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Do Contractors Get Rid of Their Most Dangerous Work When They Get Rid of Direct Employees by Using Worker Leasing Agencies?

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Abstract

Subcontracting, contingent workers, and alternative employment arrangements are used extensively in the construction industry. Subcontracting has not been reported decrease the dangerous degree in workplace. Contingent workers and workers covered by alternative employment arrangements are less well trained, and then are more precarious at the jobsite, leased workers are the main component of contingent workers and alternative employment arrangements in construction industry. The rates of workplace occupational injury and illness should be rising over time, but, in fact, the rates are decreasing. Result of intuitive thinking do not match fact, in order to explain this mismatch, this paper proposes a hypothesis, i.e., contractors get rid of their most dangerous work when they get rid of direct employees by using worker leasing agencies, and leasing workers' injuries are not reported in the construction industry but rather in the service sector industry. This essay tests this hypothesis via the econometric model and reaches the following conclusion: in the total construction industry and in the building construction sector, the increase in temporary staff and leased employee expenses will decrease the rate of injuries resulting in lost worktime and decrease the rate of injuries resulting in days-away-from-work, and this kind of relationship is statistically significant at above the 95% level. With the above two serious injuries, we can infer that leased employees replace formal workers in a greater proportion of dangerous work, and thus the incidence of the workplace injuries of formal employees is decreased. Furthermore, the incidence of workplace injuries of leased workers is not reported or is reported inadequately.

1 Introduction

The construction industry has four characteristics: it is seasonal, like agriculture; it is cyclical, like other durable goods in manufacturing; it is local, like many services; and it is unusually dangerous, like transportation and mining (Bosch & Philips, 2003), which means that a construction workplace is unusually dangerous and that the industry is also characterized by high volatility of profit and revenue. Subcontracting, contingent workers, and alternative employment arrangements are used extensively in the construction industry. Subcontracting can decrease the cost of contractors, but may not decrease the degree of danger in the workplace, because the safety net effect of the reallocation of work through subcontracting depends upon two factors: one is the relative competencies of the sending and receiving contractors, i.e., contractors may select subcontractors with comparative advantages in safety, contractors may select subcontractors with equal advantages in safety, and contractors may select subcontractors with disadvantages in safety. Another factor is the degree of holistic efforts to mitigate worksite dangers. Subcontracting fragments the worksite into self-centered decision-making units, which are often characterized by conflicts of interest. Subcontracting may lead to tolerating or fostering inadequate or incomplete communication and cooperation across contractors so that the fragmented authority will decrease holistic efforts to mitigate job site dangers (Manu, Ankrah, Chinyio, & Proverbs, 2015). Therefore, in general, the combination of the above two factors will increase the injury rate in the construction workplace.

Using contingent workers and alternative employment arrangements in the construction industry opens the door to having less well trained and more unsafe workers on the jobsite. Economics theory and logic determine that the rates of workplace occupational injury and illness in the construction industry should be rising over time or show a steady trend, but, in fact, Obtained the following statistical information was obtained from the official website of United States Department of Labor[1]: Workplace injuries trend downward from 2003 to 2012, the total recordable cases incidence rate in the construction industry declined from 6.8 to 3.7.

Economics theory does not match fact; to analyze this un-match, via sorting out the relative literature, we propose a hypothesis: contractors get rid of their most dangerous work when they get rid of direct employees by using worker leasing agencies, and leasing workers' injuries are not reported in the construction industry but rather in the service sector industry.

This paper is mainly composed of two main jobs: proposing a hypothesis and testing this hypothesis. The hypothesis is proposed based on the sorting out of the references, so the second part of this paper is the literature review. Data collection is the foundation for establishing econometric models, so the third part is about data explanation. The fourth part focuses on econometric models and their results, and the fifth part includes the conclusions: the main conclusion is that the hypothesis is confirmed.

