

Original Research Article

A model of The Impact of Sudden Public Crisis Events on Real Wages

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Abstract: Sudden public crises bring greater uncertainty to the global economy, and the effects are likely to persist. This paper starts from the impact of sudden public crisis events on enterprise costs, constructs a model of the impact of sudden public crisis events on real wages, and deduces that sudden public crisis events will increase the price level by increasing the cost of enterprises, resulting in enterprises' withdrawal and real wages decline. This paper provides theoretical support for government departments to implement more targeted policies to deal with the impact of sudden public crisis events on the economy.

Keywords: Sudden Public Crisis Events; Real Wages; Enterprise Costs; Theoretical Model

1. Introduction

Most countries in the world are in economic and social transition period, environmental pollution, medical care, employment security, demolition, resettlement, Internet finance and other sudden public crisis events occur frequently (Lai S. P., 2013; Leidner D. E., Pan G., Pan S. L., et al., 2009; Weller T., Bawden D., 2005). The occurrence of sudden public crisis will not only bring serious harm to the health and life of the public, but also have a huge impact on the social economy. For example, in 1997, the bird flu in Hong Kong caused many deaths, and more than 1.4 million chickens were slaughtered and destroyed. The government compensated the chicken dealers for the loss of HK \$140 million. In the case of foot-and-mouth disease in Taiwan, 3.8 million pigs were killed, resulting in a direct economic loss of \$15 billion. In 1999, dioxin pollution in livestock and poultry products and dairy products caused high levels of dioxins in Belgium, which also caused huge economic losses in European countries that year. At the time, in Belgium alone, direct losses amounted to 355 million euros in half a year and indirect losses reached 1 billion euros (Zhang X. L., 2003). China was affected by SARS, in April 2003, the number of overseas tourists in Beijing dropped by about 60% year on year.

The enterprise is the main force of the contemporary economy and represents a mainstream form of industrial organization that represents the direction of social and economic development (Li G. Y., Huang N. H., 2001). It has great advantages and irreplaceable effects in terms of increasing employment, increasing competition intensity, and enhancing overall economic vitality (Wu J. L., 1999). It can be seen that enterprises play a very important role in the economy and society. Therefore, to correctly and deeply understand the impact of sudden public crisis events on the global economy, we can start with the impact of sudden public crisis events on micro-enterprises. After the outbreak of the sudden public crisis in early 2020, global companies have encountered multiple problems involving various links in the industrial chain, such as delays in labor resumption, cut-off of raw material supply, and severe shrinking of domestic and foreign demand (Sun W., Dong W. Y., Song N., 2020). The International Labor Organization released a report on April 30, showing that the sudden public crisis in early 2020 has exposed more than 436 million companies worldwide to production and operation risks². According to an online questionnaire survey conducted by the Chinese Academy of Fiscal Sciences, 59.88% of the entity companies' profits fell or lost in the first half of the year, and 30.87% of the entity companies will continue to make substantial losses this year based on their losses last year (Zhao Z. G., 2020), which shows that the sudden public crisis in early 2020 has had a huge impact on the global economy. The Global Economic Outlook released by the World Bank on June 8 shows that the global economy will shrink by 5.2% in 2020, which also confirms the above conclusion.

However, in our field of vision, there are few literatures to derive theoretical models from the enterprise level to demonstrate the impact of sudden public crisis events on the real wages. In this paper, we draw on Yeaple's (2005) research ideas on heterogeneous corporate wages. According to the research purpose, the sudden public crisis events are introduced into the analysis framework,

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2 Data Sources:<http://www.chinanews.com/gj/2020/04-30/9172541.shtml>.

and the equilibrium condition of zero profit is used to analyze the impact of sudden public crisis events on real wages.

2. Assumptions

(1) This paper sets the constant elasticity of substitution utility function of representative consumers as follows:

$$U = \ln Q - L(C)$$

Where the total output of goods $Q = (\int_0^N q_i^{\frac{\sigma-1}{\sigma}} di)^{\frac{\sigma}{\sigma-1}}$, q_i denotes the output of commodity i , σ denotes the elasticity of substitution between commodities ($\sigma > 1$), C denotes sudden public crisis events, and $L(C)$ increases as C increases, which denotes the negative effects of sudden public crisis events on consumers.

According to the maximization of consumer utility, the consumer demand function for commodity i is:

$$q_i = \left(\frac{E}{P}\right) \left(\frac{p_i}{P}\right)^{-\sigma}$$

Where E denotes total expenditure, and p_i denotes the price of commodity i .

The overall price index of the commodity:

$$P = \left(\int_0^N p_i^{1-\sigma} di\right)^{\frac{1}{1-\sigma}}$$

(2) Assuming that the total number of workers in the market is M , there are only differences in skills among workers. Use Z to represent the skill level of the worker. The larger the value of Z means the higher the skill of the worker. The skill distribution of workers can be represented by the function $G(Z)$, the density is $g(Z)$, $Z \in [0, +\infty)$.

(3) Assuming that the industry structure is monopolistic competition, labor is the only factor of production. Companies have different production technologies to choose from. When the skill of a worker is represented by Z , the productivity of the worker can be represented by $\varphi(j, Z)$, where j is an index representing the technology used by workers with skill Z . And $\varphi_1(j, Z) > 0$, $\varphi_2(j, Z) > 0$. In order to facilitate subsequent derivation, assuming that the company can choose two production technologies, which means $j \in \{H, L\}$, where H refers to high technology or new technology, and L refers to low technology or old technology.

