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# Incubator role of foreign venture capital: evidence from overseas listing of enterprises

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**ABSTRACT**

This study uses the Granger-causality test and a sub-sample time-varying rolling window to explore the dynamic relationship between foreign venture capital (FVC) and overseas listing of Chinese enterprises (COLC), and takes into account the changes of legal environment and accounting standards. The results showed that from Q1 2012 to Q4 2014, the lower the FVC, the lower the COLC. From Q1 2008 to Q4 2008, the higher the FVC, the higher the COLC. Both positive and negative effects exist from COLC to FVC. Specifically, the more listed enterprises there are, the more foreign venture capitalists trust the potential of Chinese enterprises and the market. Thus, the corresponding FVC was high. Furthermore, the negative correlation between COLC and FVC was due to political factors and epidemics. Many enterprises improve their internationalization and profitability by attracting FVC to Chinese enterprises. Therefore, this study helps foreign investors achieve a greater return on investment in China and enables enterprises to improve their international reputations and realize overseas listings. In addition, the results can provide suggestions for the government to issue relevant measures conducive to maintaining the stability of the domestic market and the balanced development of domestic and foreign markets.

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Overseas listing; foreign venture capital; rolling window; dynamic relationship

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## 1. Introduction

Globally, all countries are significantly affected by the global economic structure (Lee et al., 2018). The main reasons are that Industrial Evolution 4.0[1] promotes economic globalization and investment diversification (Qi et al., 2022), and geopolitical uncertainty impacts international trade and industrial structure (Tien & Minh, 2019). There are significant unstable factors in global integration, such as the British exit or Britain exiting the European Union (Brexit), trade disputes between China and the United States (U.S.), and coronavirus disease 2019 (COVID-19). Therefore, the complexity of the global economy makes venture investors not only in their own

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countries but also increasingly active worldwide (Baldwin & Freeman, 2021). According to the World Investment Report 2021[2], foreign venture capital (FVC) flows to Europe and North America decreased by 80 and 40%, respectively, while the flow of capital into Asia increased by nearly 4% by 2020 (Contractor, 2021). China is the only growing region globally, showing that it is an ideal investment destination for global venture capitalists. Furthermore, as an incubator role, FVC increases the possibility of Chinese enterprises hiring top lawyers, bankers, and accountants, thus improving their internationalization, hence, the successful overseas listing of Chinese enterprises (COLC) in the U.S., the United Kingdom (U.K.), Germany, Japan, and Singapore. (Purkayastha & Kumar, 2021). From a macro perspective, the COLC is conducive to the flow of global capital to accelerate the integration of different economies. Concerning many overseas-listed enterprises, foreign investors are vital shareholders before listing and can provide more capital, global business strategies, and host country networks. In addition, FVC can obtain post-market income and trust in subsequent refinancing (Fernhaber et al., 2009; Hu et al., 2019). At the micro-level, the value of overseas-listed enterprises has multiplied rapidly, which helps enterprises expand their global market share and advance their international popularity, thus attracting foreign investors. In a globally competitive environment, Amazon, Microsoft, Apple, Google, Baidu, Alibaba, Tencent, *etc.*, cannot be separated from the help and promotion of FVC. Moreover, enterprises can eliminate institutional distance after listing overseas to improve internationalization (Gu et al., 2019).

The first FVC in the Chinese mainland market was invested in by the International Data Group (IDG), established by the American Pacific Technology Venture Capital Fund in 1993 (Fensterstock & Li, 2000). Since then, an increasing number of FVCs have invested in China, such as the American Sequoia Capital, the IDG Technology Venture Capital Fund, and the Japan Software Bank Group. These corporations provide capital for Chinese enterprises and a series of value-added services and post-market support, such as the incubator role (Paul & Feliciano-Cestero, 2021). Since China joined the World Trade Organization (WTO) in 2001, Chinese enterprises have become more active in the international market (Zhou et al., 2019). In recent years, the government has improved the convenience of foreign investment by streamlining administration, delegating power, strengthening regulations, improving services, *etc*. Therefore, China's institutional and economic environments have matured (Zhang, 2014). At the same time, the State Council of China has released a policy that includes measures to attract foreign investment, such as liberalization, facilitation, promotion, and protection (Jahanger, 2021). This study argues that the FVC has accelerated the listing process of enterprises. In contrast, an improvement in the internationalization level can attract more FVC (Humphery-Jenner & Suchard, 2013; Cheng & Schwienbacher, 2016; Wu & Wang, 2021).

