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# BUSINESS SURVIVAL RATE IN CONSTRUCTION INDUSTRY IN RELATION TO OTHER INDUSTRIES: A COMPARATIVE ANALYSIS

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Construction industry is one of the largest industrial sector in the United States that employs close to ten million people and makes a high contribution to the growth of the country's economy. In spite of the huge impact that the industry has on the US economy, construction businesses have a hard time surviving in the market, with construction companies having the least survival rate among all the industries. Five-year survival rate of construction companies is one of the lowest compared to other industries. This study aims at providing evidence that the construction industry suffers the most as compared to the other industries in terms of business survival rate. A General Linear Model was used for statistical analysis. Results show a significant difference between the construction industry and other industries providing evidence that the construction industry businesses have the least survival rate.

*Keywords*: Business failure, Business entry rate, Construction sector, General linear model, US economy.

## 1 INTRODUCTION

Business survival rate is the proportion of companies in an industry remaining operational at the end of a period of time. It can be measured on a yearly basis by finding out the difference between yearly entry and failure rates of enterprises in an industry.

Failure in business is considered to be a state of insolvency which is an event when a company is unable to meet its liabilities (Clusel and Lagarde 2011). Frederikslust (1978) defines failure of a business as an inability to meet its obligations. Rate of failures vary from industry to industry and also from business to business in the same industry.

The failure of businesses has a significant impact on the country's economy. Business failure in the construction industry, which historically accounts for about ten percent to the national gross domestic product and employs about ten million workers (Nunnally 2011), must have a significant impact on the economy of the nation.

The purpose of this study was to make an analysis of companies surviving in construction sector, on a yearly basis, compared with other industrial sectors. Another objective was to find out whether there is a relationship between the rates of emergence of new companies and survival on a yearly basis in nine different sectors of industry in the United States. The sectors of industry chosen were (1) agriculture, forestry, and fishing (AGR); (2) construction (CON); (3) manufacturing (MAN); (4) mining (MIN); (5) transportation, communication and public utilities (TCU); (6) wholesale trade (WHO); (7) retail trade (RET); (8) finance, insurance, and real estate (FIRE); and (9) services (SRV).

# 2 METHODOLOGY

## 2.1 Study Population

The study population was nine different industrial sectors in the United States with a longitudinal database of 38 years from 1977 to 2014. The sample size was 342. Unit of analysis was the business entity or company in an industrial sector.

## 2.2 Data Collection

Data related to business attributes of nine different industrial sectors in the United States was collected from the database of the United States Census Bureau (n.d.). The data for the study consisted of all business related information of the industrial sectors for 38 years from 1977 to 2014. The information included number of establishments in operation at the beginning of a year, number of new entries per year, and number of business exits per year.

## 2.3 Variables

The following variables were used in the study:

### 2.3.1 *Entry rate (ENTRATE)*

This variable identifies the rate at which new businesses emerge and start operations in a particular industrial sector. It was operationalized as a yearly rate as follows:

$$\left(\frac{\text{No.of new companies entering in year } i}{\text{Total no.of companies in operation in year } i}\right) * 100 \quad (1)$$

### 2.3.2 *Survival rate (SURVRATE)*

This variable is the difference between yearly entry and exit rates of companies in a particular industrial sector. It was operationalized as a yearly rate as follows:

$$\left(\frac{\text{No.of new companies entering in year } i - \text{No.of companies exiting in year } i}{\text{Total no.of companies in operation in year } i}\right) * 100 \quad (2)$$

### 2.3.3 *Sector (SECTOR)*

This is a categorical variable that classifies companies by the industry under which the establishment is categorized. The industries were classified as follows: (1) Agriculture, forestry, and fishing (AGR); (2) Construction (CON); (3) Manufacturing (MAN); (4) Mining (MIN); (5) Transportation, communication and public utilities (TCU); (6) Wholesale trade (WHO); (7) Retail trade (RET); (8) Finance, insurance, and real estate (FIRE); and (9) Services (SRV).

