The Impact of Chinese Stock Market and Investor Sentiment on Public Company Employment

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ABSTRACT

Using Chinese 21 years research data at firm-level, including 4,203 A-share companies and 43,985 panel data, we investigate how stock market and investor sentiment affect public company employment. Tobin's *q* and cash flow are applied to observe the public company cost of external finance variation with stock market and investor sentiment. The analyses suggest that under developing stock market and high investor sentiment conditions, external financing cost lower, employment is more sensitivity to Tobin's *q* and less sensitivity to cash flow as well as public company will expand their employees. Furthermore, in terms of investor sentiment, our empirical results show that its marginal effect to cash flow is more significant than Tobin's *q*. And we class all A-share companies to two groups by their sizes and find that Chinese small company is more sensitive to stock market and investor sentiment by comparing with large company.

Keywords: Chinese; stock market; investor sentiment; public company; employment; external finance.

1. Introduction

In 2014, Mclean and Zhao firstly referred to that there is relationship between public companies' employment and investor sentiment, as well as economic conditions based on their American market research. In this paper, we are going to develop their study to find out whether employment in Chinese mainland public enterprises will also be affected by stock market and investor sentiment. Mclean and Zhao (2014), they state that the company's investment, hiring, sharing issuance and debt, all of these will be influenced by the cost of external finance. This has been demonstrated by Duchin, Ozbas, & Sensoy (2010) too. Their findings show that the lower cost of the external finance, the more likely enterprises are to invest and increase their number of employees. Furthermore, the cost of expansion varies depending on the stock market and investor sentiment, as studied by a survey in Graham and Harvey (2001), and in Ritter (1991), Loughran and Ritter (1995, 1997 Pontiff and Woodgate (2008)**,** McLean, Pontiff, and Watanabe (2009), Hirshleifer and Jiang (2010) and Mclean and Zhao (2014). As a result, our study mechanism is that changes in the security market and investor sentiment can affect the financing of listed companies and thus further affect their employment and investment.

However, it is difficult to discern between these elements because the same factors that drive external finance costs also affect growth opportunities. So, we follow Mclean and Zhao's (2014) lead and develop hypotheses regarding how variations in employment and external finance vary between enterprises as a function of economic conditions and investor sentiment. And, to see the variation, we utilize Tobin's *q* (1969) and cash flow as our measurement bridge. Tobin's *q*-theory is an indicator for determining whether a company is overvalued or undervalued. If *q* is high, corporations will be more willing to invest in capital because it is 'worth' more than the price they paid for them. Therefore, high q enterprises should issue shares and debt when issuance costs are low, using the proceeds to do

investments and hire new employees, making investment, employment, and external finance become more sensitive to q.

Regarding the second, cash flow, it may be stated investment and employment sensitivity to cash flow should be lessened if financing costs are low during expansions and seasons of high investor sentiment. Low cash flow enterprises, on the other hand, are likely to need more additional financing, assuming everything else is equal. Low cash flow businesses should issue shares and debt when issuance costs are low in order to raise money for investments and hiring, which will reduce the sensitivity of these activities to cash flow.

To summary, our assumption is that stock market and investor sentiment have a big affection in companies' expansion, when external finance becomes less costly, high q firms and low cash flow firms would increase their investment and employee. In other words, q should have a positive correlation with company's employment, but cash flow should present negatively correlated, in expansion.

From 2001 through 2021, we compile a list of all Chinese A share firms, which includes 4203 public enterprises. Each variable's statistical qualities are investigated. Empirical models are then created to estimate the change in employee headcount, q intensity, and cash flow of enterprises. The findings show that q and cash flow are highly significant in predicting changes in company employment, which is in line with our two predictions. The marginal effects of the Chinese stock market and investor sentiment on q and cash flow, respectively, are then measured. The outcomes differ from those of Mclean and Zhao (2014). In China's capital market, changes in investor sentiment do not always have an impact on the changes in the company's workforce. Our results show that the joint effect between q and investor sentiment does not significantly correlate to the change of employee but the cash flow with investor sentiment does. This could be due to the characteristics of the Chinese securities market, which make investor sentiment a poor predictor of the cost of external

finance to some extent. Moreover, because Tobin's *q* is a measure of valuations, already including a substantial sentiment component, which is naturally sensitive to sentiment. Therefore, the marginal effect of investor sentiment on *q* is not significant.

The others, on the other hand, are compatible with our hypothesis as well as Mclean and Zhao's (2014). That is stock market conditions definitely affect companies' *q* and cash flow. Subsequently, corporate employees' number will be affected. As a result, if we want to investigate the relationship between investor sentiment and company employment in China, we should use cash flow as our bridge. In a period of economic development, employment sensitivity to *q* becomes higher and to cash flow becomes lower. During periods of higher investor sentiment, employment sensitivity to cash flow is decrease too.

We regress all of the direct factors and cross terms once more, and the results confirm our theory. That is the Chinese stock market and investor sentiment can have a favorable impact on public firms' employment by lowering their external finance costs. During a recession, employment is less responsive to Tobin's *q* and more sensitive to cash flow, and vice versa.

And we also research if there are any sensitivity differences with different sizes company. Our results are consistent with Mclean and Zhao (2014), which is that small company is more sensitive to investor sentiment and financial market because the small one has more difficulties to finance under low investor sentiment circumstance.