By collecting 1,431 post-market Chinese enterprises from Q1 2000 to Q4 2021 and the amount of FVC, as well as changes in a legal environment (LE) and accounting standards (AS), this study explores the two-way causality between FVC and COLC under the influence of four lag periods. Previous scholars have limited the exploration of the impact of foreign direct investment (FDI) on foreign listings (Filatotchev et al., 2007; Yang et al., 2014; Fang & Wang, 2020) or the choice of listing location for

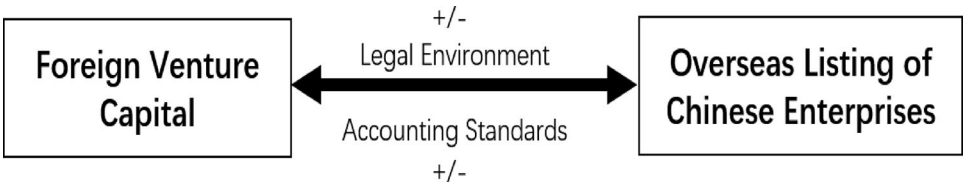


**Figure 1.** Transmission mechanism diagram.
Source: Authors' calculation.

enterprises by domestic venture capital (Humphery-Jenner & Suchard, 2013; Cheng & Schwienbacher, 2016; Bai et al., 2020; Que & Zhang, 2020), but no scholars have directly explored the two-way causal relationship between FVC and overseas listings. By contrast, this study shows whether FVC plays an incubator role in COLC and whether the internationalization of enterprises is conducive to attracting more FVC. Based on the above analysis, the transmission mechanism of FVC and COLC is shown in Figure 1. We believe that changes in LE and AS play a role in FVC and COLC causality. The LE affects investors' investment decisions. In addition, changes in AS have affected enterprises and investors under the old and new standards. Therefore, we control LE and AS, to be able to explore the causal relationship between FVC and COLC more clearly. Empirical results show that the linkage between FVC and COLC allows investors to achieve financial doubling (Zhang & King, 2010; Park et al., 2019; Que & Zhang, 2020). At the same time, foreign listings should pay attention to the incubator role of FVC by using their financial support and internal management experience to solve the problem of information asymmetry in the host country (Rodrigues & Galdi, 2017; Joshi & Subrahmanya, 2019; Wu & Wang, 2021). Moreover, existing research mainly applies to the whole sample test, which can only determine a constant Granger causality. However, LE and AS have time-varying effects on the development of FVC and COLC (Swinkels & Van Der Sluis, 2006; Gupta & Donleavy, 2009; Ma et al., 2020). Therefore, the rolling window causality test was selected to make the results more comprehensive and reliable in this paper (Balcilar et al., 2010; Nyakabawo et al., 2015).

The rest of this paper is organized as follows: Section 2 is the literature review, Section 3 expounds on the empirical method, Section 4 elaborates on the data, Section 5 presents the empirical results, and Section 6 provides the conclusion and provides some opinions.

## 2. Literature review

The goal of FVC is to help invested enterprises improve their internationalization and, successfully list them overseas finally (Suchard et al., 2021). As a vital exit mechanism for post-market enterprises (Black & Gilson, 1998; Jeng & Wells, 2000; Félix et al., 2013), foreign investors can obtain wealth, bringing about the prosperity of venture capital (Lin, 2017).