2 Literature Review

Seasonality, cyclicality, localness, and danger are four characteristics of the construction industry (Bosch & Philips, 2003). Organizational and technological complexity in the construction industry generates enormous risks (Zou, Zhang, & Wang, 2007). Employees of smaller construction companies face a greater risk due to lack of adequate skill/resource capacity of smaller contractors to handle the unique, complex and risky nature of construction contracting (CIDB, 2005). Overall, the construction industry is a high-risk industry, in terms of both profit and health. Regarding the degree of the risk in terms of health in the industry, the U.S. Bureau of Labor Statistics provides one set of indicators to measure the quantity of an industry's workplace nonfatal injuries and illness. The incidence rate of an industry's workplace nonfatal injuries and illness, the quantity of an industry's workplace fatal injuries and illness, the incidence rate an of industry's workplace fatal injuries and illness are the most important indicators.

Pursuing safety is one of the basic needs of human beings. For the construction industry, "one common response to the risks faced by capital in construction is the use of the subcontracting system to share and shift risk" (Bosch & Philips, 2003, p.8); letting out work to subcontractors can overcome the demand on special expertise, advanced equipment, and huge investment cost (Yoke-Lian, Hassim, Muniandy, & Teik-Hua, 2012). "Subcontracting is a method for managing risk, but it also can be a method of labor control and a way to cut labor costs on construction work sites" (Bosch & Philips, 2003, p.10). Hiring temporary employees is another method to cut labor cost, due to the diminishing bargaining power of labor unions, due to the shrinking extent of paid time-off, due to the increasing flexibility in weekly hours of work, due to the decreasing nonwage costs such as health insurance, pension contributions (Golden & Appelbaum, 1992). In addition, part-time, temporary and contract workers can be dismissed more easily if demand decreases (Abraham, 1988).

Hiring temporary workers may reduce costs for employers, but this practice has a downside. Nonstandard work arrangements and temporary work have been identified as emerging safety and health risk factors (Alterman, Luckhaupt, Dahlhamer, Ward, & Calvert, 2013). M. P. Foley (1998) showed that claim frequency and severity as measured by time loss were higher for temporary workers than for permanent workers in a large cohort of Washington State workers' compensation claims.

[1] https://www.bls.gov/opub/ted/2013/mobile/ted_20131114.htm

Smith, Silverstein, Bonauto, Adams, and Fan (2010) showed that temporary workers' compensation claims rates are twofold higher than permanent workers in construction and manufacturing, due to short tenure at a particular workplace which resulted unfamiliarity with new work practices and surroundings, limited safety training, and disproportionately younger workers (Breslin & Smith, 2006); due to less ability of contingent workers to refuse hazardous work or demand appropriate protective equipment for fear of dismissal (Mayhew & Quinlan, 2002); due to employers' hiring temporary workers as a means of shielding permanent workers from risky tasks, in which employers may invest less time in providing the temporary workers with appropriate training and protection equipment (M. Foley, Ruser, Shor, Shuford, & Sygnatur, 2014); due to nonpermanent workers' lack of sufficient knowledge about their work environment, feeling more constrained by their work status to complain about work hazards, and having more difficulties changing their work conditions (Aronsson, 1999); due to part of temporary workers' having two separate parties who are responsible for their safety, which raises the possibility that neither will take full responsibility to prepare the worker adequately (M. Foley et al., 2014).

The higher workplace occupational injury and illness rate in construction highlights the importance of insurance and compensation. However, many employee rights and employer responsibilities are built on the concept of an employee-employer relationship so that the data on the risks of particular workplaces are obfuscated due to the following factors: A person who is self-employed or is an independent contractor is typically not entitled to healthy compensation benefits, and so his injuries would not be captured in workers' compensation (WC) data (M. Foley et al., 2014); temporary help agencies provide compensation insurance for temporary help workers. The client company just utilizes the services of the temp workers, but does not provide workers' compensation insurance. The mismatch between the provider of temporary help workers' compensation insurance and the client company will make tracking workers' compensation data for injury and illness experiences of workers according to the industry where they work impossible (M. Foley et al., 2014); A professional employer organization (PEO) is sometimes referred to as staff leasing entities. PEOs supply new workers and administrative services to a client company. Accordingly, a PEO will serve as the employer of record and administer payroll and tax obligations, workers receive a W-2 directly from the PEO and are generally able to participate in the benefits plans of the PEO[2]; temporary staffing firms place temporary workers at a client's worksite. Typically, the assignment is for a short period, less than a year, and the firm may also often lease workers to the client (Houseman, 1999); a referral agency simply refers workers to client companies and treats the workers as independent contractors[3].

