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Analysis of the Factors Affecting the Commute Distance/Time of Construction Workers

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Abstract

For most people, commuting is an integral part of work, and the industry characteristics of the construction industry determine that construction workers cherish work opportunities more than other professionals, and endure longer commute time, so we are interested in determining how far construction workers travel to jobsites. We undertake a qualitative and quantitative analysis of survey data of construction workers' commute time, with the following conclusions: Contractors like to hire construction workers in the local labor market, and construction workers frequently live closer to their contractors than to the projects. Occupations such as construction do not allow workers to pick a jobsite and then select a home, so the workers' strategy is to pick a contractor and follow that contractor's work, or to pick a home and then pick a nearby contractor. Specialty contractors rely more upon local union hiring halls whereas general contractors may try to attach workers to them and have them follow their work. The larger the project size, the more employees will be hired per contractor. These workers generally will have a shorter commute distance, but higher hourly wages attract workers from father away. Also, if a worker works on a construction site for a short period of time, he or she can endure longer commutes. Finally, workers in some trades show greater tolerance for longer commutes, such as iron workers, operating engineers, plaster and drywall workers, and roofers. All ethnic groups express dislike of or show aversion to longer commute distance, but the degree of aversion is different. Asian or the Pacific Islanders show the highest level of aversion, and Whites display the lowest.

1 Introduction

Clothing, food, housing, and transportation are the most basic economic activities of human beings. Abraham Maslow divided the needs of human beings hierarchically into five levels at the beginning of his career and six levels during his later years: (a) physiological, (b) safety, (c) social belonging, (d) esteem, (e) self-actualization, and (f) self-transcendence[1] Maslow's first level needs, physiological needs, include breathing, water, food, sleep, clothing, and shelter. Financial security is included in the safety needs[2]. Financial security is manifested in many ways, importantly among them job safety. Clothing, food, and housing are included in Maslow's first- level needs. However, transportation is not reflected in Maslow's classification of need.

Wikipedia defines transportation as "the movement of humans, animals, and goods from one location to another."[3]

[1] https://en.wikipedia.org/wiki/Maslow%27s_hierarchy_of_needs
[2] https://en.wikipedia.org/wiki/Maslow%27s_hierarchy_of_needs
[3] https://en.wikipedia.org/wiki/Transport

In nature, the human needs included in Maslow's hierarchy of needs and the human needs for transportation are not on the same order of magnitude, as the human needs included in Maslow's hierarchy of needs belong to category of ends, but the human needs for transportation belong to the category of means, because all of life's necessities and pleasures that humans need cannot possibly locate within reach of their static bodies.

Shelter, job security, and transportation are all very important. Construction workers are closely related to these three issues at the same time. Shelters are buildings, which are the results of the labor work of construction workers. Construction workers face greater occupational risks than do workers in other industries, "because construction is a highly seasonal and cyclically volatile industry, often there is high labor turnover within the firm and in the industry" (Bosch & Philips, 2003, p.3). Highly seasonal and cyclical volatility is not the only characteristic of the construction industry. In fact, the construction industry has several important characteristics, for example, "Construction also shares a crucial characteristic with most activities in the service sector. Like most service work, productive activity in construction takes place at the point of purchase" (Bosch & Philips, 2003, p.5). This characteristic means that most buildings must be built on site, and thus construction workers need to travel to the customer before commencing work.

That shelter is important to people means that the job of construction workers is important. The localness characteristic of the construction industry means that construction workers need to endure longer commute times. The highly volatile characteristic of construction industry means that construction workers will cherish work opportunities more than other professionals, and one of the byproducts of cherishing job opportunities is enduring longer commute times.

Commuting behavior links the separation of employment site and residential location. However, different construction workers have different commute times, and different construction workers can endure different commute times, so we need to know what determines how far construction workers travel to job sites. Analyzing and sorting out the factors affecting the commute distance/time of construction workers is the objective of this paper.

2 Literature Review

The fact that the construction workers have to take endure travel times is supported by survey data. Priceonomics company[4] computed the average commute time by occupational category based on data from the 2014 American Community Survey. The calculation results show that professions in the construction and mining industry have the longest commutes. Specific results are shown in Table 1.

