Analysis of the degree to which the industry is affected by the epidemic based on the housing provident fund payment data

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ABSTRACT

Affected by the outbreak of the novel coronavirus pneumonia (COVID-19) in early 2020, the economy of all walks of life in China has been affected to varying degrees. To analyze the extent to which various industries in a certain provincial city(call it A city) are affected by the epidemic, this paper statistically analyzed the payment data of housing provident fund in A city over the last three years.

According to the final time of paying the housing provident fund, the dataset is divided into the following three categories: the final payment time is after June 2020, the final payment time is January to May 2020, and the final payment time is before December 2019. It also conducts statistical analysis on the jump payment behavior, deferred payment behavior, number of employees, monthly payment, and other data in various segments in different industries, and finally explained the industries are affected by the epidemic and their impact.

Keywords: Housing provident fund, data analysis, epidemic, industry

1. INTRODUCTION

Housing provident fund refers to a long-term housing deposit deposited by state agencies, state-owned enterprises, foreign-invested enterprises, urban enterprises, public institutions and their current employees. It belongs to the "one fund" in the "five insurances and one fund" in the basic welfare of enterprise employees. ", is social welfare for housing. Provident fund is paid by the company and individual employees according to a certain proportion of the employee's salary. Enterprises that pay the housing provident fund need to make long-term uninterrupted payments during the employee's employment period and under no special circumstances.

In social development, various enterprises have become an indispensable part. In addition to the salaries paid to employees, the development of an enterprise can also be seen from the various insurance and housing provident funds provided by the enterprise. Outstanding companies can attract the talents they need through salaries and housing provident funds and other benefits, reduce employee mobility, and increase their enthusiasm for work and their recognition and loyalty to the company. It can be seen that the essential attribute of provident fund is salary, which is regarded as part of employee compensation. Because the housing provident fund needs to be paid by the company and its employees, the company's business status can also be seen through the company's payment and payment period.

1.1. Related Work

According to the generation type of assumptions, we divided the existed work into two categories.

At the beginning of 2020, the new type of coronavirus pneumonia spread on a large scale worldwide, and the socio-economic development has been affected to a certain extent [1-2]. Various industries have received varying degrees of impact, such as the information service industry [3], the service industry [4-5], foreign trade [6], financial industry [7-8], education [9], agriculture [10], etc. The state has issued a policy that Companies eligible for deferred payment can apply for deferred payment of housing provident fund during the epidemic. Based on the new national regulations and A city's housing provident fund payment data, this paper analyzes the extent to which various industries in A city are affected by the epidemic.

Since there is almost no data analysis related to the housing provident fund paid by enterprises at this stage, the data analysis on the housing provident fund on the market is based on the way users apply the housing provident fund, so it is necessary to analyze the data on the housing provident fund paid by enterprises. And due to the particularity of the outbreak this year, it is extremely necessary to use this data to analyze the degree of impact of various industries during the epidemic.

2. HOUSING PROVIDENT FUND DATA OVERVIEW

2.1. Housing Provident Fund Data Source And Selection

This paper selects the detailed data (from January 2017 to June 2020) of the payment and remittance of the Companies that paid the housing provident fund in A city for the past three and a half years and combined the company data with the time node of the outbreak in January 2020 Divided into the following three categories: the final payment time is after June 2020, the final payment time is January to May 2020, and the final payment time is June to December 2019. Therefore, it is the basis of this paper to analyze the changes in the provident fund data of various industries' provident fund payment Companies before and after the epidemic.

This paper analyzes the detailed data of the enterprises that have paid housing provident fund in A city for the past three years, and extracted the data that can reflect the.business situation of the enterprise in the detailed data, and obtained the housing provident fund payment data table. The data summary is shown in the following table 1.

Table 1 Housing Provident Fund Contribution Data Summary Table

Data name	Data meaning
Number of paied employees	The total number of employees who have paid the provident fund
Company monthly payment	The total amount of provident fund paid by the enterprise in the month
Company deferred	An act of enterprises delaying the payment of provident fund
Company skip payment	An act of withholding the provident fund
Company normal and continuous payment	The behavior of the enterprise to continuously pay the provident fund monthly
Company Nature	Refers to the nature of entities such as agencies, organizations, legal persons, and enterprises that are not natural persons or their subordinate departments. It is used to distinguish the category relationship of the places where wage earners work.
Company category	The industry category to which the company belongs in the national economic industry classification.