# 3 ANALYSIS AND RESULTS

The data was analyzed using General Linear Model (GLM). It is an analysis of variance procedure in which the calculations are performed using a least squares regression approach to describe the statistical relationship between one or more predictors and a continuous response variable. Predictors can be factors and covariates. The design may either be balanced or unbalanced. GLM can perform multiple comparisons among or between factor level means to find significant differences. The following model was used for analysis:

$$SURVRATE = \beta_0 + \beta_1 SECTOR + \beta_2 ENTRATE + \varepsilon \quad (3)$$

where (1) ENTRATE = the rate at which new businesses emerge and start operations in a particular industrial sector, (2) SECTOR = categorical variable classifying companies by industrial sectors under which the establishment is categorized, (3) SURVRATE = the difference between yearly entry and exit rates of companies in a particular industrial sector, (4) $\beta_0$ = intercept, (5) $\beta_1$ and $\beta_2$ = regression coefficients, and (6) $\varepsilon$ = error term.

Results of the analysis are shown in Tables 1, 2, and 3.

Table 1. Results of general linear model analysis.

| **Source** | **F-value** | **Significance (p-value)** |
|---|---|---|
| Corrected Model[a] | 204.660 | 0.000 |
| Intercept | 276.742 | 0.000 |
| ENTRATE | 1239.314 | 0.000 |
| SECTOR | 29.325 | 0.000 |

a. $R^2 = 0.847$ (Adjusted $R^2 = 0.843$)

Table 2. Parameter estimates (t-values).

| **Parameter** | **Coefficient** | **t-value** | **Significance (p-value)** |
|---|---|---|---|
| Intercept | -4.166 | -13.620 | 0.000 |
| ENTRATE | .858 | 35.204 | 0.000 |
| SECTOR = AGR | -1.038 | -3.583 | 0.000 |
| SECTOR = CON | -3.168 | -11.439 | 0.000 |
| SECTOR = FIRE | .359 | 1.364 | 0.173 |
| SECTOR = MAN | -.766 | -2.958 | 0.003 |
| SECTOR = MIN | -1.282 | -4.873 | 0.000 |
| SECTOR = RET | -1.630 | -6.198 | 0.000 |
| SECTOR = SRV | -.510 | -1.927 | 0.055 |
| SECTOR = TCU | -.864 | -3.157 | 0.002 |
| SECTOR = WHO | 0[a] | . | . |

a. This parameter is set to zero because it is redundant.

Table 3. Pairwise comparison of SURVRATE.

| **Comparison** | **Mean difference** | **Significance (p-value)** |
|---|---|---|
| CON vs AGR | -2.130* | 0.000 |
| CON vs FIRE | -3.527* | 0.000 |
| CON vs MAN | -2.402* | 0.000 |
| CON vs MIN | -1.886* | 0.000 |
| CON vs RET | -1.538* | 0.000 |
| CON vs SRV | -2.658* | 0.000 |
| CON vs TCU | -2.304* | 0.000 |
| CON vs WHO | -3.168* | 0.000 |

* The mean difference is significant at the .05 level.

The model has been derived from empirical data. Predictive efficacy of this particular model was found to be quite high with an $R^2$ of 0.847, and an adjusted $R^2$ of 0.843. This means that about 84 percent of the variances in survival rates are explained by the variables included in the model. Figure 1 shows how close the data is fitted to the regression line.

The F-value of the model was found to be 204.660, which is statistically significant at less than the 0.0001 level. It indicates that the model, as a whole, accounts quite well for the behavior of the predictor variables.

ENTRATE, as hypothesized, was found to have a statistically significant positive relationship with the dependent variable SURVRATE at a level of significance of less than 0.0001 (Figure 1). When the data is segregated for the construction industry, the regression line seems to have a much closer fit (Figure 2).

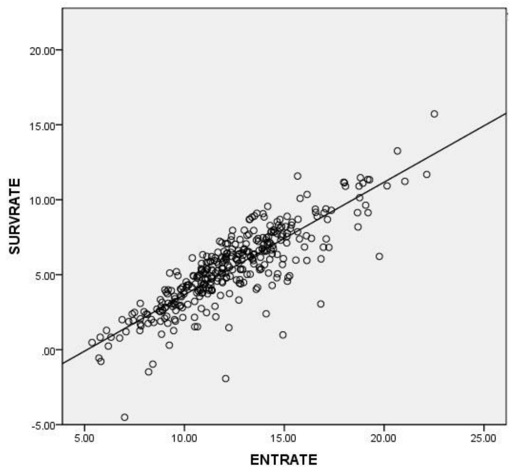


Figure 1. Relationship between entry and survival rates in all industrial sectors.