Winters, Cleland, Mierzejewski, and Tucker (2001) divide the transportation needs hierarchically like Maslow's hierarchy of needs, i.e., the transportation system users' hierarchy of needs: the first layer is personal security and safety are the most basic needs. The second layer is about time, which means timesaving and trip efficiency. Driving too much is not good for health: "The more time people spend driving, the greater their odds of having poor health and risk factors for poor health"[5]. According to TIME[6], a commute negatively affects the body in 10 ways: raising blood sugar level,

[4] www.priceonomics.com/
[5] www.sbs.com.au/news/too-much-driving-is-bad-for-you-study
[6] http://time.com/9912/10-things-your-commute-does-to-your-body/

Table 1: Average Commute Time by Occupation Type

Rank	Occupation Group	Commute in Minutes
1	Construction and mining	33.4
2	Computer science and math	31.8
3	Business operations specialists	30.2
4	Architecture and engineering	30.2
5	Finance	29.4
6	Lawyer and legal support	28.9
7	Physical and social science	28.8
8	Arts, design, entertainment, sports, and media	28.6
9	Protective service (police, firefighter, etc.)	28.4
10	Management	28.0
11	Installation, maintenance, and repair	27.7
12	Transportation	27.2
13	Healthcare practitioners	26.2
14	Administrative support	26.0
15	Industrial production	25.8
16	Cleaning and maintenance	25.7
17	Sales	25.4
18	Healthcare support	25.3
19	Social service	24.9
20	Farming, fishing, and forestry	24.6
21	Personal care and appearance	23.6
22	Education	23.1
23	Food preparation and serving	22.0
24	Military specific	21.0

Cited from https://priceonomics.com/which-professions-have-the-longest-commutes/

raising cholesterol level, raising risk of depression, increasing anxiety, decreasing happiness and life satisfaction, temporarily spiking blood pressure, raising blood pressure over time, decreasing cardiovascular fitness, impacting sleep patterns, causing back problems.

Cheu and Kreinovich (2007) demonstrated that commute disutility functions, i.e., describing the relationship between disutility and commute time, present an exponential function form, and are not only consistent with common sense, but also can simplify the computation.

Given the condition of Maslow's first basic need of security and safety; the third layer of transportation need, societal acceptance; and the fifth layer of transportation need of comfort and convenience, then the second layer need of time and the fourth layer need, cost, become two key factors for commuters to consider. Thirty years ago, metropolitan areas in the United States had already exhibited the phenomenon of the widening gulf between the Americans' living place and working place (Cervero, 1989). Although there had been a steady migration of jobs to the suburbs, many suburban residents began to commute farther than ever. Cervero (1989,1996) analyzed the factors associated with this phenomenon and argued that jobs-housing imbalances would affect levels of regional mobility and travel behavior. Levinson (1998) argued that residence in job-rich areas is associated with shorter commutes, as is having workplaces in housing-rich areas.

Green (1999) argues that many rural residents have longer than average commute times because most rural areas lack specialized, highly skilled, and nonmanual jobs, and as a result, individuals are forced to seek employment in larger labor markets, although they still prefer to reside in areas that are less expensive or that provide rural/small-town ideals.

Axisa, Scott, and Newbold (2012) established multiple linear regression models using data drawn from the 2006 Census of Canada Master File to examine factors that influence commute distance within the commuter shed of Toronto, Canada.

Their empirical results show that for recent migrants, (a) they commute longer distances compared to long-term residents; (b) residential location along the urban-rural continuum affects the commute distances, i.e., as the residential location becomes more rural, this resident will commute longer distances; (c) employment status is relative to the length of commute distance, i.e., those with full-time employment commute a great distance than those with part-time employment; (d) employment type is relative to the length of commute distance, e.g., managerial and scientific workers commute much longer distances than those employed in primary industries; (e) age is relative to the length of commute distance. The relationship between commute distance and age shows an inverted U-shape, i.e., commute distance increases as age increases, and commute distance decreases beyond age 35; (f) sex is relative to the length of commute distance; (g) household income is relative to the length of commute distance, and this relationship shows a nonlinear characteristic: the commute distance increases at a declining rate along the household income increase; (h) household structure is relative to the length of commute distance, meaning that married parents and married persons have shorter commute distances than single persons; (i) marital status is relative to the length of commute distance, i.e., married persons have shorter commute distances than single persons; and (j) the age of the youngest child is relative to the length of commute distance, i.e., the model results show that the statistical impact of workers with very young children (age 0-4) on the commute distance is not significant, but the statistical impact of workers whose youngest child is older (age 5-18) on the commute distance is significant, and workers whose youngest child is older (age 5-8) have shorter commute distances than those without children or with children aged 0-4.

