0110	(0.77)	–0.0119	(0.71)	–0.0008	(0.04)
Constant	0.1623368	(3.93)	0.1592917	(3.59)	0.1575003	(3.41)	0.1454405	(2.97)
n	6,785		6,785		4,601		4,601	

Source: Survey of Income and Program Participation, 2001, 2004, and 2008. Excluded are those not currently working, contingent workers, those under 15 and older than 65 years of age, and managerial workers.

Notes: Excluded are those not currently working, contingent workers, those under 15 and older than 65 years of age, and managerial workers. Employer-paid refers to training that was financed by the employer. Any but self-paid refers to training paid for by the employer, government, or other (includes union-sponsored or joint employer-union-sponsored apprenticeship programs). In addition to the variables listed, a series of dummy variables controlling for education, part-time worker status, region, and occupation were included in the model. Values in parentheses are absolute values of *t* statistic.

$$P = \alpha + \beta \text{ (Union coverage)} + \delta X + \varepsilon$$

where *P* represents the probability of training in the previous 12 months, Union coverage is a dummy variable that takes on the value 1 if the respondent reported union coverage and 0 if the worker reported nonunion status, *X* is a vector of other variables that may affect the probability of training, β and δ are parameters to be estimated, and ε is a random error term.[7]

I first focus on the sample of construction workers and estimate the probability that they trained to upgrade their skills in the previous year. A number of variants of the training variable are introduced in Table 2 based on who paid for the training. Table 3 reports results from estimations of the probability of Employer-paid training and Any but self-paid training, which

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[7]I estimated the models weighting the observations according to their population weights. In addition, when the models were estimated using a marginal effects probit procedure, roughly the same results were found.

includes training paid for by an employer, the government, and other sources (including joint union-management programs). The first two columns focus on all nonmanagerial workers in the construction sector, and the second two columns limit the sample to only craft workers. The union effect on training when the training variable is Employer-paid (columns (1) and (3)) is quite small, especially for the craft subsample, and fails to reach conventional levels of statistical significance. This result suggests that, other things remaining equal, strictly Employer-paid training is not much more likely to occur in unionized than in nonunion settings in the construction industry, especially among craft workers, whose skills are mostly general or transferable.

When the dependent variable is Any but self-paid, the size of the union coefficient increases substantially and becomes statistically significant. For a one-tail hypothesis test of the difference in the two coefficient estimates, the p value is 0.0102 for all nonmanagerial construction workers and 0.0142 for craft workers. Consistent with Hypothesis 2, the results indicate that, for the construction sector, unions may not necessarily elicit substantial amounts of unilateral Employer-paid training but that a union setting is characterized by substantially more skills training when the source of training is more broadly defined. These results are consistent with findings in Bilginsoy (2003).[8]

The results also indicate that the Tenure with employer variable is positively associated with the probability of training for both categories of training and both samples. In addition, the coefficient for the square of the Tenure with employer variable is negative (and statistically significant for the full sample of construction workers), which suggests a diminishing impact of tenure on the probability of training. Such results make sense to the extent that firms and workers can better judge the potential pay-off of training investments for workers whose performance and match quality they have observed over a longer period of time, but that the pay-off diminishes as workers move further along their tenure profile toward retirement.

It is also interesting that the results support the notion that, for Employer-paid training, longer employment tenure increases the probability of training but union representation does not. At first glance, this seems to be consistent with the theory of Booth et al. (2002), who argue that unions help firms internalize training externalities by reducing quits, which is consistent with longer job tenures. In regressions in which the two employment tenure variables are excluded (not reported here), the coefficients on the union variable remain virtually identical to those found in Table 3. Thus, adding the Tenure with employer variable does not reduce the union influence. At least for the construction sector, it does not appear that the union training

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[8]The table in the Appendix presents the union coefficients for training equations estimated separately for each broad industry sector. A comparison of the difference in the union coefficient for Employer-paid training and Any-but-self-paid training across industries suggests that Union coverage is particularly important for facilitating training in the construction industry. These results support Hypothesis 3.

effect runs through longer observed employment tenures (see Hypothesis 6). Firms may, however, use Union coverage as a proxy for prospective longer job tenure among union-covered workers that has not yet been observed.