To the best of our knowledge, this is the first work to examine the influence of China's stock market and investor sentiment on employment at the firm level. The study of China, the world's second largest economy, is necessary and complementary to modern economics. Furthermore, we discover that the impact of Chinese investor sentiment on stock returns is not as precise as it is in other countries, such as the United States. The results will be clearer if you use cash flow as a measurement and investigate the join effect. In

comparison to Mclean and Zhao (2014), this is a huge breakthrough in our article. While past researchers have examined the US capital market and find that it has an impact on employment, we also cannot assume that the same is true due to Chinese financial market unique characteristics (high speculation, non-rational investment behavior, limits of arbitrage). This is the study's other contribution.

Except for the fact that unstable Chinese investor sentiment is an extension of Mclean and Zhao (2014), the most of our findings are similar to theirs. We demonstrate once again that when the economy is booming and investor sentiment is high, businesses will grow their scale and hire more people.

The following is the outline of the paper. Section 2 begins by outlining the distinctive characteristics of the Chinese stock market, followed by a review of the relevant literature and the formulation of hypotheses. Section 3 discusses the empirical methodologies, data sources, sentiment index development, stock market index construction, and descriptive statistics. Section 4 presents the results of cross-sectional analysis. Section 5 finishes with a conclusion and a discussion of the consequences of our findings.

2. Literature Review

2.1 Chinese stock market

In comparison to western countries, China's capital market came into being later. The Shanghai Stock Exchange was established on December 19, 1990, while the Shenzhen Stock Exchange was established on July 3, 1991. The formation of the securities market in the People's Republic of China was characterized by the establishment of these two exchanges. In 2000, Shanghai Stock Exchange Composite Index was around 2,600, as of 1 April 2022, it’s still only 3,262. It looks like it's been 20 years and has barely grown at all, although in October 2007 it reached a peak, at 6,124. But then it fell back and is now floating at 3,000. It is clear from this that China's capital markets have been subject to dramatic fluctuations over

the years. So, although China's mainland economy has been the world's fastest expanding and largest emerging economy for the past 20 years, the development of the stock market, it is unobvious. And the Chinese capital market is very different from that of other countries in that it is very much under the jurisdiction of the government and, relatively speaking, not so free (Ho, Yang and Luo, 2022).

As above reference, the Shanghai Stock Exchange (SHSZ) and the Shenzhen Stock Exchange (SZSE) are the two major exchanges in Chinese mainland. And in November 2021, the Beijing Stock Exchange was just founded, its turnover is smaller comparing with the first two at this stage. The only practical difference between the two exchanges is that SHSZ has a bigger market capitalization than SZSE. Common shares on the two markets are classed as A-shares and B-shares, respectively, for historical reasons. They are denominated in local currency and foreign currencies (USD or Hong Kong dollar). We focus primarily on the A-share market for our empirical research because A-shares account for 96% of the market.

There are a few distinguishing characteristics of the Chinese A-share market that are worth mentioning:

According to Han and Li ,2017; Feng and Seasholes, 2004**;** Kumar and Lee, 2006, we can know that there are many young and inexperienced retail investors in Chinese equity market. Sentiment has a big impact on retail investors. They have less diversified portfolios, are more prone to trading speculative equities, and use simple trading methods like trend following and correlation trading. Han and Li ,2017 list some data in the 2013 annual report of China Securities Depository and Clearing Corporation to prove their arguments. We go to investigate the 2020 data and individual issuers still account for over 75% of the equity market. So, the above point still holds true in China.

Second, the Chinese stock market is heavily regulated, with short sales of stocks forbidden by law. Short-selling restrictions make it difficult to arbitrage mispricing at both the market and stock levels (Mei et al. 2005), also reduce the liquidity of the market.

Third, the market is less accessible to foreign investors. It is only in November 2002 that it opens its doors to foreign investors. Only recognized qualified foreign institutional investors (QFII) are permitted to invest in the Chinese A-share market, and they must adhere to a variety of rules and regulations set by the local regulatory body (e.g., capital controls) (Han and Li ,2017).

In short, the above-mentioned distinctive features illustrate that we cannot directly apply the conclusions reached by other scholars studying other regions. China's capital markets have its own feature and are well worthy of separate study.

2.2 Relevant literature

It is no secret that the stock market's primary purpose is to assist in the financing of publicly traded corporations. According to Paudel (2005), stock markets enable enterprises to swiftly obtain much-needed cash due to their liquidity, hence promoting capital allocation, investment, and growth. As a result, stock market activity is increasingly playing a role in determining the amount of economic activity in most economies.

Investor sentiment is a wide concept that encompasses any misconception that can lead to mispricing. It is defined by moods, emotions, attitudes, and investor opinion (Chang et al., 2012; Kaplanski and Levy, 2010; Yang and Li, 2013; Zhou and Yang, 2019). Baker and Wurgler (2006) described investor sentiment as an unreasonable belief about a company's risks or future cash flows based on available information. According to the growing body of research on behavioral finance, investor sentiment has a major impact on stock returns and leads to mispricing (Baker and Stein, 2004; Baker and Wurgler, 2006; Barberis et al., 1998;). There is a growing consensus in the research that investor attitude is a long-term contrarian

predictor of stock market returns (Baker and Stein, 2004; Brown and Cliff ,2005; Baker et al. 2012). This rule, however, may not apply in China. Chi, Zhuang, and Song (2012) find that high-sentiment stocks outperform low-sentiment equities not only in the near term, but also in the long run. They attributed this tendency to investors' lack of experience. Guo, Sun, and Qian (2017) state that Chinese sentiment data does not always lead to stock market price, and it can only be used to predict stock price when the stock has a lot of investor interest. This is in line with our empirical findings. In China, the annual investor sentiment index may not be a reliable indicator somehow.