Some studies have shown that FVC is beneficial for overseas listings (Nahata et al., 2014; Suchard et al., 2021). Hursti and Maula (2007) find that foreign investors promoted the listing of startups abroad in Europe. Humphery-Jenner and Suchard

(2013) use data on Chinese enterprises to show that the higher the FVC, the higher the possibility of listing startup enterprises in the host country. In addition to financial support, the FVC plays another role as an incubator. FernHaber et al. (2009) believe that venture investors' rich investment experience and resources are conducive to promoting the internationalization of enterprises' strategies, thus realizing overseas listing. Cheng and Schwienbacher (2016) point out that FVC provides information and financial support for enterprises to enter foreign markets and actively participates in the internal management of enterprises and the decision-making process of listing places. On this basis, some scholars have studied the influence of FVC on enterprise internationalization. Liu et al. (2012) find that FVC can use the embeddedness of financial institution networks to promote the overseas listing of enterprises, which can help enterprises establish contact with top bankers, lawyers, and accountants (Moore et al., 2012; Zhang & Yu, 2017).

Other studies show that FVC has a restraining effect on enterprises' overseas listing. Humphery-Jenner and Suchard (2013) believe that the number of foreign venture capitalists, the scale of capital, and the governance structure of the domestic market tend to inhibit the overseas listing of domestic enterprises. Lu et al. (2013) explain the essence of venture capital from the system's perspective and find that, under different backgrounds and time conditions, various organizational and behavioral differences among foreign venture capitalists are likely to hinder the listing of enterprises (Amit et al., 1998).

However, there is relatively little research on how enterprises' overseas listings affect their FVC. Most scholars have only explored the FVC exit strategies after the overseas listing of enterprises. Xu (2006) studied the system, law, and regulatory environment of foreign venture capital exit in China and pointed out that FVC can achieve a high exit level after overseas listing. Kelinen and Maula (2014) show that the successful exit of cross-border venture capital after the listing of enterprises is mainly due to the proximity of financial intermediaries to promote cross-border transactions. Suchard et al. (2021) found that suspension of COLC as an exogenous shock would reduce foreign venture capital.

Therefore, we find that FVC provides financial support for foreign enterprises' listings and services such as law, finance, corporate governance, *etc*. However, existing research on these studies is scattered and incomplete. This study analyzes the relationship between FVC and overseas listings from the perspective of an incubator role. In addition, there are few studies on the impact of overseas listings on the FVC. Hence, this study also complements the relationship between FVC and overseas listings using the rolling window causality test.

## 3. Methodology

### *3.1. Bootstrap full-sample causality test*

Previous studies used the Granger causality test in a vector autoregressive (VAR) model. There may be no standard asymptotic distribution when the time series is unstable. Hence, the Granger causality test could be challenging when estimating the VAR model (Toda & Phillips, 1994). Shukur and Mantalos (1997) point out that the

Residual-based Bootstrap (RB) method makes the empirical results more accurate and reliable. In addition, Shukur and Mantalos (2000) further proved that the standard test without the RB method would be inaccurate, particularly for small samples. Balcilar et al. (2010) demonstrated that the RB method could achieve excellent performance in standard asymptotic tests to determine whether these two variables have a cointegration relationship. Therefore, the likelihood ratio (LR) test, which is based on the RB method, was used in this study to revise and test small samples and explore the causal relationship between FVC and COLC.

To better explain the RB method based on the LR test, FVC and COLC can be measured by the amount of foreign venture capital and the number of Chinese enterprises' overseas listings. Then, LE and AS represent the legal environment and accounting standards respectively. We establish the VAR equation of the four variables:

$$\begin{bmatrix} FVC_t \\ COLC_t \end{bmatrix} = \begin{bmatrix} \phi_{10} \\ \phi_{20} \end{bmatrix} + \begin{bmatrix} \phi_{11}(L) & \phi_{12}(L) & \phi_{13}(L) & \phi_{14}(L) \\ \phi_{21}(L) & \phi_{22}(L) & \phi_{23}(L) & \phi_{24}(L) \end{bmatrix} \begin{bmatrix} FVC_t \\ COLC_t \\ LE_t \\ AS_t \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \quad (1)$$