In the housing provident fund payment data table(Table 1), we subdivided the three data of the company's deferred payment, skipped payment, and normal continuous payment of the housing provident fund companies, combined with the time point when the company finally paid the housing provident fund. For specific analysis, see section Three chapters.

3. CLASSIFICATION OF PAYMENT BEHAVIORS ACCORDING TO THE FINAL PAYMENT TIME

At the beginning of 2020, with the COVID-19 across the country, various industries and fields have been affected to varying degrees. The country has also issued new regulations related to the payment of housing provident funds. For example, a company affected by pneumonia may apply for deferred payment of housing provident fund before June 30 2020 as per regulations. This paper considers the impact of the epidemic on the company's payment of housing provident funds, combined with the time when the company finally pays the housing provident fund, the company's payment and payment behavior is divided into the following three categories:

(1) The final payment time is after June 2020. In the data of the provident fund paid by companies, the time point of the payment data of this type of company covers all stages of the epidemic. Therefore, we divide this type of company data into two types: before January 2020 and January to June 2020. , And then compare and analyze the industries with jumped payment, postponement, changes in the number of employees, and changes in monthly payment in these two types of segmented data.

(2) The final payment time is from January to May 2020. In the company's provident fund data, the payment data shows that this type of company was normally paied before the outbreak of the epidemic. After the outbreak of the epidemic, the payment began to be withdrawn from January to May 20. Therefore, for this type of company, we will explain the data in detail. We divided the data into two categories: before January 2020 and from January to May 2020 and then compare and analyze the industries that have jumped payment, postponed payment, changes in the number of employees paid, and changes in monthly payment amounts in these two types of subdivision data

(3) The final payment time is before December 2019. In the company's provident fund data, this type of company's payment data has been withdrawn before the outbreak of the epidemic. For this type of company, this paper will also analyze the type of jump payment, postponement, change in the number of employees paid, and monthly payment. For industries with changing stocks, finally compare the results of the first two categories to analyze whether the industry types between them are similar.

3.1. Analysis of jump payment in various segments

This paper counts the jump payment information of the companies that pay housing provident funds in A city and conducts a description and analysis according to the three data categories above.

The first type of final remittance is in the jump payment data of the industries in June 2020 and later. The industries in these industries that have jumped in December 2019 and before including scientific research and technical services, leasing and business services. The nature of its companies is all limited liability companies. The industry that jumped over after January 2020 is a state agency, and its nature is a state agency.

The second type of final remittance is in the jump payment data of the industry from January to May 2020, which occurred in December 2019 and before. The industries include scientific research and technical services, information transmission, software and information technology services. , Internet and related services, manufacturing, other financial industries, real estate, education, leasing and business services, social security, transportation, warehousing and postal services, news and publishing, retail, insurance, road transportation, Water production and supply industry, leasing industry, mass organizations, social organizations and other member organizations, agriculture, forestry, animal husbandry, fishery, research and experimental development, social work, others, wholesale and retail industry, water transportation industry, agriculture. Most of the companies are limited liability companies.

In the third category, there are 5 industries that have jumped payment before December 2019. Those industries are information transmission, software and information technology services, business services, wholesale and retail, manufacturing and others. The main nature of the company is a limited liability company.