Investor sentiment evidence on the predictability of short-run market performance is debatable. Brown and Cliff (2004), for example, demonstrate that investor attitude has little effect on following weekly and monthly market returns in the United States. Using their aligned sentiment index, Huang et al. (2014) show that investor sentiment is a contrarian predictor at the monthly frequency in the United States. Baker and Wurgler (2006) find that the contrarian predictability of investor sentiment is stronger in difficult-to-value stocks, such as small-cap and high-volatility companies. Following that, Baker and Wurgler (2007) indicate that if all stock prices are positively related to sentiment, investor sentiment will be a contrarian predictor of future market returns. However, if hard (easy) to value equities are positively (negatively) related to sentiment, the impact of sentiment on later market returns is weakened.

Because of the specific characteristics of the Chinese market (i.e., highly speculative market dominated by local retail investors, short sale limits), Han and Li (2017) recently hypothesize that investor sentiment is likely to expect positive market returns in the short run in China. As a result, they demonstrate that investor emotion is a good predictor of future monthly market returns. In addition, Lan, Huang, and Yan (2021) discover strong evidence that investor sentiment influences the pre-announcement anomalous return in Chinese stock

markets. Within one month after an announcement, the market corrects the sentiment-driven overvaluation. These findings support the theory that market timers' issue seasoned shares to take advantage of investor emotion. The 'bubble period' was considered by Cheema, Man, and Szulczyk (2020). During the bubble period, they discover a substantial link between investor sentiment and future market performance. Once the bubble period is removed, however, investor sentiment has no effect on subsequent monthly market results. Our study spans the years 2001 to 2021, including the so-called "bubble" years of 2006 to 2008. And the findings imply that annual investor sentiment does influence the cost of external funding for businesses especially through observing companies' cash flow change. For the time being, there is no evidence that annual investor sentiment indexes that include the bubble period do not predict market results.

There is minimal disagreement on the existence of market defects that produce a wedge between the costs of internal and external funds, with a large body of theoretical research supporting the claim that external funds are more expensive. The size of financial frictions, on the other hand, remains an unsettled subject. To determine the magnitude of financial constraints, empirical researchers have used a variety of methodologies. Altinkilic and Hansen (2000), for example, estimate underwriter fee schedules. Many researchers, including Asquith and Mullins (1986), use announcement effects to calculate the indirect costs of external equity. Weiss (1990) calculates the direct legal costs associated with Chapter 11 bankruptcy. In a sample of highly leveraged deals that turned distressed, Andrade and Kaplan (1998) examine the indirect costs of financial crisis. Another set of studies, such as Fazzari et al. (1988), use reduced-form investment regressions to estimate the extent of financial frictions. Bolton, Chen, and Wang (2011) present a detailed q-theory model that takes into account financing frictions and connects investment, external finance, q, and internal funds.

The majority of empirical research in this field has followed the methodology of Fazzari et al. (1988), who argue and find that when groupings of enterprises confront financial limitations, their investment responds significantly to changes in cash flow, hence maintaining investment possibilities. They point out that, while measurement error can contaminate the standard tool for testing this hypothesis (regressions of investment on *q* and cash flow), there's no reason to believe it does so to a higher amount for restricted enterprises than for unconstrained firms. As a result, they claim that increased cash flow sensitivity in cash-strapped enterprises is evidence of financial restrictions.

However, this technique has been questioned in a number of articles, both empirically and theoretically. From an empirical standpoint, Kaplan and Zingales (1997) and Cleary (1999) demonstrate that cash-flow sensitivity does not necessarily identify businesses that are cash-flow constrained; in other words, sensitivity is not monotonous with respect to the severity of restrictions. Additionally, research by Erickson and Whited (2000), Bond and Cummins (2001), Cooper and Ejarque (2001), and others demonstrates that the observed cash-flow sensitivity is most likely a byproduct of measurement error in Tobin's q, the accepted tool for assessing investment opportunities. To be more specific, Erickson and Whited (2000, pp. 1049–1051) explain that measurement error, when combined with at least one of the following purely mechanical effects: variations in cash flow variance, variations in the covariance between investment and q, and, as mentioned by Poterba (1988), variations in the amount of measurement error in q, can account for variations in investment-cash flow sensitivities across groups of firms.

In external financing restrictions and dependence on external finance, Duchin, Ozbas, and Sensoy (2010) use a differences-in-differences method, controlling for firm fixed effects and observable measures of investment possibilities, notably Q and cash flow. They conducted cross-sectional analyses based on firm-level financial constraints and industry-

level measures of reliance on external finance and discovered that the previous crisis' investment decline was particularly severe for firms in industries that have historically been more reliant on external finance or external equity finance (Rajan and Zingales, 1998). They also discover that these companies' internal resources (cash) have a greater impact on post-crisis investment. All of these data are noteworthy in terms of both economics and statistics, and they support our theory of a causal supply effect. By comparing before and after the economic crisis, they suggested that firms may have depleted their financial buffer stocks in the early stages of the crisis, leaving even previously high-cash firms with insufficient resources to cushion subsequent investment declines. As a result, we deduce that during periods of economic expansion, investor sentiments should be greater, and the corporation prefers to invest rather than keep cash.