3 Data and Descriptive Analysis

Data used in this paper are from individual worker payroll data for several public building projects completed in San Jose, California between 2008 and 2016. The structural characteristics of several important indicators in the data are analyzed. The analysis results are shown in Table 2.

Table 2: The Structure of Several of the Most Important Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Distance Between Contractors to The Project Site	3789	59.78298	195.2322	.0004242	3980.888
Distance Between Workers to The Project Site	3936	53.25569	140.4585	.0004242	4099.858
Distance Between Workers to The Contractor’s Place of Business	3789	8.615565	56.27318	1.368979	1375.733

We can draw the density function graph of the above three variables as shown in Figure 1, Figure 2, and Figure 3.

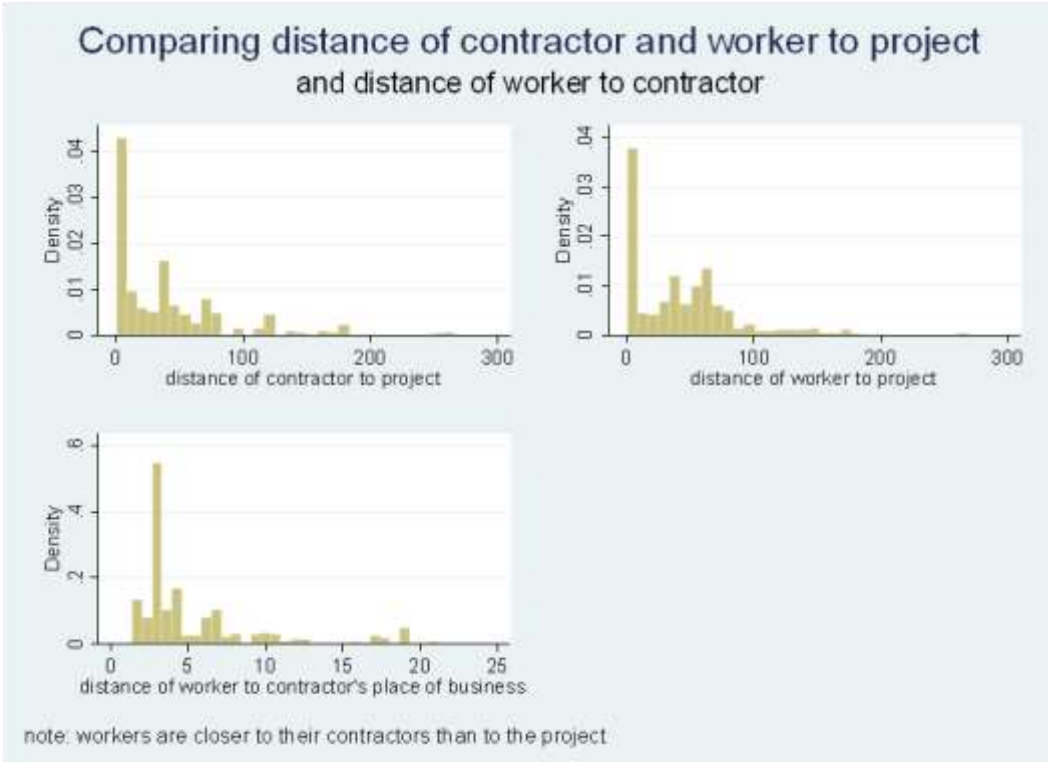

Figure 1. Distance of contractor to project, distance of worker to project, distance of worker to contractor's place business.

Figure 1 describes the density distribution of the distance between California contractors and the project site, the density distribution of the distance between California workers and the project site, and the density distribution of the distance between California workers and California contractors.

Figure 2 describes the kernel density estimation (KDE) of variable distance of contractor to project, figure 3 describes the kernel density estimation of variable distance of worker to project, KDF is a non-parametric way to estimate the probability density function of a random variable.