3.2. Analysis of deferred payment in various segments

This paper counts the deferred payment information of the companies that pay housing provident fund in A city and calculates the proportion of deferred payment times in A city industry in the total number of deferred payments in all industries. The proportion of deferred payments of industries paid until June 2020 and later before December 2019 and the proportion of deferred payments from January to June 2020 are calculated. The industries paid from January to May 2020 are in 2019. The proportion of deferred payments before December of 2018 and the proportion of deferred payments from January to May 2020, and the proportion of industries that were paid until December 2019 before December 2019. All statistical data are presented in the form of pie charts, as shown in Figures 1, 2, 3, 4, 5 below.
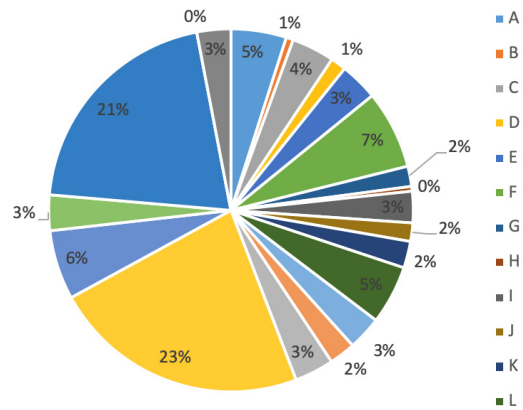

Figure 1 Pie chart of the proportion of industry deferred payment before the epidemic with the final remittance time in June 2020 and beyond
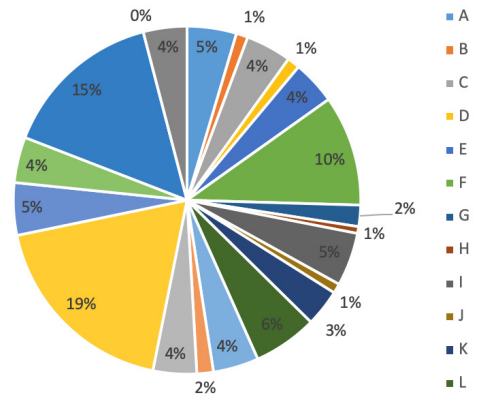

Figure 2 Pie chart of industry deferred payment proportions after the epidemic with the final remittance time in June 2020 and beyond

Comparing the data shown in Figure 1 and Figure 2, the first type of final remittance time in June 2020 and later industries in the F wholesale and retail industries accounted for an increase of 3.3%. Secondly, the proportion of I information transmission, software and information technology service industries increased by 2.2%. S public management, social security and social organizations accounted for the largest decrease in the proportion of deferred payment, a decrease of 5.5%, followed by a decrease of 4.2% in P education. The change in the proportion of deferred payment in other industries is between -1% and 2%.
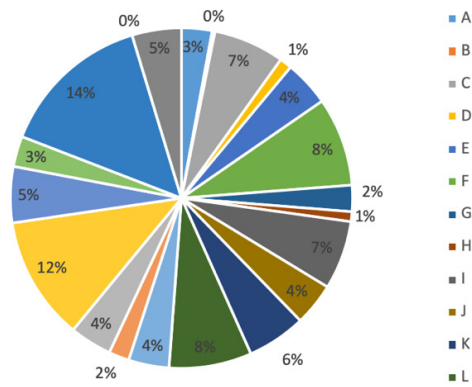
Figure 3 Pie chart of the proportion of industry deferred payment before the epidemic with the final remittance time from January to May 2020
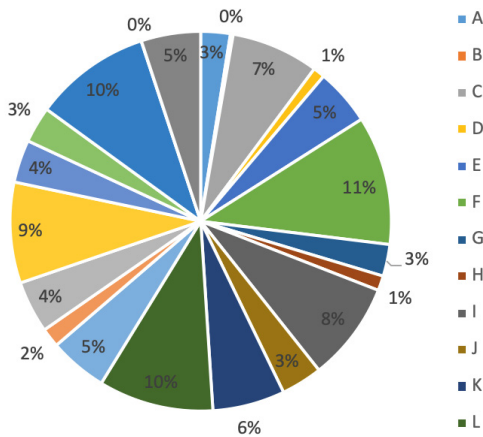

Figure 4 Pie chart of industry deferred payment proportions after the epidemic from January to May 2020 with the final remittance time