Other notable results reported in Table 3 show that, although the incidence of skills training appears to have declined between the 2001 and 2004 periods, by 2008 it had bounced back. Thus, the evidence does not point to a statistically significant secular decline in training for the construction sector, which runs counter to Hypothesis 5. Other findings indicate that Hispanic construction workers as well as those who have migrated from foreign countries are less likely to have engaged in skills training in the previous year. An interaction term between the variables Hispanic and Migration from foreign country is positive but not statistically significant. In contrast to the negative training effect for Hispanics, no such effect appears to hold for African Americans, which is consistent with Bilginsoy's (2005) findings. The results also show that workers employed in smaller firms are less likely to have engaged in training to upgrade skills in the previous year.[9]

Most other research on the union training effect does not focus on only one industry. Thus, comparing the results for the construction sector with estimates based on samples from the labor market more broadly defined is instructive. The results in Table 4 are regressions of the same dependent variables (Employer-paid and Any but self-paid training) as in Table 3. The samples in Table 4, however, include data on nonmanagerial workers either from All industries (columns (1) and (2)) or from Other industries. (A rationale for excluding public administration from the Other industries variable is that such employers do not face profitability constraints when making decisions on training investments. A similar argument can be made for excluding education because many of these employers are also in the public sector.)

The results in Table 4 are qualitatively similar to those in Table 3. For All industries, the union training effect increases in magnitude when the definition of training changes, from a union coefficient of 0.0384 (Employer-paid) to a coefficient of 0.0498 (Any but self-paid) ($p\text{-}value = 0.0212$). Similarly, for the next two columns, Other industries, the coefficient increases in size from 0.0044 (Employer-paid) to 0.0151 (Any but self-paid) ($p\text{-}value = 0.0436$). Recall that, in the construction sector, the increasing union training effect is much larger when the definition of training is broadened beyond Employer-paid to Any but self-paid, with the coefficient increasing from 0.0112 to 0.0533 for craft workers.

Although the magnitudes of the union training effect are much smaller for the industries represented in Table 4, the same qualitative pattern exists. An important finding from Table 4 is that, for most private-sector employers, the union training effect appears only when the dependent variable is broadened to include Government-paid and Other-paid training, which

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[9]Waddoups (2011) finds similar results for workers in Australia.

Table 4. Probability of Training to Upgrade Skills for Current Job during Previous Year

| | All Industries | | | | Other industries[a] | | | |
| | Employer-paid | | Any but self-paid | | Employer-paid | | Any but self-paid | |
Variable	Coefficient	t statistic	Coefficient	t statistic	Coefficient	t statistic	Coefficient	t statistic
Union	0.0384	(9.82)	0.0498	(12.22)	0.0044	(0.99)	0.0151	(3.29)
Tenure with employer	0.0040	(8.81)	0.0043	(9.13)	0.0034	(6.99)	0.0035	(7.12)
Tenure squared	−0.0001	(7.46)	−0.0001	(7.17)	−0.0001	(5.21)	−0.0001	(5.27)
Age	0.0035	(7.18)	0.0037	(7.28)	0.0033	(6.44)	0.0034	(6.35)
Age squared	−0.0001	(17.29)	−0.0001	(18.65)	0.0000	(15.92)	−0.0001	(17.14)
Year = 2004	−0.0525	(20.68)	−0.0584	(21.84)	−0.0510	(18.78)	−0.0561	(19.86)
Year = 2008	−0.0637	(9.74)	−0.0696	(9.18)	−0.0612	(9.04)	−0.0663	(8.19)
Black	−0.0344	(1.81)	−0.0339	(1.76)	−0.0335	(0.47)	−0.0313	(0.36)
Female	0.0048	(7.51)	0.0048	(7.36)	−0.0013	(6.86)	−0.0010	(6.92)
Hispanic	−0.0350	(12.30)	−0.0359	(13.16)	−0.0333	(10.95)	−0.0346	(11.56)
Migrated from foreign country	−0.0509	(3.79)	−0.0566	(3.86)	−0.0480	(2.70)	−0.0520	(2.78)
Hispanic × Migrated	0.0258	(14.64)	0.0273	(13.28)	0.0189	(18.61)	0.0200	(17.85)
Firm size fewer than 25 workers	−0.0429	(5.69)	−0.0402	(4.19)	−0.0578	(10.41)	−0.0567	(9.66)
Firm size 25 to 99 workers	−0.0182	(5.37)	−0.0139	(5.87)	−0.0360	(5.44)	−0.0341	(5.92)
Constant	0.1233	(9.31)	0.1340	(9.74)	0.1539	(11.25)	0.1667	(11.81)
n	109,440		109,440		92,081		92,081	