Investment sensitivity to internal funds increases with external financing costs, according to Bolton, Chen, and Wang (2011), which is consistent with our result that investment sensitivity to cash flow is higher during recessions and poor sentiment times.

Moreover, some strong data suggests that financial development has a positive impact on employment. Through their research into the US market, Montone and Zwinkels (2020) have demonstrated that better US sentiment leads to faster global employment growth. This has also been researched, and according to Mclean and Zhao in 2014, the less expensive expansions are, and the stronger investor mood, the more likely enterprises are to expand their workforce. Marco Pagano and Giovanni Pica (2012) demonstrate that financial development led to increased employment, incomes, and labor productivity by studying international industry-level data from 1970 to 2003. Credit market inefficiencies, as shown by Acemoglu (2001) and Wasmer and Weil (2004), obstruct business entry, resulting in higher equilibrium unemployment. Furthermore, according to Hamid Boustanifar (2014), credit-market efficiency and employment have a substantial positive link. They won't be able to

afford the fixed costs of hiring new employees until credit access (especially for smaller businesses) is returned to pre-crisis levels. Surprisingly little is known about how the stock market affects job creation. Evangelia Papapetrou (2001) investigates the Greek stock market and employment. He discovers that stock returns do not lead to changes in real activity or employment. Stock returns do not logically communicate or lead changes in real activity and employment. Better real stock returns may not always predict higher levels of industrial production and employment growth, as a real stock return shock has a negative effect on industrial output and employment growth. Real stock returns are negatively impacted by interest rate shocks.

Boustanifar (2014) investigates the American credit market and discovered that labor, like capital, need financing. Firms will invest more and recruit more employees if they can obtain more bank debt. This suggests that financial constraints may exacerbate variance in employment levels over the business cycle, which helps to explain why recessions caused by financial crises are so severe. According to Mclean and Zhao (2014), if businesses have more money, they will invest more and hire more people. As a result, we've posted our hypotheses here.

Hypothesis1*: With a developing Chinese stock market and high investor sentiment, the cost of external financing for companies should be lower.*

Hypothesis2: *When companies have easier access to external financing, they will tend to recruit more employees.*

3. Data and Methodology

3.1 Data

Xiangmei Fana, Yanrui Wub, and Nicolaas Groenewold (2003) divide the Chinese stock market into four stages: development (1983-1991), regulatory system transition (1992-1996), Red Chips mania and deflation (1997-1999), and WTO membership and state share

reduction (2000-present). During the first three periods, China's securities markets were extremely unstable and majority data were not public. So, we are supposed to collect firm-level and market-level data from 2000 to the end of 2021.

External finance and employment variables in firm-level

As we referred above, we are going to use Tobin's *q* and cash flow as bridges to relate the extent of external financing to firm's data

So, combining with our research target, there are three variables in firm-level:

Employee Growth. The change in the log number of employees is used to track annual employee growth.

Tobin's q (*q*). The natural log of the market value of equity (MV of equity), subtract the book value of equity (BV of equity), plus the book value of assets, all scaled by the book value of assets, is how we calculate Tobin's q (log ([MV of equity - BV of equity + BV of assets]/BV of assets)). All data is counted yearly.

Cash Flow. Cash flow is calculated as net income plus depreciation and amortization, all scaled to the book value of assets at the beginning of the year.

Investor sentiment

Mclean and Zhao (2014) quantify investor sentiment using the Baker and Wurgler (2006) sentiment index and the University of Michigan consumer sentiment index. However, it is not available in the context of the Chinese stock market because the Chinese equities market's history is brief and inexperienced. In the spirit of Baker and Wurgler (2006), we construct the market-wide investor sentiment variable using market regression error terms. We also construct a sentiment index based on Han and Li's (2017) research, which used three sentiment proxies: the price-earnings (PE) ratio, the turnover (TO) ratio, and the number of newly opened individual investor accounts (IA) on the Shanghai Stock Exchange. According to Baker and Stein's theoretical reasoning, stock market turnover is a direct indicator of

investor sentiment (2004). A high market turnover ratio suggests that emotions investors are driving rational investors out of the market, causing asset prices to become unstable. The number of newly opened investor accounts in China (Chen et al. 2014) is also a good indicator of investor sentiment: Given retail investors' substantial market power in China, an increase in the number of new accounts implies increased (irrational) demand from retail investors. The inclusion of the price-earnings ratio adheres to Indro's theory (2004). As long as (more) money is invested in the market, the valuation ratio will increase. Historical instances of big price bubbles in China's stock markets have usually been associated with unreasonably high price-earnings (PE) occurrences. Since each of the three distinct measures has a greater value during bull markets and a lower value during bear markets, demonstrating a positive relationship with investor mood, they are all, in theory, strong candidates for measuring investor sentiment. The sentiment index (*S*) is then produced using principal component analysis on the residuals from PE, TO, and IA.