Contingent workers and alternative employment arrangements offer a challenge to the collecting data of workplace occupational injury and illness rate of Occupational Safety and Health Administration (OSHA). Phipps and Moore (2010) showed that: A part of the firms did not record temporary help workers on their OSHA logs or did not know if that was the appropriate thing to do; some firms assumed that the contingent workers hurt at the worksite were reported on the staffing company log or whoever provided the workers' compensation insurance; some firms were uncertain about regarding recordkeeping requirements for contract employees.

Above all, uncertainty or unclearness regarding recordkeeping requirements for contingent worker status and for co-employment situations in which who should report injuries or how to report injuries will obfuscate the collecting data of workplace occupational injury and illness rate of OSHA. Contingent work brings a new challenge to accurate data reporting in existing injury and illness surveillance and benefit programs (M. Foley et al., 2014).

3 Data Explanation

Data are the base of statistical analysis. For our study:

1. The injury rate data we use are taken from the U.S. Bureau of Labor Statistics (BLS), State Occupational Injuries, Illnesses, and Fatalities (IIF) program. (U.S. Bureau of Labor Statistics 2012, 2007, 2002, 1997).

[2] https://www.americanbar.org/content/dam/aba/events/labor_law/2018/papers/Litigation%20Issues%20Involving%20Staffing%20Agencies%20and%20PEO.pdf

[3] Ibid.

2. The BLS records total injuries, injuries resulting in lost worktime, injuries resulting in days-away-from-work (a subset of lost-worktime injuries), and injuries that do not result in lost worktime. Among the four injuries, the injuries resulting in lost worktime, injuries resulting in days-away-from-work represent the serious injuries, and the injuries that do not result in lost worktime represent not serious injuries.

3. Injury rates are calculated for all 100-full-time equivalent (FTE) employees in the BLS Statistics. This method can normalize injury rates relative to exposure to injury risks, controlling for annual variations in employment and hours worked.

4. Injuries are reported for total construction and the three main branches of the construction industry, i.e., general contractors, specialty contractors, and civil engineering/heavy-highway contractors.

5. Subcontracting data are taken from the quinquennial U.S. Economic Census, Construction for the years 1997, 2002, 2007 and 2012. The data are reported by state and detailed construction industry category (NAICS). We match Economic Census data to the most commonly reported BLS injury rate data by state, year, and NAICS categories, and two measures of subcontracting value are calculated: the value of work subbed-in and the value of work subbed-out. Work subbed-in is reported only for 2007 and 2012, whereas the value of work subbed-out and the net value of work are reported for 4 years.

6. For subbed-in value and subbed-out value, assume contractor A gets a task from an owner, and then assign part of the obligations and tasks under a contract to another contractor B known as a subcontractor. For A, this practice is subbed-out; for B, this practice is subbed-in, so in a closed system, the subbed-out value must be equal to the subbed-in value. In an open system, the value subcontracted-out and the value subcontracted-in describe the extent of subcontracting together.

7. We obtain the quantity of employment and the number of establishments in the North American Industry Classification System (NAICS) sector, and then compute the value of employment over the number of establishments in this sector.

8. We obtain data about temporary staff and leased employee expenses, the net value of construction work, annual payroll, and total benefits by state, year, and NAICS category.