Further, I assume $\varphi(j, 0) = 1$, then $\ln \varphi(j, Z) \geq 0$, further $\frac{\partial \ln \varphi(H, Z)}{\partial Z} > \frac{\partial \ln \varphi(L, Z)}{\partial Z} > 0$, so I can get

$$\frac{1}{\varphi(H, Z)} \frac{\partial \varphi(H, Z)}{\partial Z} > \frac{1}{\varphi(L, Z)} \frac{\partial \varphi(L, Z)}{\partial Z} > 0$$

Company which applies H or L technology for production must pay a fixed cost of F_H or F_L , and $F_H > F_L$.

3. Equilibrium without sudden public crisis events

For an enterprise using technology j , the unit cost of production by a worker with skill Z is $W(Z)/\varphi(j, Z)$. In a perfectly competitive labor market, the wage distribution of Z will be adjusted to a state of equilibrium, in which the unit cost of all companies using the same technology is the same. Companies will comprehensively consider the technology applied and the distribution of balanced wages, and minimize costs by constantly adjusting their behavior. Set C_H and C_L as the unit cost of the enterprise applying the corresponding technology for production.

Obviously, if a worker with skill Z works in a company that utilizes the L technology, then all workers with skill $Z < \bar{Z}$ will only be employed in companies that utilize L technology. Defining the skills of the most skilled workers employed by enterprises that use L technology as Z_1 , the wage distribution in the competitive labor market is:

$$W(Z) = \begin{cases} C_L \varphi(L, Z), 0 \leq Z \leq Z_1 \\ C_H \varphi(H, Z), Z \geq Z_1 \end{cases}$$

Set $MR_L = P_L = 1$, $W(Z)$ is a continuous function, then $W(Z_1) = C_L \varphi(L, Z_1) = C_H \varphi(H, Z_1)$, and the unit cost can be expressed as:

$$\begin{cases} C_L = 1 \\ C_H = \varphi(L, Z_1)/\varphi(H, Z_1) < 1 \end{cases}$$

As shown in Figure 1, the wages of workers with certain skills can be maximized when they choose a company which applies a certain technology that suits them. The wage distribution gradient increases at the critical point Z_1 because new technologies are more sensitive to skills and the value of additional unit workers' skills is greater.

It should be noted that the marginal revenue of the firm, that is, the product price, is always equal to the marginal cost, so we can get the ratio of the revenue of the firm using technology H and technology L as: $R_H/R_L = (C_H/C_L)^{1-\sigma}$.

4. Equilibrium with sudden public crisis events

(1) The sudden public crisis events. In the first quarter of 2020, the research team of the Chinese Entrepreneur Survey System conducted a questionnaire survey of thousands of enterprises and found that the main problem that the sudden public crisis in early 2020 has brought to enterprises is the increase in cost pressures. (Chinese E. S. S., 2020) For example, the increase in labor costs causes an increase in variable cost τ , and an increase in fixed cost F caused by crisis prevention expenses. It is worth noting that the sudden public crisis events will reduce the labor force in the market. We denote the new total labor force as M_A or M_B .

(2) Equilibrium with sudden public crisis events. Taking into account the increase in fixed costs and variable costs of enterprises caused by the sudden public crisis events, compared with the absence of sudden public crisis, the income of enterprises using technology j has decreased by $(1 - \tau^{1-\sigma})$ ratio. Correspondingly, the income is $R_j \tau^{1-\sigma}$, and the fixed cost becomes $C_j(F_j + F)$.

Let us discuss the following two situations:

Case A: $F_L > F \cdot \tau^{\sigma-1}$, $\sigma > 1$; $M > M_A$.

Case B: $F_H > F \cdot \tau^{\sigma-1} > F_L$, $\sigma > 1$; $M > M_A > M_B$.

When situation A occurs, the sudden public crisis events will have less impact on the company, and will not cause one type of company to completely withdraw from the market, and both types of companies will continue to produce. Through equation (7), the new income ratio is:

$$\frac{R_H^A}{R_L^A} = \left(\frac{C_H}{C_L}\right)^{1-\sigma} = \frac{C_H(F_H + F)}{C_L(F_L + F)}$$

Organize the above formula to get:

$$\frac{C_H}{C_L} = \frac{\varphi(L, Z)}{\varphi(H, Z)} = \left(\frac{F_H + F}{F_L + F}\right)^{-\frac{1}{\sigma}}$$

Proposition 2: In case A, the sudden public crisis events caused a small increase in the fixed cost F of enterprises, which will reduce Z_1 , that is, increase the share of labor hired by companies applying technology H and reduce the share of labor hired by companies applying technology L ($dZ_1 dF < 0$).

In addition, the number of various types of enterprises has also changed:

$$N_H^A = \frac{M_A}{\sigma(F_H + F)} \int_{Z_1}^{+\infty} \varphi(H, Z) dG(Z)$$

$$N_L^A = \frac{M_A}{\sigma(F_L + F)} \int_0^{Z_1} \varphi(L, Z) dG(Z)$$

The new price index is:

$$P_A = \frac{1}{\alpha} \left(\frac{M_A}{\sigma(F_L + F)}\right)^{\frac{1}{1-\sigma}} \left(\int_0^{Z_1} \varphi(L, Z) dG(Z)\right)^{\frac{1}{1-\sigma}}$$

5. Conclusion

Since the outbreak of the sudden public crisis in early 2020, it has added more uncertainty to the global economy. Although various countries have introduced various policies to prevent the event from spreading further, the increasing number of deaths and confirmed cases suggests that these policies are not very effective. By constructing a model, this paper derives the adverse effects of the expanding sudden public crisis events on the economy, including inflation, some companies withdrawing from the market, and the decline in real wages of companies that have not withdrawn from the market. This shows that countries should implement more targeted policies and actively promote enterprises to resume work and production on the premise of preventing the spread of sudden public crisis as soon as possible, so that the global economy can get out of the trough as soon as possible.

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