Measuring Stock Market Conditions

With regard to the stock market development index, there is no theory providing a standard to measure it, but according to Ross Levine and Sara Zervos' (1996) study, we can utilize a comprehensive measure of overall stock market development that incorporates the several individual features of stock market functioning, such as size, liquidity, and risk diversification. They created an index(*E*) by combining with the market capitalization ratio, the total value traded ratio, the turnover ratio and pricing error measure of stock market integration. Larger index values indicate that the stock market is developing at a faster pace. Among these are market capitalizations, nominal GDP, major stock exchanges, and excess return. We'll utilize the annual present-earning (PE) ratio minus the risk-free rate for the excess return because there is no reliable official statistic data so far.

All the above data can be found in the official Wind database.

The data set provides annual firm-level growth rates in employment for a total of 4203 entities and 43,985 panel data. Table 1, Panel A presents firm-level data (market value of equity, book value of equity and total assets), some summary statistics of the market status variables (stock market index and investor sentiment index), and the firm-level variable (Tobin's *q*, cash flow and the change of employment) from 2001 to 2021. We collect our data from 2000, but Tobin's *q* is lagged one year, so the other variables can only be calculated from 2001 onwards. The average of the employee growth is about 5% but more that 25 of the time the company had negative employee growth. This is in line with our assumptions. When economic conditions are bad, companies may save money by cutting staff. Panel B shows the relationship between variables.

Table 1 Sample Descriptive Statistics

Panel A: Summary Statistics

	Mean	SD	25th Percentile	Median	75th Percentile	N
Market Value (¥ millions)	15,328	73,229	2,398	4,627	9,816	43,985
Book Value (¥ millions)	8,886	68,331	781	1,660	3,778	43,985
Total Assets (¥ millions)	56,139	768,445	1,398	3,050	7,847	43,985
Stock Market	2.5772	0.8235	2.1851	2.4869	2.7970	21
Sentiment	3.2535	11.3674	-7.8100	8.0353	14.2903	21
q	0.7627	0.6116	0.3051	0.6661	1.1075	43,985
Cash Flow/Assets	0.1031	5.4980	0.0343	0.0647	0.1051	43,985
EmployeeGrowth	0.0520	0.3827	-0.0461	0.0187	0.1212	43,985

Panel B: Correlation

	Stock Market	Sentiment	*q*	Cash flow	Employee growth
Stock Market	1				
Sentiment	0.17	1			
q	-0.005	0.01	1		
Cash Flow	0.0048	-0.0039	0.062	1	
EmployeeGrowth	0.017	-0.0094	0.095	0.05	1

3.2 Methodology

Similar to Mclean and Zhao (2014), the change of employee intensity of Tobin's *q* and cash flow is estimated using the follow model:

$$e_{i,t} = \beta_1 q_{i.t-1} + \beta_2 \frac{CF_{i,t}}{A_{i,t-1}} + \varepsilon_{i,t} \qquad (1)$$

Where *e* is the annual change in the log number of employees for respective company, *q* is measured by firms' markets value, book value of equity and book value of assets. Because all of these data are counted at the end of natural year generally, *q(t-1)* should have an impact on *e* in year *t*. Cash flow is only meaningful when measured though total assets. It is worth mentioning that cash flow *(t)* is unknown when *q(t-1)* is measured, so *q* may not predict companies' employment float accurately.

Step 2 we could regress the yearly β_1 and β_2 coefficients on measures of the stock market (*E*) and investor sentiment (*S*) to determine how the economic situation and investor mood affect companies' employment sensitivity to and cash flow:

$$\beta_{1,t} = \alpha + \beta_3 E_t + \beta_5 S_t + \varepsilon_t \qquad (2)$$

$$\beta_{2,t} = \alpha + \beta_4 E_t + \beta_6 S_t + \varepsilon_t \qquad (3)$$

Step 3, substitute equations (2) and (3) into equation (1); according to Petersen (2009), Thompson (2011) and Mclean & Zhao (2014) study, there is a persistent firm effect as well as year/time effect. If we clustered our panel data on firm and year, we would get unbiased standard errors of coefficients. As a result, we use the below equation (4) to estimate the marginal impact of *E* and *S* on the *q* and *CF* coefficients. Based on our 43,985-panel data, and in order to control any firm-specific attributes that don't vary across time as well as remove heterogeneity, we use fixed effect model and cluster on firm and year to regress our equation.

$$e_{i,t} = \alpha_i + \alpha_t + \beta_1 q_{i,t-1} + \beta_2 \frac{CF_{i,t}}{A_{i,t-1}} + \beta_3 q_{i,t-1} \times E_t + \beta_4 \frac{CF_{i,t}}{A_{i,t-1}} \varepsilon_{i,t} \times E_t + \beta_5 q_{i,t-1} \times S_t + \beta_6 \frac{CF_{i,t}}{A_{i,t-1}} \varepsilon_{i,t} \times S_t + \varepsilon_{i,t} \qquad (4)$$