where $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t})'$ is a white noise process with a zero mean. $\phi_{ij} = \sum_{k=1}^{p+1} \phi_{ij,k} L^k$, where $i, j = 1, 2$. The optimal lag length p is determined using the Schwarz information criterion (SIC). L is a lag operator, where $L^k Z_t = Z_{t-k}$. The null hypothesis of this study is that when COLC is the Granger causality of FVC if the first null hypothesis is $\phi_{12,k} = 0$, $p$ is rejected, which means COLC has a significant effect on FVC, COLC plays a predictive role in FVC. Similarly, if the second hypothesis $\phi_{21,k} = 0$, $p$ is rejected, it indicates that FVC significantly impacts COLC.

### 3.2. Parameter stability test

A full-sample causality test assumption in the VAR model is that the parameters are constant. However, if the potential full-sample time-series changes structurally, the causal links would become unstable (Balcilar & Ozdemir, 2013). Therefore, the rolling-window bootstrap estimation can be used to avoid the problem of parameter non-constancy. Moreover, the short-term constancy of the parameter was tested using the Sup-F, Mean-F, and Exp-F tests (Andrews, 1993; Andrews & Ploberger, 1994). The $L_c$ test (Nyblom, 1989; Hansen, 1992) was used to test the constancy of long-term parameters. These tests were performed according to the LR statistical sequence. In addition, p-values and critical values can be calculated using a parametric bootstrap program (Andrews, 1993; Andrews & Ploberger, 1994).

### 3.3. Sub-sample rolling-window causality test

Rolling-window bootstrap estimation was used to overcome the above problems in this study. Rolling window technology depends on fixed-size subsamples. Therefore, a fixed-size rolling window is established, including the observation of l, which rolls sequentially from the beginning to the end of the total sample (Balcilar et al., 2010).

The total sample is divided into $T-l$ samples, that is, $\tau-l+1, \tau-l, \ldots, T$ and $\tau = l, 1+l, \ldots, T$. The RB based on a small-sample-modified LR is applied to each subsample instead of an individual causality test for the total sample. The relationship between FVC and COLC can be observed by calculating the bootstrap p-values of the LR statistics of the $T-l$ rolling subsamples. In addition, a transfer coefficient was observed between these two variables. The influence of FVC on COLC can be calculated from the equation $N_b^{-1}\sum_{p-k}^{p}\hat{\phi}_{12,k}^{*}$ to be identified, where $N_b$ represents the number of bootstrap repetitions.

Similarly, the influence of COLC on FVC can be calculated from the equation $N_b^{-1}\sum_{p-k}^{p}\hat{\phi}_{21,k}^{*}$. At the same time, $\hat{\phi}_{12,k}^{*}$ and $\hat{\phi}_{21,k}^{*}$ are the bootstrap estimation from the above VAR model. Moreover, the 95% confidence interval indicates that the lower limit is equal to 0.05 quantiles and the upper limit is equal to 0.95 quantiles.

The accuracy and actual performance of the rolling-window estimation depends on the increment interval and window width of each regression. On the one hand, larger window size can ensure parameter estimation accuracy, but an extremely large window size would reduce representativeness due to heterogeneity. On the other hand, if the window size is too small, it can reduce the heterogeneity and improve the representativeness of the parameters. However, the parameter estimation accuracy is reduced due to the increase in the standard deviation estimation. Therefore, the window width should be set within an interval with good representativeness and accuracy.