Source: Survey of Income and Program Participation, 2001, 2004, and 2008.
Notes: Excluded are those not currently working, contingent workers, those under 15 and older than 65 years of age, and managerial workers.
Employer-paid training refers to training that was financed by the employer. Any but self-paid refers to training paid for by the employer, government, or other. In addition to the variables listed, a series of dummy variables controlling for education, part-time worker status, region, occupation, and industry were included in the model. Values in parentheses are absolute values of *t* statistic.
[a]All industries excluding construction, education, and public administration.

suggests that the union effect originates primarily from unions facilitating training opportunities outside those that are paid for solely by the employer. These findings suggest that the mechanism outlined in the models of imperfect competition, in which union bargaining improves the skills-training investment landscape for employers, who then provide and pay for training, is not entirely consistent with the data. The results are consistent, however, with the notion that more training occurs when unions are in the picture, playing a coordinating role. Indeed, it seems likely that, in such instances, firms partner with unions in financing training (as in joint union-management training programs in construction) but that workers responding to the SIPP survey, when asked about who paid for the training, did not perceive it as strictly Employer-paid and thus reported it as Other-paid.

The results in Table 4, columns (1) and (2), for the overall labor market, show a positive and statistically significant union training effect, which again runs counter to Becker (1962) (see Hypothesis 4); however, they are consistent with models of imperfect competition, in which a positive union training effect is expected (Booth and Chatterji 1998; Booth et al. 2002). When

construction, education, and public administration are excluded from the sample, the union effect falls from 0.0384 to 0.0044 (*p-value* = 0.0001), and the latter coefficient is statistically insignificant. For the Any but self-paid training variable, the coefficient falls from 0.0498 for All industries to 0.0151 for Other industries (*p-value* = 0.0001). The large positive union training effect found in the model estimated with data on all nonmanagerial workers appears to be driven primarily by the strong union effects in the three excluded industries. The remaining union effect indicated in Table 4, column (4), although statistically significant, is quite small.

   Other interesting findings are also found in Table 4. For example, coefficients on the year variables are large, negative, and statistically significant. Such findings indicate a secular decline in the probability of Employer-paid training and in training more generally from 2001 through 2004 and 2008. Such results are consistent with Cappelli's (2012) argument that employers have significantly reduced their training efforts. The results are also consistent with Hypothesis 5, suggesting that a significant component of training may be usefully understood as a piece of the compensation package that can be withdrawn as workers' bargaining power fades with slack labor markets; however, more research is necessary to verify such a claim. Similar to the results for the construction industry, findings for the labor market as a whole indicate that Hispanic workers were less likely to train, even after we have controlled for whether they migrated from a foreign country.

   The regression equations estimated for Table 4 provide more evidence to evaluate Hypothesis 1, that is, that workers in construction are less likely to have received Employer-paid skills training than workers in other industries. The combined results for union and nonunion workers in Table 2 certainly offer tentative support for this claim, but the descriptive results do not control for other factors that simultaneously affect the probability of job training. To further investigate interindustry comparisons of the incidence of training, parameter estimates on the industry control variables from the equations estimated for Table 4, columns (1) and (2), are presented in Table 5. The excluded industry category is construction;, thus, the coefficients represent the differences in the probability of training in a given industry compared to construction. All the coefficient estimates are positive, with the exception of agriculture, and most are statistically significant at conventional levels. Such findings suggest that, other things remaining equal, the incidences of Employer-paid and Any but self-paid training are significantly lower in construction than in most other industries. The coordinating effect of unions to support training thus appears especially important for producing skilled workers in the construction sector.

Training in the Previous 10 Years

Now I turn the discussion to the other measure of training—whether any training was undertaken by workers to train for or find a new job or to upgrade skills in their current job in the previous 10 years. The first two

Table 5. Probabilty of Training to Upgrade Skills for Current Job during
Previous Year: Construction Compared with Other Industries