4. Empirical Results

4.1 The correlation between employee growth with q and cash flow

The link between company employment and *q* and cash flow is estimated using Equation (1). Table 2 shows the findings of regressions 1 that lagged *q* and cash flow are both positive and high significant correlated to the employee change. The *q* coefficient is 0.1127 and the *t*-statistic is 6.52. Because the standard deviation (*SD*) of the *q* variable is 0.0173, the regression shows that a 1-*SD* increase in *q* leads to a 0.0019 increase in employment. The cash flow coefficient is 0.0029 (*t*-statistic = 2.84), and the cash flow *q* variable has a standard deviation (*SD*) of 0.001, indicating that a 1-*SD* increase in cash flow results in an increase in employment of 0.0003. Cash flow's effect is not as large as *q*'s effect to the change to employment, but it is still a main effect in our regression. In terms of economics, positive *q* sensitivity states that companies with great growth potential increase employment more, whereas positive cash flow sensitivity indicates that firms with appropriate internal resources increase employment more. So far, Mclean and Zhao (2014) and our underlying assumptions that listed firms' employee will vary with the changes of Tobin's *q* and cash flow have been confirmed.

4.2 q and Cash Flow Sensitivity

In equation (1) we can get all annual coefficients β_1 and β_2, and we estimate the marginal impact of *E* and *S* on the *q* and *CF* coefficients. The results are showed in Table 2, regressions 2 and 3. β_3 and β_5 test the correlation whether employment sensitivity to *q* is significant correlation when economic expansions and investor sentiment changes. Note that *q* is lagged one year, while *E* and *S* are measured at the same as employment, so we don't include year fixed effects here. In other words, because the *q* and *E* with *S* are in different periods in our regression, if we regress them with time fixed effects, *E* and *S* don't have any explanatory power in our test. β_3, the *q* with stock market index interaction coefficient is

0.0167(t-statistic = 2.61), which shows that employment sensitivity to q is greater when stock market is more developed. This is because a company's valuation will be higher in better economic conditions, as the cost of external financing for a business will decrease as the economy improves, Bolton, Chen, and Wang (2011). The marginal effect between q and stock market partly supports our Hypothesis 1 that the more developed China's stock market is, the lower the external financing costs of listed companies.

However, β_5, q with investor sentiment interaction, the correlation is insignificantly, implying that the correspondence between q and employment is not necessarily influenced by investor sentiment in China. This is not the case with Mclean and Zhao (2014). It is commonly established that investor sentiment has an association with stock return. In high sentiment, abnormal stock return would be higher. And this prediction is equally applicable for China (Bu and Pi, 2014; Chu, Wu and Qiu, 2016; Ni, Wang and Xue,2015). But according to Chi, Zhuang and Song (2012) and Lan, Huang and Yan (2021), investor sentiment towards Chinese equity market returns has shown some unique properties. They show that in China, high-sentiment equities not only earn greater short-term returns than low-sentiment stocks, but also earn higher long-term returns. Theoretically, if emotion drives a stock's price higher than its intrinsic worth, the stock's future return should be poor. To put it another way, the affection of Chinese investor sentiment is a little conflict with other countries so far. Given the Chinese stock market's short history, we argue that investors in the Chinese stock market lack expertise, and that investor sentiment has a disproportionately large impact on stock returns in China. More than anything, it may be that Chinese investor sentiment is not a reasonable predictor of the cost of external finance, leading to an insignificant β_5. This could also explain why the coefficients of our interaction terms predict negative numbers. The q-investment sentiment coefficient is -0.0008 (t-statistic = -1.20). Because investors are obsessed with chasing hot spots and ignore the true value of the stock, which leads to an

uneven distribution of external financing costs for firms. That is, firms that are favored by investors may have easy access to financing in the long run, while growth firms may not necessarily have access to more financing even when investor sentiment is high.

The regressions 3 shows the coefficients β_4 and β_6 test our assumption that employment sensitivity to cash flow is lower during economic expansions and periods of high investor sentiment. β_4, the cash flow with stock market index interaction coefficient is -0.1769 (*t*-statistic = -3.73), and β_6, the cash flow with investor sentiment interaction coefficient is -0.0023 (*t*-statistic = -2.72). Both of them prove that during the recession, employment sensitivity to cash flow is higher. This is not only consistent with Mclean and Zhao (2014), but also wholly supports our Hypothesis 1 that the cost of external financing for companies will be lower under a more developed Chinese stock market and higher investor sentiment circumstance.

Thus, we get a conclusion that stock market conditions and investor sentiment can impact Chinese public companies' cost of external finance, which shows that our Hypothesis1 is true. And the effect is even more significant if we regress cash flows to find a correlation between investor sentiment and external financing in China.

4.3 Employment Growth

In this section, we test whether firms' decisions to increase or decrease employment are affected by financing costs. These results are reported in Table 2. The first regression tests q, cash flow with employment correlation have been talked above. Regression 4 and 5 include joint effect with either Chinese stock market condition, or investor sentiment measure. In the fourth regression, the q becomes insignificant after adding the economic moderate. Frazier, Tix & Barron (2004) and Echambadi & Hess (2007) claim that the presence of a product term changes the interpretation of the effect of both predictor and moderators from unconditional effects ("main effects", here they stand for q and cash flow) to

conditional effects ("first-order effects") which represent the effect of the respective predictor for those cases who have a "zero" value in the moderator (and vice versa). And we have centered predictor and moderator, zero hence is the mean value for the respective variable. In these cases, the first-order effect is the effect of the predictor when the moderator is average. That is the "main effects" no longer carry the same meaning when an interaction term is included in the model, so their coefficients have no necessary relationship to the coefficients seen by the variables of the same name in a no-interaction model. Therefore, in regression 4, the *q*-stock market interaction has stronger explanatory power than *q*. The coefficient of stock market and Tobin's *q* is 0.0346 (*t*-statistic = -3.73), which is correlated at 99% confidential interval. And the joint effect of stock market and cash flow is significant at 95% CI, its coefficient is -0.1117and *t* value equals to -2.17. For corporate investment, it is more possible to expand their investment when Chinese securities market is at high level.