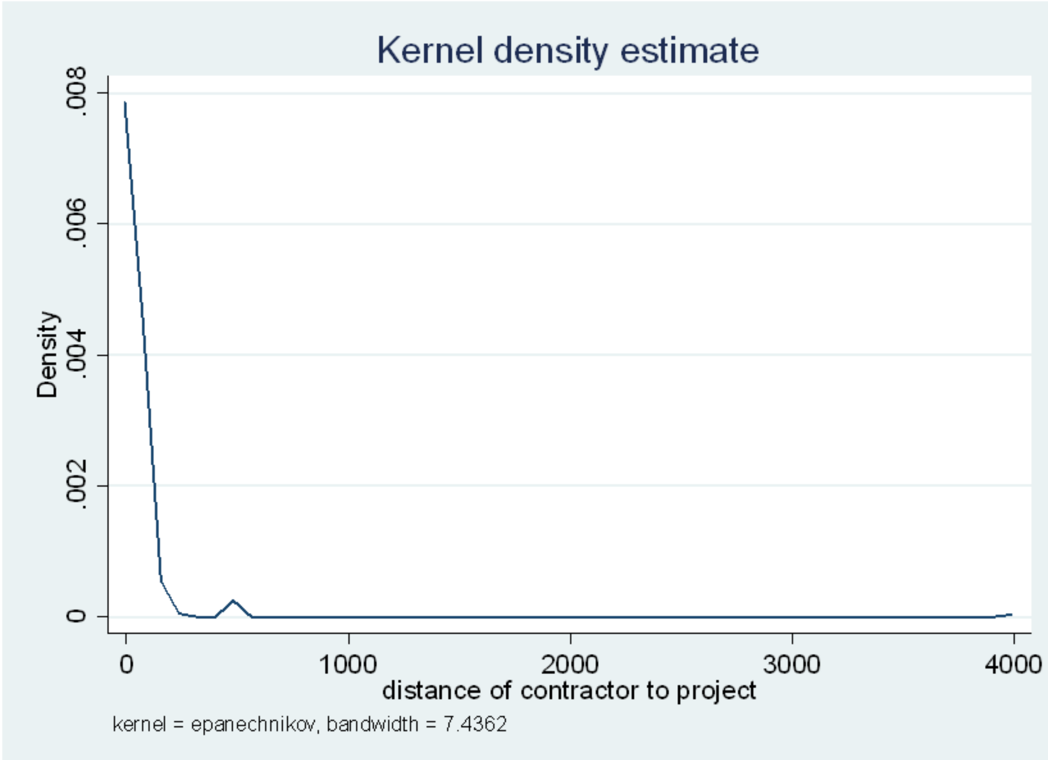

Figure 2. The kernel density graph of variable distance of contractor to project

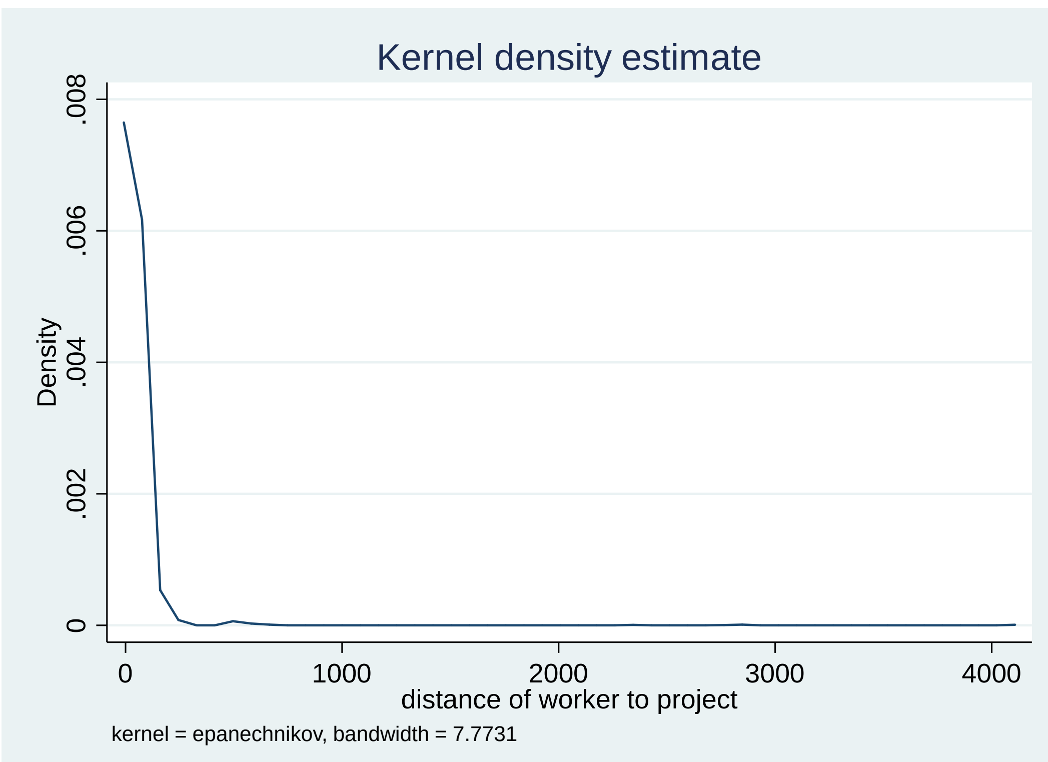

Figure 3. The kernel density graph of variable distance of worker to project

We can also compute the commutative density of the short commute distances of both contractors to project site and workers to project sites. These detailed results are presented in Table 3.

Table 3: Commutative Percent within a Certain Distance of an Entity to the Project Site

The Distance of Contractor to Project Site	Commutative percent within a certain distance of contractor to project site	Commutative percent within a certain distance of worker to project site	The distance of worker to project site
The Distance of Contractor to Project Less Than 10 Miles	36.58	31.73	The distance of worker to project less than 10 miles
The Distance of Contractor to Project Less Than 20 Miles	46.79	36.43	The distance of worker to project less than 20 miles
The Distance of Contractor to Project Less Than 30 Miles	49.59	40.29	The distance of worker to project less than 30 miles
The Distance of Contractor to Project Less Than 40 Miles	64.63	53.23	The distance of worker to project less than 40 miles
The Distance of Contractor to Project Less Than 50 Miles	69.99	59.63	The distance of worker to project less than 50 miles
The Distance of Contractor to Project Less Than 80 Miles	82.40	87.65	The distance of worker to project less than 80 miles
The Distance of Contractor to Project Less Than 100 Miles	87.33	91.01	The distance of worker to project less than 100 miles

Source: our computation based on investigation data

Based on the comparative analysis of the three small graphs in Figures 1, we find the following:

1. Contractors can endure a much longer commute distance than workers.