4 Models and Results

4.1 The relationship between the total benefits and temporary staff and leased employee expenses

We construct a linear regression model as below:

$$\text{Total benefits} = \beta_1 * \text{annual payroll} + \beta_2 * \text{temporary staff and leased worker employee expenses} + a + \mu_t$$

The regression results of this model are put in Table 1. The results of statistical analysis show that: the total benefits and annual payroll show a positive correlation in all four sectors; the total benefits and temporary staff and leased employee expenses show a negative correlation in three sectors, except in the heavy and civil engineering construction sector, which means that an increase in temporary staff and leased employee expenses will decrease the benefits gained by standard employees. Two implementation paths are available: via temporary staff and leased employees to replace the standard employees, which reduces the total welfare expenses, and via reducing the per capita welfare expenditure of the standard employees, as the lower wage of the temporary staff and leased employees puts pressure on the welfare expenditure to the standard employees, thereby reducing the per capita welfare expenditure of the standard employee.

Table 1: The Regression Results of the Relationship between the Total Benefits and Temporary staff and Leased Employee Expenses

Variable	Total Benefit of The Total Construction Industry	Total Benefit of The Construction of Building Sector	Total Benefit of Heavy and Civil Engineering Construction Sector	Total Benefit of Specialty Trade Contractor Sector
Annual Payroll	0.291*** (37.81)	0.246*** (68.56)	0.261*** (26.5)	0.301*** (33.04)
Temporary Staff and Leased Worker Employee Expenses	-1.684*** (-3.73)	-1.063*** (-6.96)	0.00936 (0.02)	-1.233* (-2.32)
Constant	26068.6 (0.46)	-2328.4 (-0.37)	27412.0 (1.84)	4541.2 (0.11)

Note: t statistics in parentheses * $p<0.05$, ** $p<0.01$, *** $p<0.001$

4.2 Factor Model Affecting Occupational Workplace Injury Rate

4.2.1 Our model structure

Because panel data samples are used to estimate model coefficients, the model form should be chosen from the fixed effect model and random effect model firstly.

The formal structure of our theoretical models is as follows:

fixed effect model: $yit= \beta1\ x1it+ \beta2\ x2it + \beta3\ x3it+ \beta4\ x4it+ \beta5\ x5it+ \beta6\ x6it +ai+ \mu it$
random effect model: $yit= \beta1\ x1it+ \beta2\ x2it + \beta3\ x3it+ \beta4\ x4it+ \beta5\ x5it + \beta6\ x6it + \mu it$

where y_{it} is the injury rate for specific injury types in state i and year t, i stands for the state index, and t stands for period (2007, 2012); x_1 is the logged value of subcontracting out over the net value of construction; x_2 is the logged value of subcontracting in over net value; x_3 is the logged value of total employment for the NAICS sector; x_4 is the logged value of employment over the number of establishments in the NAICS sector; x_5

is a year trend; x_6 is the logged value of temporary staff and leased employee expenses over the net value of construction; a_i is a state-specific intercept; and μ_{it} is the error term.

We used the Hausman test to determine which model to use. The test results showed that in the whole construction industry and most sectors of the construction industry, the random effect model should be chosen, so that is what we chose.

4.2.2 Model's regression results

The regression results of model in the total construction industry are put in Table 2, the regression results of model in the construction of building sector are put in Table 3, the regression results of model in the heavy and civil engineering construction sector are put in Table 4, the regression results of model in specialty trade contractor sector are put in Table 5.

Table 2: The Regression Results of Model in the Total Construction Industry

Variable	The Injury Rate for Total Cases (1)	The Rate of Injuries Resulting in Lost Worktime (2)	The Rate of Injuries Resulting in Days-away-from-work, (3)	The Rate of Injuries not Resulting in Lost Worktime (4)
The Logged Value of Subcontracting Out Over the Net Value of Construction	0.121 (0.16)	0.154 (0.37)	0.150 (0.43)	-0.0601 (-0.12)
The Logged Value of Subcontracting in Over Net Value	1.573 (1.44)	1.289 (1.84)	0.826 (1.39)	0.472 (0.87)
The Logged Value of Total Employment for the NAICS Sector	-0.232 (-1.11)	-0.0658 (-0.67)	-0.027 (-0.31)	-0.175 (-1.25)
The Logged Value of Employment Over the Number of Establishments in The NAICS Sector	-1.717 (-1.84)	-0.413 (-0.91)	-0.894*** (-3.33)	-1.332** (-2.65)
The Logged Value of Temporary Staff and Leased Employee Expenses Over the Net Value of Construction	-0.36 (-1.24)	-0.396** (-2.77)	-0.337* (-2.40)	0.0222 (0.13)
Year Trend	-0.292*** (-6.97)	-0.106*** (-4.24)	-0.0664** (-2.7)	-0.186*** (-7.12)
Constant	598.3*** (7.00)	216.6*** (4.30)	136.8** (2.76)	382.5*** (7.10)

