

Impact of the Global COVID -19 Pandemic on the Earnings of the Construction Industry

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Abstract: The past two and half years has witnessed the huge impact of COVID-19 on the world economy. Construction industry is a pillar of the economy, buildings such as factories and warehouses and structures such as roads, docks, and dams required by various material production departments of the national economy are all products of the construction industry; machinery and equipment of industrial enterprises must also be installed by construction enterprises to form the final production capacity. is going through huge effect caused by COVID-19. This research aims to develop an understanding of how much, from which aspects and at what ratio the COVID -19 pandemic have affected the earning of construction industry by calculating the relative earnings of the construction industry through the data collected about four cities around the world. The result showed that Both the income and cost of the construction industry suffered from loss at the first stage of covid-19 pandemic. While London and NYC went through more loss in construction industry compared with Beijing and Wuhan.

Keywords: Covid-19, construction industry, construction

1. Introduction

The past two and half years has witnessed the huge impact of COVID-19 on the world economy. The health challenges [1] and multifaceted challenges caused by different kinds of restrictions[2] it brought about has caused extraordinary obstacles on international trade, supply chain, the fluency of skilled labor [3] material [4] and project suspension[5], resulting in the increased unemployment and decreasing speed of global economic growth [6].

Construction industry is a pillar of the economy, which takes 7% of the world employment and 10% of gross domestic product (GDP) (International Labour Organization,2017). COVID-19 has also brought about huge direct and indirect negative impact to the construction industry, including the hazard of COVID -19 infection of the staff members, the rise of prize and lack in supply of material, the closure of construction sites under the lock down policy of different countries, the decreasing price and the amount of order. Construction industry around the world , especially in the developing countries, can hardly afford the long term close and other negative effect brought by the virus pandemic.

The earnings of construction industry can be easily calculated by minus the cost with income. Therefore, in order to investigate the effect of COVID -19 on the earnings of the construction industry.

How did the virus pandemic influence the income and cost of different aspect, is the basic analysis need to be conducted through this study.

2. Aims and Objectives

The aim of this research is to develop an understanding of how much, from which aspects, and at what ratio the COVID-19 pandemic has affected the earning of the construction industry.

To achieve this aim, the following objectives are undertaken: gathering information about the cost and income of construction projects of different categories from different cities around the world with different economic backgrounds, proportion of COVID-19 infections, proportion of vaccination ratio, and period of lockdown. Moreover, investigate the effect of the relation between the cost, income of different kinds of construction projects and the COVID-19 situation in that area with the time unit of month.

3. Methodology

The methodology taken in this research is the data analysis on the base of some case studies.

Firstly, the data about the cost and income of construction projects from different backgrounds, along with the data showing the COVID-19 situation in these areas, are gathered. Secondly, these data will be classified into different categories and parked in the table developed as a database. And thirdly, this information will be used to develop the Figures and tables showing the effect of COVID-19 on the earning of construction projects from different backgrounds.

In this study, the effect of COVID-19 was generally evaluated by the proportion of COVID-19 infections, the proportion of vaccination ratio, the period of lockdown, and the GDP reduction of the city caused by the pandemic. While the cost and earnings of the projects are evaluated through the data of the material prize, the average salary of the skilled workers, and government investment in the infrastructure during 2020. The detailed information on the data collected is shown in the following Table 1. The information.

Table 1: Categories of information gathered.

INFORMATION ABOUT VIRUS PANDEMIC		
COVID -19 PANDEMIC INFORMATION	proportion of COVID-19 infections	
	proportion of vaccination ratio	
	Days of lock down	
INFORMATION ABOUT CONSTRUCTION PROJECTS EARNINGS		
COST REALTED INFORMATION	Prize of Material	Cement
		Aggregate
		Steel
	Land Prize	
	Design and consultant prize	
	Average Worker salary	
INCOME RELATED INFORMATION	Residential Projects	Average prize of houses/apartment
		Average rent of houses/apartment
	Commercial projects	Average high street and shopping center rents
	Govenment investment on Infrustructural projects	

In order to find out the effect of the virus on the construction industry, monthly relative value was used to conduct further analysis, the equation of relative value is shown as follows:

$$\text{Relative value of } x^{\text{th}} \text{ season in } y \text{ year} = \frac{\text{value of } x^{\text{th}} \text{ season in } y \text{ year}}{\text{value of } x^{\text{th}} \text{ season in 2019}} \quad (1)$$

Four cities around the world were selected as specimens to conduct the following analysis, including Beijing, Wuhan, London, and New York.

Wuhan, which is widely believed to be the first city going through the COVID-19 crisis, has unique research value and significance and was selected to be the first subject of research.

Beijing, the capital city of China, has continuously taken the strictest politics and rules to control COVID-19. Apart from this, China has been the country with the largest amount and scale of construction projects for over ten years. Therefore, Beijing was also selected to investigate the effect of the virus pandemic.