Regressions 5 tests investor sentiment joint effect. We find that all of them is insignificant except *q*. This point is conflict with Mclean and Zhao (2014). But it is consistent with our assumption about Chinese stock market peculiarity. China's capital market started late, is heavily regulated by the state and is an insufficiently free market. And while Chinese investor sentiment has been shown to have driven abnormal pre-announcement returns (Lan, Huang, and Yan, 2021), it has not led to a decline in post-announcement returns, Chi, Zhuang, and Song (2012). These characteristics may have contributed to the fact that investor sentiment has not played a significant role in the Chinese market as it has in other countries, such as the United States.

Regressions 6 has both the economic conditions and the investor sentiment interaction in the same regression. Only the coefficient of *q* is insignificant (*t*-statistic = -0.29). And according to Frazier, Tix & Barron (2004) and Echambadi & Hess (2007), we should pay more attention to our moderators. Consequently, our results are consistent with Mclean and

Zhao's (2014) findings and again supports our Hypothesis 2. That is when the cost of external financing decreases, Chinese listed firms will add their employee.

And we compare our results with American market (Mclean and Zhao 2014), we find that American economic conditions and investor sentiment marginal effects are both higher than Chinese. For example, the *q* with American expansions coefficients is 0.133 but Chinese only 0.0369. The American interaction cash flow and sentiment is -0.648, which is lower too much compared with Chinese -0.0024. Hence, even though Chinese public companies' investment is sensitive to external financing, its effect is not as pronounced as America's.

To evaluate the influence of Chinese economic significance, we take the sixth regression into account, including stock market interactions as well as investor sentiment interactions. The coefficient of joint effect, cash flow stock market is -0.1731(*t*-statistic =-3.95), and cash flow-sentiment interaction coefficient is -0.0024 (*t*-statistic = -3.13). The coefficient of cash flow is 0.5613 (*t*-statistic = 3.98) and investor sentiment index median is 2.487 in Table 1. In this case, the overall cash flow coefficient is 0.5613 + (-0.0024) × 2.487 + (-0.1731) = 0.3822 under developing economic conditions and 0.5613 + (-0.0024) × 2.487 = 0.5553, or 45% higher, in recession. We make a comparison with America again, and we make the same conclusion, the effects of a recession on the number of employee sensitivities are not only statistically significant, but also economically important.

In order to assess the marginal effect of investor sentiment on cash flows, assume that the economy is in an expansion, and compare the overall coefficients using 25th and 75th percentile values (show in Table1). The investor sentiment index has a 75th percentile value of 14.2903 and a 25th percentile value of -7.81. The overall cash flow coefficient is 0.5613 + (-0.1731) + (-0.0024) × 14.2903 = 0.3539 during the high sentiment period, and 0.5613 + (-0.1731) + (-0.0024) × 7.81 = 0.3694, or 4.4% higher, during the low sentiment period. The effect of investor sentiment to cash flow is similar to the effect of the stock market,

suggesting that both types of frictions have economically important effects on real investment.

Table 2 Stock Market, Investor Sentiment, and Employment

	(1)	(2)	(3)	(4)	(5)	(6)
$q(t\text{-}1)$	0.1127***	0.0643**		0.0061	0.1062***	-0.0091
	(6.52)	(2.43)		(0.20)	(5.14)	(-0.29)
Cash Flow	0.0029***		0.5756***	0.3749**	0.0055	0.5613***
	(2.87)		(3.78)	(2.18)	(1.35)	(3.98)
Stock Market		0.0167**		0.0346***		0.0369***
$\times q(t\text{-}1)$		(2.61)		(4.37)		(4.84)
Stock Market			-0.1769***	-0.1117**		-0.1731***
× Cash Flow			(-3.73)	(-2.17)		(-3.95)
Sentiment		-0.0008			0.0011	0.0016*
$\times q(t\text{-}1)$		(-1.20)			(1.09)	(1.95)
Sentiment			-0.0023***		0.0003	-0.0024***
× Cash Flow			(-2.72)		(0.64)	(-3.13)
Observations	43,985	43,985	43,985	43,985	43,985	43,985

This table displays the results of our head count growth regressions. The dependent variable is employee growth. All regressions, with the exception of regression 2, incorporate firm and year fixed effects. Standard mistakes are clustered both at the company and year levels. You can find reliable t-statistics in the parenthesis. For significance at the 10%, 5%, and 1% levels, respectively, the symbols *, **, and *** are used.

For additional robustness checks, we include *E* and *S* in the regression to control for how these variables affect investment. We get the same findings.

In sum, based on our regression results, in China's market, the stock market and investor sentiment have an influence on companies' external finance cost. When economic is expansion and investor sentiment is high, corporate investment and employee would be increased. In comparison two factors and combining Chinese capital market characteristic, it makes sense that macroeconomics affects the cost of financing for companies more than investor sentiment.