Comparing the data on the proportion of deferred payment shown in Figure 3 and Figure 4, the second type of final remittance time will increase the proportion of F wholesale and retail in the industry from January to May 2020. 2.6%. Secondly, I information transmission, software and information technology service industry and L lease and business service industry increased by 2.4% and 2% respectively. S public management, social security and social organizations accounted for the largest decrease in the proportion of deferred payment, by 4.5%, followed by P education, which decreased by 3.2%. The change in the proportion of deferred payment in other industries is between -2% and 2%.
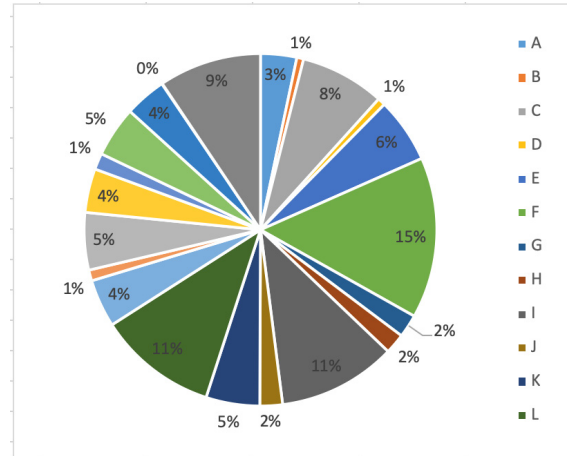

Figure 5 Pie chart of the proportion of industry deferred payment before the epidemic with the final remittance time is before December 2019

As shown in Figure 5, the F wholesale and retail industries accounted for 14.8% of the industries where the final payment time of the third type of data was delayed before December 2019. Followed by I information transmission, software and information technology service industry, L lease and business service industry, accounting for 10.9%. T international organizations account for at least 0%. B mining industry, D electricity, heat, gas and water production and supply industries also accounted for a relatively small proportion, respectively 0.6% and 0.7%.

3.3. Analysis of changes in the number of paied employees in various segments

This paper counts the industry personnel scale of the companies that pay housing provident funds in A city and calculates the personnel scale values in December 2019 and June 2020 for industries whose final remittance time is June 2020 and later. For industries whose payment time is from January to May 2020, the personnel scale values for December 2019 and May 2020 are calculated. According to the statistical personnel scale value, calculate the difference ratio of personnel scale. The difference ratio of the staff size indicates the proportion of the increase or decrease in the staff size of industry over a while. The difference ratio is obtained by dividing the statistical difference between the two time periods by the data in December 2019. A positive value indicates that the industry has increased, and a negative value indicates that the industry has decreased. The personnel scale and difference ratio data are shown in Table 2 and 3. The histogram of personnel scale is shown in Figures 6 and 7.

Table 2 Client–Server experimental results

Industry category	2019.12	2020.6	Difference ratio
A	3511	3521	0.28%
B	**277**	**256**	**-7.58%**
C	4485	4505	0.44%
D	2524	2496	-1.10%
E	1955	1957	0.01%
F	**5408**	**4931**	**-8.82%**
G	2958	2799	-5.37%
H	**224**	**209**	**-6.69%**
I	1408	1412	0.28%
J	2884	2876	-0.27%
K	**1556**	**1607**	**3.27%**
L	7262	7267	0.06%
M	1956	1987	1.58%
N	**2776**	**2934**	**5.69%**
O	3768	3780	0.31%
P	59547	59235	-0.52%
Q	**10486**	**11471**	**9.39%**
R	2096	2149	2.52%
S	33132	33252	0.36%
T	0	0	0%
U	3063	3030	-1.07%

Table 3 The size of industry personnel with the final payment time from January to May 2020

Industry category	2019.12	2020.5	Difference ratio
A	23887	18519	-22.47%
B	**14423**	**3968**	**-72.48%**
C	351914	219144	-37.72%
D	60418	55315	-8.44%
E	**77653**	**43785**	**-43.61%**
F	117942	71563	-39.32%
G	**139890**	**76284**	**-45.46%**
H	**12015**	**6329**	**-47.32%**
I	71266	45174	-36.61%
J	102541	81516	-20.50%
K	**61673**	**31415**	**-49.06%**
L	136108	84645	-37.81%
M	50100	31123	-37.87%
N	21176	17592	-16.92%
O	53363	36175	-32.20%
P	249738	226563	-9.27%
Q	132220	106737	-19.27%
R	18568	13965	-24.78%
S	197967	178492	-9.83%
T	223	217	-2.69%
U	27142	17711	-34.74%