London and New York are not only the most prominent cities but also the largest trade centers all around the world. The tertiary industry took the majority of the GDP in these two cities, while COVID-19 had a highly significant adverse effect on the tertiary industry. Because of these, data from New York and London were also selected to conduct the analysis.

The following part has compared the effect of COVID-19 on the earning of the construction industry in these four different cities through the years of 2019, 2020, 2021, and 2022, which can hopefully find out reasons from which aspects have caused the actual economical loss in construction industry earning.

4. Result and Discussion

4.1. COVID-19 Situation Comparison of Four Cities

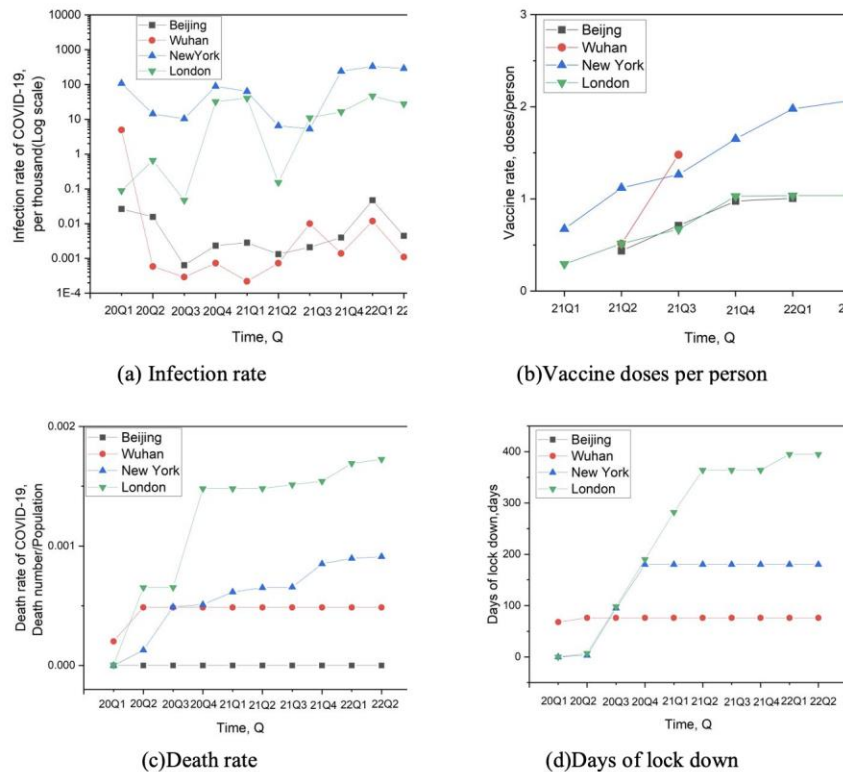


Figure 1: Data used to evaluate the COVID-19 effect and response.

Figure 1 was developed on the basis of data collected from the government statistics website of UK, US, and China. It is clear that at the very first age, Wuhan and Beijing suffered the most from the COVID-19 situation, but since the second season of 2020(Q2), the city of London and New York went through a terrible pandemic.

Figure 1(a) and (c) showed that Beijing and Wuhan have quickly taken the COVID-19 under control since Q2 of 2020, It is mainly because of the very strict rules including cut off all the transport going out off Wuhan since 28th of March. The peak of infection and death rate of London and New York showed almost at the same time,; Q4 of 2020 and Q4 at 2021, corresponding to the existence two new kinds of virus with high infectivity: SARS-CoV-2 and Omicron Covid-19 variant.

Figure1(b) and (d) showed the response of these cities against the virus, London went through the longest period of lock down, followed by the city of New York, Wuhan got totally locked down at the first season, but went through no extra restriction afterward. London is now having the highest level of vaccine rate, which is believed is the corresponding methods to reduce the high death and infection rate.

4.2. Relation Between Relative Earning of Construction Projects and Proportion of Covid-19 Infection

In this study, in order to find out the effect of COVID-19 on earnings, the following simplified equation was used to calculate the relative earning of the construction industry over the past two and half years. It should still be noted that this calculation didn't take the actual income and cost into account, therefore, can only be used as a reference. In equation (2), the relative income means the average value of three income-related values. And the relative cost is the average value of five cost-related value

$$\text{relative earning} = \text{relative income} - \text{relative cost} \quad (2)$$

The result is shown in the following figure 4, together with the infection rate from Figure1(a).