Note: t statistics in parentheses * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 3: The Regression Results of Model in the Construction of Building Sector

Variable	The Injury Rate for Total Cases (1)	The Rate of Injuries Resulting in Lost Worktime (2)	The Rate of Injuries Resulting in Days-away-from-work, (3)	The Rate of Injuries not Resulting in Lost Worktime (4)
The Logged Value of Subcontracting Out over the Net Value of Construction	0.847 (0.66)	0.261 (0.49)	0.300 (0.54)	0.552 (0.59)
The Logged Value of Subcontracting In over Net Value	0.00379 (0.01)	0.0919 (0.33)	-0.094 (-0.33)	-0.134 (-0.47)
The Logged Value of Total Employment for the NAICS Sector	-0.299 (-0.88)	-0.161 (-1.01)	-0.153 (-1.09)	-0.129 (-0.51)
The Logged Value of Employment over the Number of Establishments in the NAICS Sector	-2.374 (-1.66)	-1.172 (-1.79)	-1.457* (-2.44)	-1.200 (-1.26)
The Logged Value of Temporary Staff and Leased Employee Expenses over the Net Value of Construction	-0.220 (-0.51)	-0.294* (-2.17)	-0.315* (-2.49)	0.0364 (0.11)
Year Trend	-0.361 (-1.95)	-0.120 (-1.90)	-0.0732* (-1.26)	-0.228 (-1.70)
Constant	736.6* (1.96)	246.1 (1.92)	150.9 (1.28)	464.1 (1.70)

Note: t statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001

Table 4: The Regression Results of Model in the Heavy and Civil Engineering Construction Sector

Variable	The Injury Rate for Total Cases (1)	The Rate of Injuries Resulting in Lost Worktime (2)	The Rate of Injuries Resulting in Days-away-from-work, (3)	The Rate of Injuries not Resulting in Lost Worktime (4)
The Logged Value of Subcontracting Out over the Net Value of Construction	-0.279 (-0.53)	-0.101 (-0.26)	-0.0389 (-0.15)	-0.178 (-0.61)
The Logged Value of Subcontracting in over Net Value	0.652 (1.33)	0.429 (1.07)	0.230 (0.71)	0.252 (0.77)
The Logged Value of Total Employment for the NAICS Sector	-0.243 (-1.37)	-0.141 (-0.88)	-0.0933 (-0.82)	-0.0952 (-0.89)
The Logged Value of Employment over the Number of Establishments in The NAICS Sector	-1.145 (-1.32)	-0.200 (-0.27)	-0.360 (-0.73)	-0.867* (-2.27)
The Logged Value of Temporary Staff and Leased Employee Expenses over the Net Value of Construction	-0.160 (-0.95)	-0.0807 (-0.59)	-0.0679 (-0.72)	-0.132 (-1.39)
Year Trend	-0.222*** (-4.94)	-0.0847* (-2.39)	-0.0416 (-1.56)	-0.147*** (-5.38)
Constant	456.3*** (5.13)	174.8* (2.50)	87.14 (1.64)	301.1*** (5.45)

Note: t statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001

Table 5: The Regression Results of the Model in Specialty Trade Contractor Sector