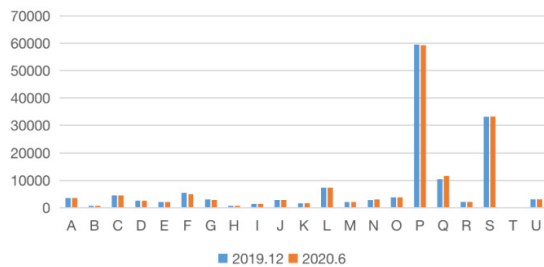Comparison of industry personnel scale between December 2019 and June 2020

Figure 6 Histogram of industry personnel scale data with the final remittance time in June 2020 and beyond

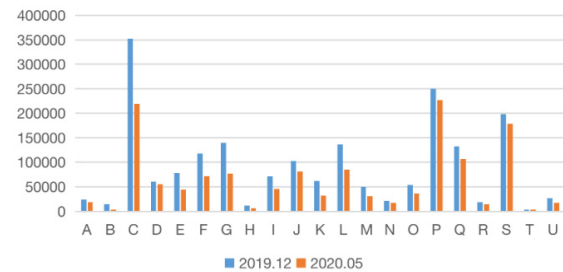Comparison of industry personnel scale between December 2019 and May 2020

Figure 7 Histogram of industry personnel scale data with the final remittance time from January to May 2020

As shown in Table 2, the size of personnel in each industry in the first category of final remittance time will increase and decrease slightly in June 2020 and beyond. Among the data on the increase in staff size, Q health and social work increased the most, an increase of 9.39%. Followed by N and K, which increased by 5.69% and 3.27% respectively. Among the data on the reduction of personnel scale, the personnel scale of F wholesale and retail industry has the largest reduction, a decrease of 8.82%. Followed by B mining industry, H accommodation and catering industry decreased by 7.58% and 6.69% respectively.

As shown in Table 3, the size of industry personnel in the second type of final remittance time between January and May 2020 will all decrease. The largest reduction in the number of personnel in the B mining industry, a decrease of approximately 72.48%. Followed by the K real estate industry, H accommodation and catering industry, G transportation, storage and postal industry, and E construction industry, the decline rates were 49.06%, 47.32%, 45.46% and 43.61% respectively. T international organization industry, D electric power, heating power, gas and water production and supply industry, P education, S public management, social security and social organizations have a small reduction in personnel scale

value, which is about 2.69%, 8.44%, and 9.27 respectively. % And 9.83%.

3.4. Analysis of changes in the monthly payment of various segments

This paper counts the industry monthly payments of companies that pay housing provident funds in A city and calculates the monthly payments of December 2019 and June 2020 for industries whose final remittance time is June 2020 and beyond. For industries whose final remittance time is from January to May 2020, the monthly payments for December 2019 and May 2020 are calculated. According to the statistics of monthly payments, calculate the difference ratio of monthly payments. The difference ratio of the monthly payments represents the ratio of the increase or decrease of the monthly payments of an industry in the past data. The difference ratio is obtained by dividing the data difference by the number in December 2019. A positive value indicates an increase in the industry's monthly payment and a negative value indicates a decrease in the industry's monthly payment. The monthly payment amount and the difference ratio data are shown in Tables 4 and 5. The histograms of monthly payments are shown in Figures 8 and 9.

Table 4 The industry's monthly payment amount for the final remittance time in June 2020 and beyond

Industry category	2019.12	2020.5	Difference in	Difference ratio
A	6514438	7394422	879984	13.50%
B	427080	458670	31590	7.39%
C	**3921870**	**4496821**	**574951**	**14.66%**
D	3524278	3772502	248224	7.04%
E	2117932	2375341	257409	12.15%
F	7301136	7350587	49451	0.67%
G	4257878	4396136	138258	3.24%
H	**166272**	**161824**	**-4448**	**-2.67%**
I	**1391220**	**1387127**	**-4093**	**-0.29%**
J	6606312	7159469	553157	8.37%
K	1466170	1613877	147707	10.07%
L	16906666	17967340	1060674	6.27%
M	**3168266**	**3612642**	**444376**	**14.02%**
N	**4699314**	**5619527**	**920213**	**19.58%**
O	4429166	4968211	539045	12.17%
P	10214946	11128719	9137735	8.94%
Q	**14569690**	**19196923**	**4627233**	**31.75%**
R	**3164888**	**3623011**	**458123**	**14.47%**
S	77532758	84214268	6681510	8.61%
T	0	0	0	0
U	5100226	5797800	697574	13.67%