Industry	Employer-paid		Any but self-paid		Training in previous 10 years	
	Coefficient	*t statistic*	*Coefficient*	*t statistic*	*Coefficient*	*t statistic*
Agriculture	−0.0147	(1.62)	−0.0152	(1.59)	−0.0420	(3.15)
Mining	0.0886	(4.36)	0.0790	(3.82)	0.1024	(4.16)
Manufacturing	0.0260	(3.75)	0.0150	(2.08)	0.0243	(2.57)
Transportation	0.0209	(2.53)	0.0153	(1.78)	0.0123	(1.09)
Communication	0.0638	(5.40)	0.0550	(4.54)	0.0783	(5.35)
Utilities	0.1248	(7.53)	0.1153	(6.84)	0.1055	(5.65)
Wholesale trade	0.0324	(3.70)	0.0228	(2.54)	0.0173	(1.47)
Retail trade	0.0091	(1.34)	0.0023	(0.33)	−0.0137	(1.45)
Finance/insurance/real estate	0.0943	(10.87)	0.0880	(9.85)	0.1128	(10.11)
Health	0.0478	(6.24)	0.0462	(5.79)	0.0611	(5.97)
Education	0.0373	(4.73)	0.0522	(6.30)	0.0225	(2.15)
Services	0.0258	(3.92)	0.0227	(3.30)	0.0192	(2.10)
Public administration	0.0657	(7.78)	0.1404	(15.52)	0.1428	(13.10)
n	109,440		109,440		109,440	

Source: Survey of Income and Program Participation, 2001, 2004, and 2008.
Notes: Excluded are those not currently working, contingent workers, those under 15 and older than 65 years of age, and managerial workers.
Employer-paid training refers to training that was financed by the employer. Any but self-paid training refers to training paid for by the employer, government, or other.

columns of Table 6 display the results for the construction industry; the third and fourth columns contain results for All industries and Other industries. The union training effect is substantially larger for construction workers when the window for training encompasses 10 years (instead of 1 year) and includes training to find employment as well as training to upgrade skills. For the industry as a whole, Union coverage leads to an 11-percentage-point increase in the likelihood of such training. The analogous figure for craft workers in construction is 12 percentage points. For All industries combined and for Other industries, the union effect is substantially smaller (2.7 and 5.6 percentage points, respectively). The differences in the coefficients of Union coverage in construction and both aggregated-industry equations are highly statistically significant ($p < 0.0001$). The results are probably indicative of the front-loaded nature of training in construction compared to other industries, which suggests that the variable Training in the previous year is not entirely consistent with the way unionized construction workers train. In contrast, the results in Table 5, column (3), indicate that workers in most other industries are generally more likely to have engaged in training during the previous 10 years than workers in construction, with agriculture, retail trade, wholesale trade, and transportation being the exceptions.

Other findings also contrast with the results in Tables 3 and 4. Perhaps not surprisingly, the Tenure with employer variables are much smaller and mostly fail to reach statistical significance with this measure of training. The length of employment with any one employer is not nearly as important in

Table 6. Probability of Any Training during the Previous 10 Years

Variable	Construction		Construction craft		All industries		Other industries[a]	
	Coefficient	t statistic	Coefficient	t statistic	Coefficient	t statistic	Coefficient	t statistic
Union	0.1125	(6.73)	0.1244	(6.30)	0.0557	(11.73)	0.0268	(4.69)
Tenure with employer	0.0025	(1.13)	0.0042	(1.56)	0.0015	(2.55)	0.0001	(0.15)
Tenure squared	−0.0001	(1.10)	−0.0001	(0.99)	−0.00002	(0.97)	0.00002	(1.08)
Age	0.0063	(2.18)	0.0046	(1.35)	0.0135	(17.35)	0.0133	(16.20)
Age squared	−0.0001	(2.23)	−0.0001	(1.56)	−0.0002	(16.42)	−0.0002	(15.25)
Year = 2004	−0.0351	(2.52)	−0.0403	(2.37)	−0.0576	(15.32)	−0.0603	(14.87)
Year = 2008	−0.0277	(1.86)	−0.0156	(0.87)	−0.0867	(22.66)	−0.0885	(21.36)
Black	−0.0138	(0.67)	−0.0180	(0.75)	−0.0441	(9.35)	−0.0451	(8.85)
Female	0.0075	(0.29)	−0.0044	(0.11)	0.0042	(1.26)	0.00000	(0.00)
Hispanic	−0.0836	(4.10)	−0.1007	(4.54)	−0.0634	(10.15)	−0.0622	(9.38)
Migrated from foreign country	−0.0991	(4.78)	−0.0864	(3.63)	−0.0745	(13.60)	−0.0731	(12.51)
Hispanic × Migrated	0.0529	(1.81)	0.0638	(1.98)	0.0132	(1.40)	0.0088	(0.89)
Firm size < 25 workers	−0.0578	(3.49)	−0.0472	(2.28)	−0.0381	(10.14)	−0.0531	(13.13)
Firm size 25 to 99 workers	−0.0171	(0.91)	−0.0059	(0.25)	−0.0081	(2.04)	−0.0244	(5.49)
Constant	0.1717	(2.84)	0.1260	(1.91)	0.1070638	(6.00)	0.1448251	(7.75)
n	6,785		4,601		109,440		92,081	