Figure 3 and Table 3 show support for this finding. Viewing Table 3, this phenomenon can be explained by the theory of the transportation hierarchy of needs. The theory of transportation hierarchy of needs includes two main points (Winters et al., 2001), one concerning time and the other cost. The cost-level need means that the commuter making decision of the choosing of the job or project or the house will balance between benefit and cost. Because of contractors' the higher benefit gained from projects, contractors have stronger financial strengths to endure much longer commute distance than workers.

2. Both workers and contractors like a short commute distance.

Form Figure 3, we see that both workers and contractors prefer short commute distance. The theory of transportation hierarchy of needs holds that commuters like the shortest commuter time, and the disutility of commute will grow exponentially along with the commute time increases (Cheu & Kreinovich, 2007).

3. Contractors like to hire construction workers in the local labor market, and the construction workers are closer to their contractors than to the projects.

We first compute the distance difference between the distance of workers to contractors and the distance of workers to projects, and then the commutative percent of the distance difference of workers to contractors and the distance of workers to the projects under the condition of which distance difference is positive, and get the result of 13.18%. This result shows that the frequency of workers who are farther from their contractors than from the project is only 13.18%: however, the frequency of workers who are closer to their contractors than to the projects is 86.82%, which strongly supports strongly the argument that workers are closer to their contractors than to the projects.

We can also compute the commutative density of the distance of the workers to their contractors' business place of less than 20 miles, and get the result of 98.89%. This result shows that the commutative density of the distance of workers to their contractors which is less than 20 miles is 98.89%, which shows that the distance of workers to their contractors is very short, meaning workers like to choose a residence near the contractors.