Variable	The Injury Rate for Total Cases (1)	The Rate of Injuries Resulting in Lost Worktime (2)	The Rate of Injuries Resulting in Days-away-from-work, (3)	The Rate of Injuries not Resulting in Lost Worktime (4)
The Logged Value of Subcontracting Out over the Net Value of Construction	-2.058** (-2.96)	-1.289*** (-3.48)	-0.794* (-2.14)	-0.750 (-1.44)
The Logged Value of Subcontracting in over Net Value	2.518 (1.83)	1.497 (1.59)	1.270 (1.72)	1.043 (1.56)
The Logged Value of Total Employment for the NAICS Sector	-0.149 (-1.02)	-0.0452 (-0.61)	-0.0738 (-1.02)	-0.103 (-0.92)
The Logged Value of Employment over The Number of Establishments in the NAICS Sector	-1.373 (-1.69)	0.0186 (0.04)	-0.562* (-2.00)	-1.395*** (-3.43)
The Logged Value of Temporary Staff and Leased Employee Expenses over the Net Value of Construction	-0.0604 (-0.39)	-0.112 (-1.07)	-0.104 (-1.10)	0.0508 (0.40)
Year Trend	-0.248*** (-4.94)	-0.0845* (-2.28)	-0.0684* (-2.16)	-0.167*** (-5.65)
Constant	504.0*** (5.01)	170.2* (2.28)	139.8* (2.19)	340.5*** (5.73)

Note: t statistics in parentheses * $p<0.05$, ** $p<0.01$, *** $p<0.001$

4.3 Analysis of Regression Results

4.3.1 The Effect of Subcontract Activity on the Four Incident of Occupational Workplace Injuries

In theory, the reallocation of construction project work through subcontracting has three potential effects on workplace safety: safety-beneficial, safety-neutral, or safety-detrimental. Whether safety-beneficial effect can be obtained via subcontracting depends on whether subcontractors with comparative advantages in safety can be selected.

Regression model results show that:

1. in the total construction industry, subcontract-out activity and subcontract-in activity will increase the incident rate of total injuries, the incident rate of injuries resulting in lost work time, and the incident rate of injuries resulting the away-days from work. Subcontract-out will decrease the incident rate of injuries not resulting lost work time, whereas subcontract-in can increase the incident rate of injuries not resulting lost work time. These effects are not statistically significant at the 95% level.

2. in the construction of buildings sector, the subcontract-out activity will increase for workplace injury rates, but not be significant statistically; the subcontract-in activity's effects on four workplace injury rates are not certain: some signs of the coefficients are positive, some negative. Also, these effects are not significant statistically.

3. in the heavy and civil engineering construction sector, subcontract-out activities decrease the four incident rates of occupational workplace injuries, and subcontract-in activities increase the four incident rates of occupational workplace injuries. These effects are not statistically significant at the 95% level.

4. in the specialty trade contractor sector, subcontract-out activities decrease the four incident rates of occupational workplace injuries, and three effects among of them are statistically significant at the 95% level. Subcontract-in activities decrease the four incident rates of occupational workplace injuries, but these effects are not statistically significant at the 95% level.

From the above results, it can be inferred that the impact of subcontract activity on the four incident rates of occupational workplace injuries is only one of its externalities. The purpose of subcontract activity is to decrease contractors' economic risk and increase their economic productivity and profit. To realize this goal, construction contractors will subcontract out part of a project at a low price. The subcontractors get the business at a low price and so must hire low skilled workers to complete the work. Such behavior will increase the incidence rates of occupational workplace injuries. Specialty trade contractors face different situations, as they are at the bottom of the subcontracting pyramid. They get a project from general contractors or owners, so they do not have a strong motivation to subcontract part of the project to others to decrease economic risk.

They, then, are the risk bearers. When specialty trade contractors subcontract part of a project to others, that may mean they having difficulty completing this part, so they need to find a contractor with a higher skill level and greater advantages, including comparative advantages in safety.

4.3.2 The Effect of the Employment-Establishment-Size Variable and Average Employee Size Variable on the Four Incident Rates of Occupational Workplace Injuries

In theory, higher average employment size per establishment and higher employment-establishment-size are associated with lower injury rates across all types, because higher employment size means the workers in the larger establishment will have more opportunities to be trained, and the establishment will have better safety climate. The injury rates will thus decrease. Nevertheless, big employment size will result in management problems.