4.4 Employment Growth Sensitivities of Small Company and Large Company

Beck & Demirguc (2006) show that SMEs (small and medium-size enterprises) face a lot of growth constraints and have less access to formal sources of external finance with

cross-country research. We can infer that comparing with large company, small and medium company needs external finance more and their risk tolerance is lower. Furthermore, it is not rare small company is more probably to lay off employees to maintain their operation under recession period. And when the cost of external finance is high, firms will only invest the most valuable project (Mclean and Zhao, 2014). Therefore, we assume that small size enterprises are more sensitive to the equity market development and investor sentiment.

From our Table 1, Panel A, firm level data, we divide our data to two groups by the median company market capital. The first group is small company and the second is large company. To measure the differential sensitivity of two sizes of companies to economic and investor sentiment, we do a regression of equation (5) with firm fixed effects model and cluster the standard errors of the panel data at the firm level as well. Because our stock market index and investor sentiment index both are annual data, we exclude year effect.

$$e_{i,t} = \alpha_t + \beta_1 E_t + \beta_2 S_t + \varepsilon_{i,t} \qquad (5)$$

The results are reported in Table 3, Panel A. From the regression results, we find that not only economic conditions but also investor sentiment make an obvious impact on the number of small companies' employee. The coefficients of economic and investor sentiment are 0.0141(*t*-statistic = 3.07) and 0.0020(*t*-statistic = 6.33), separately. Both are positive and significant. As a consequence, during the period of economic expansion and high investor sentiment, small companies' staff will increase.

Regarding to large company, only investor sentiment is significantly correlated to their own employee change, which coefficient is 0.0033(*t*-statistic = 11.58). However, Baker and Wurgler (2006) point that the investor sentiment is stronger in difficult-to-value stocks, such as small-cap and high-volatility companies. In order to examine whether Chinese investor sentiment affects different types of companies differently, we do regressions of equation (4) once again with small company and large company respectively. The results are

shown in Table 3, Panel B. The logic is the same with the whole market research method. We utilize *q* and cash flow to access investor sentiment and business cycle margin effects. What attracts us is the cross items. From the results, we can conclude stock market has a positive impact not only on small company but large one. But in terms of sentiment, it only affects small company's Tobin's *q*. Large company almost isn't affected. That is small company external finance cost is more sensitive to investor sentiment. In recession, it would be more difficult to acquire funds for small company, which is consistent with Baker and Wurgler (2006). Therefore, comparing large company and small company in the whole, we can notice that small company are more responsive and susceptible to economic and investor sentiment. This phenomenon is also as the same as American (Mclean and Zhao,2014).

Table 3 Small Company and Large Company Sensitivity

Panel A

	Small Company	Large Company
Stock Market	0.0141***	0.0011
	(3.07)	(0.34)
Sentiment	0.0020***	0.0033***
	(6.33)	(11.58)

Panel B

	Small Company	Large Company
$q(t\text{-}1)$	-0.1364***	-0.0577**
	(-3.53)	(-2.29)
Cash Flow	-0.3095	0.7469***
	(1.39)	(4.36)
Stock Market × $q(t\text{-}1)$	0.0164	0.0171**
	(1.31)	(2.52)
Stock Market × Cash Flow	-0.0988	-0.2141***
	(-1.41)	(-4.58)
Sentiment × $q(t\text{-}1)$	0.0028**	0.0004
	(2.03)	(0.62)
Sentiment × Cash Flow	-0.0007	0.0035
	(-0.81)	(0.60)
Observations	21992	21993

The table reports the different sensitivities of small company and large company to stock market and investor sentiment. Panel A is regressed by equation (5) with fixed model in two groups. Panel B is the results about external finance cost sensitivity through equation (4). You can find reliable t-statistics in the parenthesis. For significance at the 10%, 5%, and 1% levels, respectively, the symbols *, **, and *** are used.

5. Conclusion

We find that changes in the Chinese stock market and investor sentiment do affect the cost of external financing for listed companies and further affect company recruitment. In times of economic development and high investor sentiment, public company would increase their investment and hire more people (and vice versa), consistent with Mclean and Zhao (2014).

Comparing our two variables of a mediating nature, Tobin's *q* and cash flow, both of them can measure financing cost variation with economic conditions. But when we observe the influence of investor sentiment, cash flow has a more significant effect than Tobin's q, in China. This is different from American financial market. Furthermore, our results show that Chinese small businesses are more sensitive to investor sentiment and capital markets as they are in the US.

Finally, we agree with Mclean and Zhao (2014) study and promote Chinese government guides investor sentiment reasonably. Believing that in the future Chinese investor sentiment will be a reliable predictor to external finance costs.

Our research also has some limitations. First and foremost, due to the late development of the Chinese securities market, the relevant disclosure system has only been improved in recent years. Many listed companies did not disclose their number of employees in earlier years, resulting in less than half of the data qualifying for our analysis across the market. According to our statistics, from 2000 to 2021, there are 105,666 records of listed companies in China, but only 43,985 of them are available. In addition, compared to the US market, the Chinese market does not have the same diversity of methods for measuring investor sentiment indices as the US. This limits the possibility of iterative validation of our regression results.

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