The localness characteristic of the construction industry (Bosch & Philips, 2003) means that most of construction projects should be built on the building-site, i.e., the building cannot be built in one place and then moved to another. The localness characteristic determines that every place has local construction contractors, so the density of the short distance contractors travel to the project is very high. Contractors can compete for projects not only in their local markets, but also across the country, so viewing Figure 2, the density of long distances of contractors to projects is very small but still is larger than zero. In addition, contractors like to hire local construction workers, a shortage of local construction workers will decrease the productivity of the construction industry (Hendrickson, Hendrickson, & Au, 1989).

The argument that contractors like to hire local construction workers to improve the productivity of the industry is also supported by our data analysis. Table 4 shows that the commutative percent within 80 miles of contractor to the project site is 82.40%, but the commutative percent within 80 miles of workers to the project site is 87.65%; the commutative percent within 100 miles of contractors to the project site is 87.33%, but the commutative percent within 100 miles of worker to the project site is 91.01%. Under the same distance range, the latter percentage is higher than the previous percentage, which means that the contractors like to hire local construction workers.

4 Models and Results

4.1 Model 1 and its Explanation

We build two forms of regression models: log versus level and log versus log. The regression results are shown in Table 4. The two models' regression results show that the two variables, i.e., the distance of worker to project and the distance of contractor to project, are highly relative, i.e., the effect of the distance of contractor to project on the distance of worker to project is statistically significant. Comparing the two forms of regression models, the log versus log form is much better than the log versus level form, because the log versus log form means that the relationship between the distance of worker to project and the distance of contractor to project is linear. In contrast, the log versus level form means that the relationship between the distance of worker to project and the distance of contractor to project is nonlinear. A nonlinear relationship is not a true relationship, because, as previously noted., we know that the workers like to live near the contractors so that the distance of worker to project and the distance of contractor to project is relative, but it cannot be a nonlinear relationship.

Table 4: The Regression Results between Variable of the Distance of Worker to Project and the Variable of the Distance of Contractor to Project

Variable	The Logarithm Value of The Distance of Worker to Project (1)	The Logarithm Value of The Distance of Worker to Project (2)
The Distance of Contractor to Project	0.00169*** (0.000245)	
The Logarithm Value of the Distance of Contractor to Project		0.227*** (0.0150)
Constant	2.569*** (0.0484)	2.128*** (0.0575)
R-sq	0.013	0.060

Note: standard errors in parentheses * $p<0.05$, ** $p<0.01$, *** $p<0.001$

4.2 Model 2 and its Explanation

Regarding the California workers and California contractors as research objects, we analyze the variable distance of workers to the project and contractors to the project, employment size of the project, number of employees of per contractor, specialty contractors; the regression results are shown in Table 5. Among the independent variables, specialty contractors' impact on the distance of workers to project is not statistically significant; the effect of both variable employment size of project and variable number of employees per contractor on the explained variable distance of worker to project is statistically significant. Furthermore, this kind of effect is negative, meaning that the larger the employment size of the project, the more employees per contractor will have shorter commute distance. This fact might mean that a contractor with more employees is highly competitive in the local project market, and a project that has a larger size employment size is like to hire a contractor with more employees. We then compute the correlation coefficient of employment size of the project and number of employees per contractor, which. is 0.2573. Next, we build the regression model of variable employment size of project and variable number of employees per contractor; the regression results are shown in Table 6.

Table 5: The Regression Results of the Model about the Explained Variable of the Distance of Worker to Project

The Logarithm Value of the Distance of Worker to Project	Coef.	Robust Std. Err.	T	p>│t│
The Logarithm Value of the Distance of Contractor to Project	0.2174	0.01779	12.22	0.000***
The Logarithm Value of Employment Size of Project	-0.1391	0.06504	-2.14	0.033*
The Logarithm Value of Number of Employees of Per Contractor	-0.22948	0.04587	-5.00	0.000***
Specialty Contractor	-0.1276	0.3129	-0.41	0.683
Constant	3.9556	0.4834	8.18	0.000***
Number of obs=3585 F(4, 3580)=61.15 Prob>F=0.0000 Root MSE=2.684 R-sq=0.0728				

Note: * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 6: The Regression Result of the Model about the Variable of the Employment Size of Project

The Employment Size of Project	Coef.	T
The Number of Employees of Per Contractor	1.906	17.18***
Constant	636.7	61.4***

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

4.3 Model 3 and its Explanation

Because of the correlation between employment size of project and number of employees per contractor, we drop one variable in a new model and add some new variables. Table 7 shows the regression results.