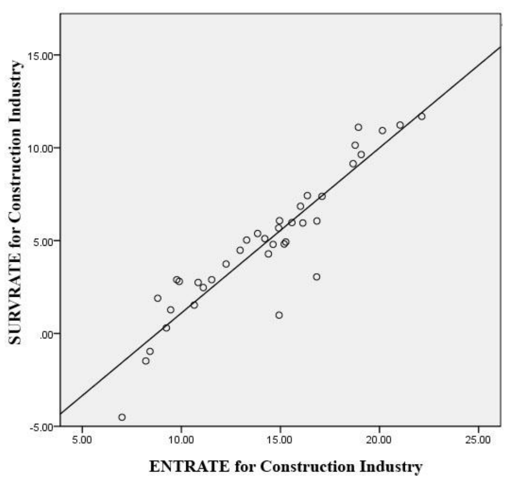


Figure 2. Relationship between entry and survival rates only for construction industry.

SECTOR also had a statistically significant relationship with SURVRATE at the level of significance less than 0.0001. All industrial sectors, except FIRE and SRV, were found to have statistically significant relationship with SURVRATE. The mean SURVRATE in construction industry was found to be the lowest among all sectors.

## 4 DISCUSSIONS

Survival rate of businesses, as found in this study, is a function the emergence of new enterprises and industrial sectors. But the factors that trigger business failure were beyond the scope of this research.

Kangari (1988) stated long back that "the construction industry has characteristics that sharply distinguish it from other sectors of the economy. It is fragmented, very sensitive to economic cycles, and highly competitive because of the large number of firms and relative ease of entry (p. 173)." This discussion highlights some of the probable determinants of survival rate specific to the construction industry.

According to Kisner and Fosbroke (1994), the construction industry is plagued with injuries and hazards. The construction industry has the highest fatal injuries and workdays lost among all the industries (Dong *et al*. 2014). Because of higher degrees of exposures to occupational hazards in construction industry compared to other sectors, construction industry confronts an increased level of risks associated with safety. At times, it may lead to business closures.

Another risk that sets the construction industry apart from other industries is the seasonal slowdown that is witnessed in extremely hot or cold seasons. According to Koehn and Brown (1985), works in extreme weather conditions (either cold or hot) are often stalled or slackened in most of the United States. Therefore, seasonal sluggishness is one of the risks that can have an enormous impact on the survival of construction businesses.

The risk associated with change orders and project delays are commonly occurring risks in the construction industry. Change orders, leading to delays, may sometimes have a negative impact on the productivity and efficiency of a project (Moselhi *et al*. 2005). A study by Srdic and Selih (2015) indicates that delays in projects can often lead to additional costs, conflicts and litigation. It often renders businesses vulnerable, making them struggle for survival.

Poor quality of work leads to increased work hours for labors and equipment, resulting in increased overall expenses for a contractor (Love *et al.* 2016). Survival of companies may be at stake if quality of work is not maintained.

One last thought about the low survival rate of businesses in construction industry is related to innovations. One of the main reasons for low productivity and quality of products in comparison with other industries is believed to be a lack of innovation (Yusof *et al*. 2014). Existing empirical studies consistently find a positive relationship between innovative activity and company survival (Yusof *et al*. 2014, Buddelmeyer *et al*. 2006). Successful innovations have been found to have clear positive effects on survival in other industries.

## 5 CONCLUSIONS

This study was conducted to find out whether survival rates of businesses are lower than those in other industrial sectors in the United States. The objectives of the study were twofold: (1) to make a comparative analysis between construction sector and other industrial sectors with respect to survival rates on a yearly basis and (2) to find out whether there is a relationship between the rates of emergence of new companies and survival in nine different sectors of industry in the United States. The data, obtained from the United States Census Bureau, was analyzed using a General Linear Model. The spread of the data incorporated a time period of 38 years from 1977 to 2014. The findings provide evidence that the construction industry has the least business survival rate among the nine industrial sectors taken into consideration for this study.

The scope of the study did not include the analysis of the actual determinants of business survival rate in the construction industry. Some conjectures were made on the probable causes that might have an effect on business failure. The factors include risks associated with safety, injuries, and fatalities; seasonal slowdown; changes in scope of work; time overrun; quality of work; labor productivity; and technical innovations. Future studies related to business survival in construction industry may include some or all of these factors to find out the correlates of survival rate in the industry.

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