As shown in Table 4, the industries and payments for the first category of payments to June 2020 and beyond have generally increased, while individual industries have decreased. Among the data on the increase in monthly

payments, Q health and social work increased the most, an increase of 31.75%. Followed by N water conservancy, environment and public facilities management industry, C manufacturing industry, R culture, sports and entertainment industry, M scientific research and technical service industry increased by 19.58%, 14.66%, 14.47% and 14.02% respectively. The only data on the decrease in monthly payments are H accommodation and catering industries, and I information transmission, software and information technology service industries, which decreased by 2.67% and 0.29% respectively.
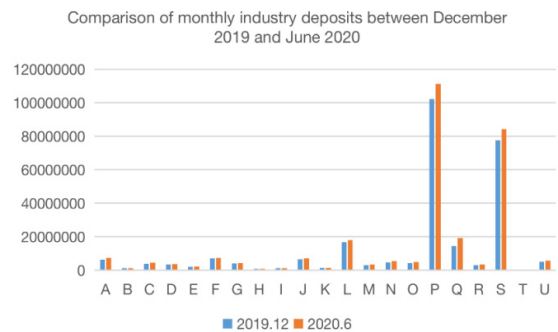

Figure 8 The bar chart of the industry's monthly payment amount in June 2020 and after the final remittance time

Table 5 The industry's monthly payment amount for the final remittance time from January to May 2020

Industry category	2019.12	2020.5	Difference in	Difference ratio
A	37478164	35336939	-2141225	-5.71%
B	**18874622**	**5658514**	**-**	**-70.02%**
C	33518222	22260119	-	-33.58%
D	12334366	12027690	-3066762	-2.48%
E	**11131774**	**63490651**	**-**	**-42.96%**
F	11540684	86611587	-	-24.95%
G	20669943	12508671	-	-39.48%
H	**8210992**	**4778583**	**-3432409**	**-41.80%**
I	79503438	58922124	-	-25.88%
J	27750208	22963542	-	-17.24%
K	**79002874**	**37557324**	**-**	**-52.46%**
L	16718792	12709818	-	-23.97%
M	63629458	47174891	-	-25.85%
N	33665036	32894988	-770048	-2.28%
O	37467976	26035961	-	-30.51%
P	**42916838**	**42991399**	**745610**	**0.17%**
Q	**15490570**	**13718749**	**-**	**-11.43%**
R	22149472	19321029	-2828443	-12.76%
S	44473649	44113676	-3599733	-0.80%
T	**579106**	**581043**	**1937**	**0.33%**
U	33361176	25285721	-8075455	-24.20%

As shown in Table 5, the final remittance time of the second category has declined in most industries from January to May 2020, and only two industries have

increased. Among the data on the decrease in monthly payments, the payment of B mining industry has decreased the most, about 70.02%. Followed by the K real estate industry, E construction industry, H accommodation and catering industry, which decreased by 52.46%, 42.96% and 42.80% respectively. The only data for the increase in monthly payments are T International and P Education, which have increased by 0.33% and 0.17% respectively.

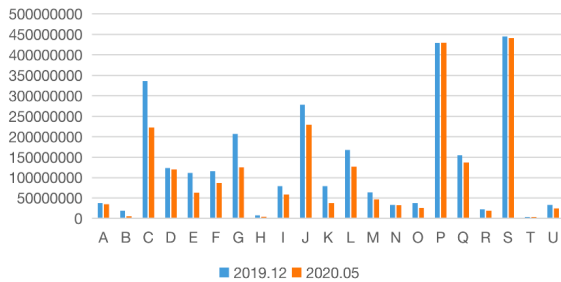Comparison of monthly industry deposits between December 2019 and May 2020

Figure 9 The bar chart of the industry's monthly payment amount in the period of 202001-202005 for the final remittance