We make the variable project into a dummy variable, and then find that some projects will impact the distance of worker to project significantly, in terms of the statistics. These projects are fire station #35 and Met North.

The effect of Variables real total wages and real wages per hour on the variable distance of worker to project is statistically. The effect of real total wages is negative, and the effect of real wages per hour is positive. This kind of negative effect and positive effect is in line with economic logic. Because of the high real wages per hour, workers can endure a longer commute distance, but along with the increasing of real total wages and commute times, the workers' ability and will to endure long commutes will decrease. In the meantime, higher hourly wages attract workers from father away while total wages during a pay period attract workers from closer in.

The regression results also show that the workers in some trades show greater tolerance for longer commutes; these trades are iron-worker, operating engineer, plaster and drywall worker, and roofer. The workers of some trades do not show the will to endure the longer commutes. These trades are carpenter, laborer, electrician, plumber-fitter, and sheet metal worker, because they have a larger scope of employment, compared to iron-worker, operating engineer, plaster and dry wall worker, and roofer. For example, a carpenter may prefer to find a job in a furniture factory with a shorter commute distance instead of choosing a job in a construction project with a longer commute distance.

Table 7: The Regression Result of another Model about the Explained Variable of the Distance of Worker to Project

The Logarithm Value of The Distance of Worker to Project	Coef.	Robust Std. Err.	T	p>│t│
The Logarithm Value of the Distance of Contractor to Project	0.2253	0.02053	10.98	0.000***
The Logarithm Value of Number of Employees of Per Contractor	-0.34946	0.0525	-6.66	0.000***
Specialty Contractor	-1.5785	0.2099	-7.52	0.000***
Project: Fire Station #19	0.079495	0.23034	0.35	0.730
Project: Fire Station #35	-0.4921	0.22664	-2.17	0.03*
Project: Fire Station No.21	-0.0711	0.18266	-0.39	0.697
Project: Met North	-0.37407	0.16974	-2.20	0.028*
Project: SJIA - North Concourse	-0.30691	0.24039	-1.28	0.202
Project: San Carlos	0.05933	0.17257	0.34	0.731
Project: Southeast Library	-0.22362	0.19304	-1.16	0.247
The Logarithm Value of The Real Total Wages	-0.08016	0.0313	-2.56	0.010**
The Logarithm Value of The Real Wage Per Hour	0.31907	0.1176	2.71	0.007**
Iron Worker	0.7339	0.17365	4.23	0.000***
Carpenter	0.10901	0.21237	0.51	0.609
Laborer	0.1743	0.1938	0.90	0.369
Operating Engineer	0.5922	0.2816	2.1	0.036*
Plasterer Drywall	0.4343	0.2192	1.98	0.048*
Roofer	1.0090	0.15569	6.48	0.000***
Electrician	-0.1090	0.3887	-0.28	0.779
Plumber fitter	0.3973	0.4309	0.92	0.356
Sheet Metal Worker	-0.6121	0.5707	-1.07	0.284
Constant	4.235	0.6264	6.76	0.000***
Number of obs=3387 F(4, 3580)=22.80 Prob>F=0.0000 Root MSE=2.643 R-sq=0.0950				

Note: * p<0.05, ** p<0.01, *** p<0.001

4.4 Model 4 and its Explanation

We add the ethnicity variable in model 3 to obtain model 4 finally. We make the variable ethnicity into a dummy variable and estimate the regression model. Table 8 shows the regression results. These results show that the effect of American Indians and Whites on the distance of worker to project is not significant at the 5% level, but the effects of Asian or Pacific, Hispanic, other ethnicity, including mixed races, on the distance of worker to project are significant at the 5% level. The regression results also show that all ethnicities dislike or show aversion to the longer commute distance. Among of them, those of Asian or Pacific ethnicity have the highest degree of aversion to longer commute distance, and given the other effect factors, compared to White ethnicity, those of Asian or Pacific ethnicity will make the commute distance decrease by 2.29%, mixed races will make the commute distance decrease by 1.27%, other races will make the commute distance decrease by 1.07%, and Hispanic ethnicity will make the commute distance decrease by 0.97%.