Source: Survey of Income and Program Participation, 2001, 2004, and 2008.
Notes: Excluded are those not currently working, contingent workers, those under 15 and older than 65 years of age, and managerial workers. In addition to the variables listed, a series of dummy variables controlling for education, part-time worker status, region, occupation, and industry (for columns 3 and 4) were included in the model.
Values in parentheses are absolute values of *t* statistic.
[a]All industries excluding education, construction, and public administration.

determining whether any sort of training has occurred in the previous 10 years. Not only is the type of training more broadly defined in this measure, but the source of payment is not observed and the time frame is larger. These factors combine to reduce the importance of tenure with the firm as a determinant of training. Similar to the results in Tables 3 and 4, the coefficients on the Hispanic variable are quite large, negative, and statistically significant. Also, Hispanic immigrants who are in construction craft jobs appear to fare significantly better in terms of training incidence than their non-Hispanic immigrant counterparts for the 10-year measure of training incidence. Interestingly, the secular decline in training is also evident in this measure of training for industries outside the construction sector (see Hypothesis 5).

Conclusion

This study relies on two major premises: 1) that the structure, organization of work, and skill requirements in the construction industry are sufficiently distinctive, and the institutional response by employers and unions with

respect to training is sufficiently unique, that we are justified in studying union training effects in the construction sector in isolation and 2) that job-related training is an important aspect of skill formation. Thus, to the extent that trade union presence affects training, the relationship is an important matter to address. In light of these two premises, I used the 2001, 2004, and 2008 installments of the SIPP to examine the union training effect in the construction industry in particular and, then, in the labor market more generally. The SIPP surveys proved useful for both projects because not only do they ask a wide array of questions on training but the training questions have remained consistent over the three panels between 2001 and 2008. Thus, when the data are aggregated, they form a large enough data base so that questions addressed in this paper can be explored for a relatively small industry such as construction.

Given the current production technology, organization of production, and skill requirements in the construction industry (i.e., smaller employers, short-duration projects, the need for labor with a high degree of general/transferable skills, and skills that are most efficiently learned on the job), standard human capital theory predicts that construction firms will be particularly reluctant to train workers compared to firms in other industries. The data clearly support this prediction. Both unadjusted and regression-adjusted estimates show that the incidence of employer-paid training is low in construction compared to other industries. Regression-adjusted estimates of Employer-paid training during the previous year indicate that only workers in agriculture are somewhat less likely to receive training, although the coefficient is not precisely estimated.

The research also demonstrates that, although Union coverage in construction is not strongly correlated with Employer-paid training, especially for craft workers, it is more highly correlated with a measure of training that is more broadly defined. When training is defined as Any but self-paid (which includes Employer-paid, Government-paid, and Other-paid training), workers covered by unions were much more likely to report receiving training. Compared to other industries, unions in construction play a particularly vital role in remedying market failures and securing training opportunities for nonmanagerial workers.

When union training effects are estimated for all industries aggregated together, an unmistakable positive union training effect occurs, with the probability of training increasing by between 3.8 and 4.8 probability points. Based on an unadjusted proportion of training incidence of approximately 0.22, this represents a substantial increase in the probability of training. Further investigation of the union training effect that excludes data from education, construction, and public administration finds a much smaller union effect. Indeed, for Employer-paid training the union effect essentially disappears, becoming very small and statistically insignificant. It appears that most of the union effect for Employer-paid training is concentrated in education and public administration.

A modest union effect emerges, however, when the broader measure of training (Any but employer-paid) is used as the dependent variable. Qualitatively, this is the same pattern found in the construction sector. Such results are consistent with the idea that the union training effect in the private sector more generally stems from actions that unions take to coordinate training opportunities either from outside sources or in conjunction with employers. This finding may still be consistent with the narrative embodied in the imperfect competition models to the extent that they predict that employers will invest in general skills when unions help them internalize training externalities (Booth and Chatterji 1998; Booth et al. 2002). But when such training takes the form of jointly sponsored and financed programs, as in the unionized construction sector, workers did *not* classify the training as Employer-paid. Unfortunately, the SIPP data do not observe whether a training program is jointly financed by employers and unions. Additional research is warranted to better describe the existence of such programs in other industries. Overall, however, an important implication of the present research for the theories of work-related training is that the union training effect varies significantly across industries, which suggests that the usefulness of broad interindustry estimates of a union training effect is limited.