4. CONCLUSION

Through the analysis of the enterprise provident fund payment data in Chapter 3, we can know the following points:

(1) In the dimension of personnel scale change, this paper believes that the mining industry; the accommodation and catering industry; the wholesale and retail industry; the transportation, storage and postal industry; are more affected by the epidemic because they are no matter in the industry that continues to pay the provident fund. Among the companies that terminated their payments during the epidemic, the number of personnel declined year-on-year. Scientific research and technical services; leasing and business services; public management, social security and social organizations; and manufacturing industries are less affected by the epidemic because they compare the two types of subdivision data with a relatively low change in personnel scale. In addition to the above-mentioned enterprises, the extent of the impact of the epidemic on other industries is between these two categories.

(2) In the dimension of changes in monthly payments, this paper considers mining industry; accommodation and catering industry; transportation, storage and postal industry; real estate industry; information transmission, software and information technology service industry; construction industry; manufacturing industry is affected by the epidemic The impact is greater because comparing the first and second types of data, the accommodation and catering industry; the difference in the monthly payment of information transmission, software and information technology service industries has changed more, while others are considered to be more affected by the epidemic In the industry, although the first type of data compares the

proportion of the decline in the monthly payment amount, this paper believes that this should be caused by the different nature of the business company. In the first type of industry, state-owned enterprises account for a relatively large proportion. Some state-owned enterprises have state support behind them, and their ability to resist risks is much higher than that of other types of enterprises. Therefore, after comprehensively considering these factors, this paper focuses on the second type of data and considers the first type of data and draws the above conclusions.

(3) In the dimension of deferred payment in the industry, this paper believes that wholesale and retail industries; public management, social security and social organizations; education are more affected by the epidemic; because comparing the data before and after the first and second types of epidemics, The wholesale and retail industries; public management, social security and social organizations; and the education industry have noticeable changes in the proportion of postponed payment before and after the epidemic. Mining industry, accommodation and catering industry; electricity, heat, gas and water production and supply industry; water conservancy, environment and public facilities management industry; transportation, storage and postal industry are less affected by the epidemic, and the proportion of deferred payment before and after the epidemic The difference does not exceed 1%. For industries such as international organizations, since the proportion of deferred payment has always been 0, it is impossible to analyze it in this dimension. In addition to the industries mentioned above, the health and social work industries have the largest increase in the proportion of deferred payment before and after the epidemic, and the largest decline is in the scientific research and technical service industries.

(4) In the dimension of industry skip payment behavior, although many industries have skip payment behavior after the epidemic, the number of skip payment companies is small and the industries are widely distributed. This paper believes that these companies that have skip payment behavior represent their industries. Chance and lack of effectiveness. Among them, the wholesale and retail industries have jumped payment behaviors in the second and third types of industries. This paper believes that the chance of this happening is low. Therefore, in this dimension, this paper believes that the wholesale and retail industries are more affected by the epidemic, and other companies are all affected to a lesser degree by the epidemic than the wholesale and retail industries.

Combining the above four dimensions and the proportion of deferred payment behaviors in various industries before the epidemic, this paper believes that the wholesale and retail industries are most affected by the epidemic. Because it is in the category of industries most affected by the epidemic in four dimensions and is also the industry with the largest proportion of deferred payments before the epidemic, this shows that the development of this industry is relatively unstable compared with other industries and is vulnerable to various emergencies. This paper believes that the electricity, heat, gas and water production and supply industries and water conservancy, environment and

public facilities management industries are least affected by the epidemic because they are in the least affected industry category in the four dimensions.

ACKNOWLEDGMENT

Appendix

Appendix 1 Housing provident fund industry category code comparison table

A	Agriculture, forestry, animal husbandry,
B	mining
C	manufacturing
D	Electricity, heat, gas and water
E	Construction
F	wholesale and retail
G	Transportation, storage and postal
H	Accommodation and Catering
I	Information transmission, software and
J	Financial
K	Real estate
L	Leasing and business services
M	Scientific research and technical service
N	Water conservancy, environment and
O	Resident services, repairs and other
P	education
Q	Health and social work
R	Culture, sports and entertainment
S	Public administration, social security and
T	International organizations
U	other

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