Table 8: The Regression Result of the Different Model about the Explained Variable of the Distance of Worker to Project

The Logarithm Value of the Distance of Worker to Project	Coef.	Robust Std. Err.	T	p>│t│
The Logarithm Value of the Distance of Contractor to Project	0.1923	0.02388	8.05	0.000***
The Logarithm Value of Number of Employees of Per Contractor	-0.472933	0.07663	-6.17	0.000***
Specialty Contractor	-1.4422	0.4049	-3.56	0.000***
Project: Fire Station No.21	0.1316	0.2484	0.53	0.596
Project: Met North	-0.4122	0.3067	-1.34	0.179
Project: San Carlos	-0.02192	0.3076	-0.07	0.943
Project: Southeast Library	-1.1483	0.49317	-2.33	0.020*
The Logarithm Value of the Real Total Wages	-0.08865	0.0436	-2.03	0.042*
The Logarithm Value of the Real Wage Per Hour	0.1649	0.1632	1.01	0.312
Ethnicity: Asian or Pacific	-2.2895	1.1191	-2.05	0.041*
Ethnicity: American Indian	-0.8878	0.5524	-1.61	0.108
Ethnicity: Hispanic	-0.9737	0.3287	-2.96	0.003**
Ethnicity: Other	-1.0703	0.3541	-3.02	0.003**
Ethnicity: Mixed Races	-1.2738	0.3458	-3.68	0.000***
Ethnicity: White	-0.4825	0.3101	-1.56	0.120
Iron Worker	0.7060	0.2915	2.42	0.016*
Carpenter	-0.0684	0.3469	-0.20	0.844
Laborer	0.2505	0.3040	0.82	0.410
Operating Engineer	0.4102	0.5681	0.72	0.470
Plasterer Drywall	-0.5314	0.4605	-1.15	0.249
Roofer	1.1156	0.3168	3.52	0.000***
Electrician	-3.2044	1.6547	-1.94	0.053
Plumber Fitter	0.4009	0.4270	0.94	0.348
Sheet Metal Worker	-0.5949	0.9062	6.40	0.000***
Constant	6.2577	0.9772	6.40	0.000***
Number of obs=1838 F(4, 3580)=28.85 Prob>F=0.0000 Root MSE=2.606 R-sq=0.1246				

Note: * *p*<0.05, ** *p*<0.01, *** *p*<0.001

5 Conclusion

We evaluate the effect of factors associated with the distance of worker to project using the data of several public building projects constructed in San Jose, California over the past 5 years. Via the data analysis, we find that:

1. Contractors like to hire construction workers in the local labor market, and construction workers are closer to their contractors than to the projects. Occupations such as construction do not allow workers to pick a job site and then select a home, as their construction jobs change too fast, and the cost of changing home is too high. Their strategy then is to pick a contractor and follow that contractor's work, or to pick a home and then pick a nearby contractor. Therefore, it is not the overall employment that matters but the employment of the contractor they work for.

2. The regression results show that variable specialty contractors, but not general contractors, impact the distance of worker to project significantly in the statistical sense, and also this effect is negative. Then we infer that specialty contractors bring workers from closer to the job site compared to general contractors, and specialty contractors rely more upon local union hiring halls, whereas general contractors may try to attach workers to them and have them follow these contractors' work.

3. Contractors can endure a much longer commute distance than workers, and the larger the employment size of the project, the more employees per contractor. Those workers will have a shorter commute distance, as contractors with a substantial amount of work on a project do not bring all their workers with them but hire locally.

4. The effect of variables real total wages and real wages per hour on the distance of worker to project is statistically significant. The effect of real total wages is negative, and the effect of real wages per hour is positive. This kind of negative effect and positive effect meet the economics theory: higher hourly wages attract workers from father away; if a worker works on a construction site for a short period of time, he or she can endure longer commutes; if a worker works on a construction site for a long period of time, he or she is more willing to choose a shorter commute.

5. The workers in some trades show greater tolerance for longer commutes; these trades are iron-worker, operating engineer, plaster and drywall worker, and roofer.

6. The effects of Asian or Pacific, Hispanic, and other ethnicity, including mixed races, on the distance of worker to project are significant at the 5% level. The regression results also show that all the ethnicities dislike or show aversion to a longer commute distance, but the degree of aversion is different. Those of Asian or the Pacific ethnicity show the highest level of aversion, Whites the lowest.

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