Another interesting finding of this study points to a secular decline in the incidence of both measures of training in the previous year. Although more research is necessary to ascertain the source of such a decline, it is consistent with the notion that training may be, to some extent, part of the compensation package, which may be withdrawn as workers' bargaining power diminishes. Such findings support Cappelli's (2012) contention that employers have reduced their commitment to training over the last 10 to 15 years. The major reduction in training incidence appeared between the 2001 and 2004, although the trend continued through 2008. Additional research to address the source of the decline in training incidence will be useful.

Finally, theoretical predictions rooted in human capital theory predict a negative relationship between Union coverage and Employer-paid training, in contrast to theories rooted in imperfect competition, which predict a positive relationship. The results reported here reveal a negative union training effect only in retail trade (see the Appendix). This suggests that, generally, the traditional neoclassical model's (i.e., Becker 1962) prediction of a negative union training effect does not hold. The models of imperfect competition suggest a positive union effect, but the effect does not seem to work through the job tenure variable (a proxy for quits), as would be expected based on one of the theories of imperfect competition. Moreover, the positive union training effect does not generally hold for employer-paid training as we would predict based on the logic of the imperfect competition models, although this finding may simply be based on a weakness in the SIPP survey (which does not observe joint union-management training).

The data appear to be more consistent with the idea that the union training effect originates from unions securing training opportunities for their workers either in cooperation with employers, as in joint union-management programs in the construction industry, or from sources independent of the employer. Either way, the implication is that, as union density declines, the job-training efforts that go along with union bargaining will also decline, thus reducing investment in the nation's human capital stock.

Appendix

Table A.1. Coefficient on Union Coverage Variable by Industry and Various Definitions of Training

Industry	Employer-paid		Any but self-paid		Difference in coefficients	Training in past 10 years		
	Coefficient	t statistic	Coefficient	t statistic	t statistic	Coefficient	t statistic	n
Agriculture	0.0439	(0.92)	0.0264	(0.54)	0.258	0.0360	(0.54)	1,537
Mining	0.1174	(1.61)	0.1329	(1.79)	−0.150	0.0957	(1.17)	477
Construction*	0.0204	(1.79)	0.0602	(4.72)	−2.320	0.1125	(6.73)	6,785
Manufacturing	−0.0132	(1.41)	−0.0099	(1.04)	−0.247	−0.0218	(1.80)	14,186
Transportation	0.0357	(2.59)	0.0400	(2.84)	−0.219	0.0832	(4.70)	4,447
Communication	−0.0051	(0.18)	0.0002	(0.01)	−0.130	0.0713	(2.15)	1,980
Utilities	0.0407	(1.06)	0.0426	(1.09)	−0.035	0.0337	(0.78)	946
Wholesale trade	−0.0168	(0.66)	−0.0175	(0.68)	0.019	−0.0453	(1.36)	3,626
Retail trade	−0.0283	(2.61)	−0.0274	(2.47)	−0.061	0.0031	(0.19)	14,871
Finance/insurance/ real estate	−0.0378	(1.22)	0.0148	(0.44)	−1.143	−0.0208	(0.52)	5,767
Health	0.0041	(0.29)	0.0151	(1.02)	−0.536	0.0080	(0.48)	11,546
Education	0.0999	(9.66)	0.1159	(10.80)	−1.073	0.1157	(9.92)	10,734
Services	0.0339	(2.78)	0.0399	(3.17)	−0.339	0.0240	(1.60)	24,660
Public administration	0.0882	(6.49)	0.0936	(6.43)	−0.273	0.1001	(6.74)	6,625

Source: Survey of Income and Program Participation, 2001, 2004, and 2008.

Notes: Excluded are those not currently working, contingent workers, those under the age of 15 and older than 65 years of age, and managerial workers. * indicates the difference in the coefficients is statistically significant at 0.05 level or less.

Employer-paid refers to training that was financed by the employer. Any but self-paid refers to training paid for by the employer, government, or other. The models also control for the same variables as presented in Tables 3 and 4, along with a series of dummy variables controlling for education, part-time worker status, region, and occupation.

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