1. in the construction industry, higher employment scale and higher average employment scale will decrease the four incident rates of occupational workplace injuries, but these effects are not statistically significant, except in the case of effects of the average employee size on the rate of injuries resulting in days-away-from-work and on the rate of injuries not resulting in lost worktime. These two effects are significant at the 99% level.

2. in construction of building sector, the employee-size variable and average employee size variable will decrease the four incident rates of occupational workplace injuries, but these effects are not statistically significant, except in the case of the average
employee size on the rate of injuries resulting in days-away-from-work, which is significant at the 95% level.

3. in the heavy and civil engineering construction sector, the effect of the employee-size variable and average employment size variable on the four incident rates of occupational workplace injuries is not statistically significant except in the case of average employee size on no-lost-worktime injuries.

4. in specialty trade contractor sector, employee-size variable and average employment size variable do not affect the four incident rates of occupational workplace injuries significantly in statistics except in the case of average employee size on no-lost-worktime injuries.

4.3.3 The Effect of the Year Variable on the Four Incident Rates of Occupational Workplace Injury

Year as a dummy variable in this model affects the four occupational workplace injuries rate significantly in statistics, except in the construction industry of the building sector. This model includes 2 years: 2007 and 2012. In 2007, the United States was in an economic boom, but by 2012, the country was in a recession. Observing the original data, we saw that the four occupational workplace injury rates are decreasing over time, so the dummy variable year included in these models not only can capture the well-documented long-term decline in reported injuries but also can capture the effect of the recession between 2007 and 2012. The economic recession can decrease the four occupational workplace injury rates.

4.3.4 The Effect of Temporary Staff and Leased Employee Expenses Variable on Four Incident Rates of Occupational Workplace Injury

1. in the total construction industry, the increase of temporary staff and leased employee expenses will decrease the rate of injuries, resulting in lost work time and a decrease in the rate of injuries resulting in days-away-from-work. This relationship is statistically significant at above the 95% level, because the injuries resulting in lost worktime and the injuries resulting in days-away-from work are serious. We can then infer that the negative effect on the reported injury rates of direct employees from the use of leased workers is because (a) leased workers are assigned the more dangerous work, which lowered the injury rate of direct employees, and (b) the injuries of leased workers are either not reported by anyone or are reported in the service industry, because leasing agencies are service companies and do not report in the construction industry.

2. in the construction industry of building sector, the increase in temporary staff and leased employee expenses will decrease the rate of injuries, resulting in lost worktime and a decrease in the rate of injuries resulting in days-away-from-work. This relationship is statistically significant at above the 95% level.

3. in the other two sectors, the effect of temporary staff and leased employee expenses variable on the four incident rates of occupational workplace injury are not statistically significant.

5 Conclusions

Based on our analysis of the literature and using the econometrics model, we conclude that:

1. The work arrangement of temporary staff and leasing employee work has, first, the function of helping contractors reduce costs and economic risk. The temporary staff and leasing employee work arrangement implements this function in two ways: by relying on the temporary staff and leasing employee work arrangement to lower wages benefits, and by leading to a decline in the benefits of formal workers.

2. Subcontracting and the temporary staff and leasing employee work arrangement have a functional overlap in decreasing the contractors' cost.

3. The second function of the temporary staff and leasing employee work arrangement is to help construction contractors decrease the incidence rates of occupational workplace injuries, as contractors get rid of their most dangerous work when they get rid of direct employees by using worker leasing agencies. In the meantime, the injuries of leased workers are not reported in the construction industry but rather in the service sector industry, due to intentional or unintentional confusion during the collection of data regarding the workplace occupational injury and illness rate. Employment Services (NAICS 5613) comprises employment placement agencies, temporary help services, and professional employer organizations. Using leasing workers, the workplace occupational injury and illness' cases of the construction industry are diverted to the employment services sector (NAICS 5613), which is harmless to the service industry and beneficial to the contractors in the construction industry. The total workplace occupational injury and illness' cases may be unchanged.

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