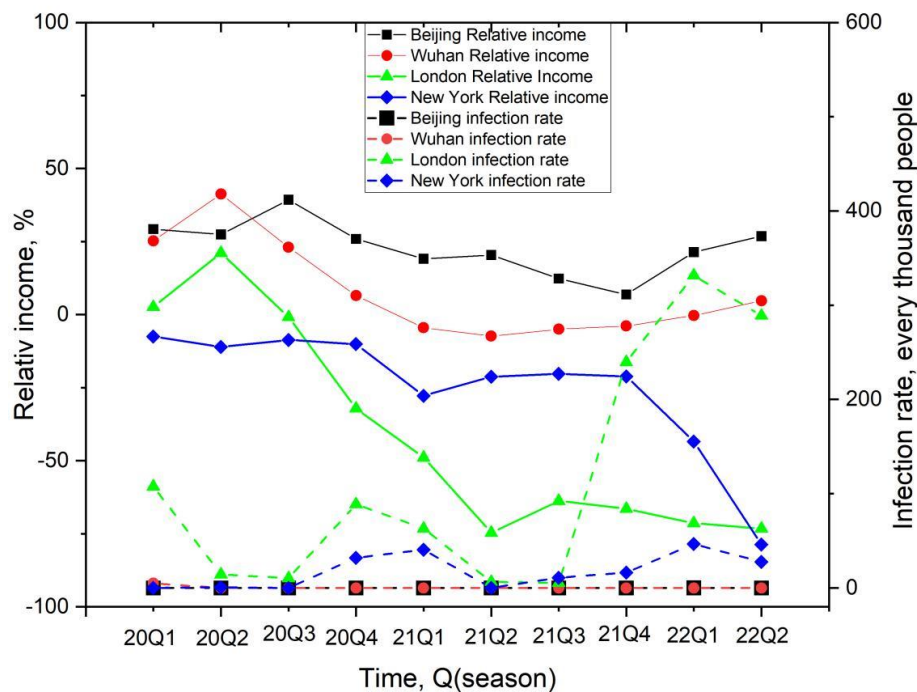


Figure 2: Relative earnings of the construction industry in four cities.

It is obvious that except Beijing, Beijing and Wuhan witnessed the steady increase in earning compared with the year 2019 while New York and London went through great decrease of about 70% at the year of 2022. Construction industry in London suffered from the largest loss since it has gone through the decrease of over 50% since the early season of 2021. These phenomenon may be caused by the following reasons:

(1) China, as a developing country, has larger potential in the construction industry compared with developed countries like London and New York.

(2) The economy of Wuhan and Beijing relied primarily on Secondary industries, including manufacturing. Which has higher resistance to the effect caused by COVID-19.

(3) The first stage of the lockdown policy in China is efficient in long-term control of the virus.

When being compared with the infection rate data shown in break lines, the earning line is showing an opposite trend compared with the infection rate line, the phenomenon is evident in London and New York lines.

5. Conclusion

This study collected the data gathered from the government websites, and established one equation to calculate the appropriate earnings of construction industry relative the earning of 2019, the year before COVID-19 pandemic. Following are the conclusions according to the analysis in this study:

(1) London and NYC went through more loss in construction industry compared with Beijing and Wuhan. It is believed that the larger potential in construction industry, higher percent of manufacture in economic and stricter lock done policy at the first stage is the main reason for this phenomenon.

(2) Both the income and cost of the construction industry suffered from loss at the first stage of covid-19 pandemic. The price of material, average salary, along with the prize and rent of houses and retail shops all went through a decrease at the first and second quarters of 2020. However, the effect of COVID-19 is more significant in the retail rent.

References

- [1] Amoah, C. and Simpeh, F. (2020), "Implementation challenges of COVID-19 safety measures at construction sites in South Africa", *Journal of Facilities Management*, Vol. 19 No. 1, pp. 111-128, doi: 10.1108/jfm-08-2020-0061.
- [2] Ogunnusi, M., Hamma-Adama, M., Salman, H. and Kouider, T. (2020), "COVID-19 pandemic: the effects and prospects in the construction industry", *International Journal of Real Estate Studies*, Vol. 14 Special Issue 2, pp. 120-128.
- [3] Sierra, F. (2021), "COVID-19: main challenges during construction stage", *Engineering, Construction and Architectural Management*. doi: 10.1108/ecam-09-2020-0719.
- [4] Alsharef, A., Banerjee, S., Uddin, S., Albert, A. and Jaselskis, E. (2021), "Early impacts of the COVID-19 pandemic on the United States construction industry", *International Journal of Environmental Research and Public Health*, Vol. 18 No. 4, p. 1559.
- [5] Agyekum, K., Kukah, A.S. and Amudjie, J. (2021), "The impact of COVID-19 on the construction industry in Ghana: the case of some selected firms", *Journal of Engineering, Design and Technology*, ahead-of-print(ahead-of-print). doi: 10.1108/jedt-11-2020-0476.
- [6] Amponsah, R. and Frimpong, I.A. (2020), "Ghana in the face of COVID-19: economic impact of coronavirus (2019-NCOV) outbreak on Ghana", *Open Journal of Business and Management*, Vol. 8 No. 04, p. 1404.