## 4. Data

Data from Q1 2000 to Q4 2021 was used to investigate the interaction between FVC and COLC. In November 1999, China and the U.S. signed a bilateral agreement on China's accession to the WTO, which promoted the development of Sino-US relations and contributed to the prosperity of the world economy. After that, China joined the WTO in 2001 and opened a new page for China's reform and opening-up. The relevant COLC data are obtained from the overview stock table of Chinese enterprises' overseas listings in the China Stock Market and Accounting Research Database (CSMAR). Among them, listed enterprises[3] are repeatedly deleted and reserved for those listed on different businesses with more than one-quarter difference. Finally, 1,431 remain after 1,647 enterprises were deleted, which were classified at the quarterly level according to the time of listing. FVC is measured by the amount of foreign venture capital (Guler & Guillén, 2010; Wang & Wang, 2012), which can be manually filtered from the Zero2IPO and CVSource databases. FVC was classified into quarterly categories to ensure data consistency. Furthermore, the corresponding non-foreign and non-venture investments were excluded. In addition, the measurement of LE mainly includes legal protection and legal enforcement. This paper chooses the perspective of law enforcement, that is, to calculate the ratio of newly added blacklist enterprises to all enterprises. And the relevant data comes from the National Public Credit Information Center. Furthermore, AS is measured by calculating the difference between an enterprise's net profit under the old and new standards, and the data comes from Wind.

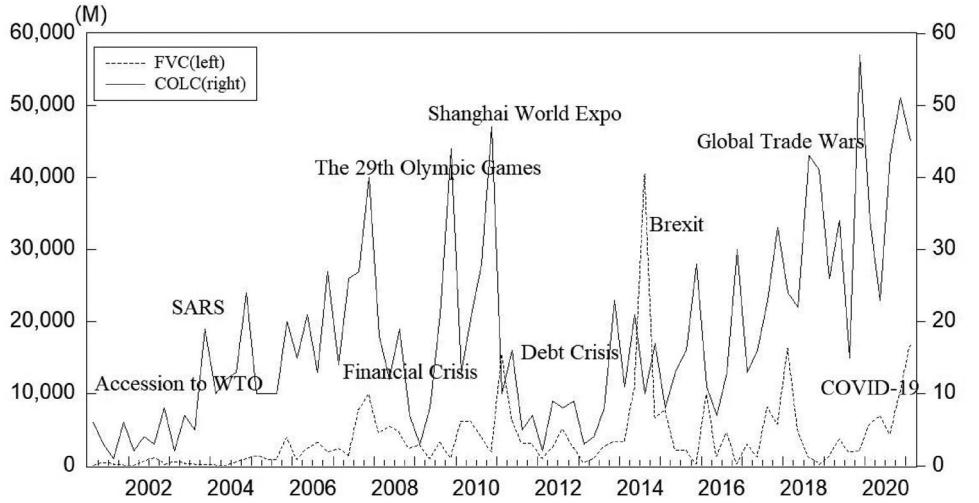


**Figure 2.** The trends of FVC and COLC.
Source: Authors' calculation.

As shown in Figure 2, COLC generally exhibits a fluctuating upward trend. Before 2008, COLC steadily increased, except for a slight decline in 2005. In 2006, FVC increased significantly and declined sharply in 2008. The main reason for this is that the financial crisis in 2008 caused the FVC and COLC to decrease sharply. Due to the credit crisis and financial turmoil, the COLC dropped sharply from 40 in Q4 2007 to 2 in Q1 2009 (Athreye et al., 2021). At the international level, the subprime mortgage crisis in the U.S. has extended to the global financial crisis, which has caused significant stock indexes to fall sharply in Europe, America, and Asia (Rudd, 2009). In particular, after several major financial institutions collapsed, the securities market entered a new round of vicious decline. Thus, the COLC process has been seriously hindered (Liu et al., 2012). Domestically, in September 2006, the Ministry of Commerce of China promulgated a revised policy[4] that imposed strict restrictions on domestic enterprises' overseas listings, significantly impacting COLC (Huang, 2007).

Furthermore, in 2014, China's foreign capital inflow was $119.6 billion[5], ranking first in the world for the first time. FVC is $6.2 billion, which benefits from the policy of opening up to the outside world (Williams & Zhang, 2015). To speed up the construction of a new open economic system, the government has explored the pre-entry national treatment and negative list management model for foreign investment in China (Shanghai) Pilot Free Trade Zone. In addition, studies show that COLC has increased foreign investors' recognition of Chinese enterprises (Yao & Whalley, 2016). In June 2018, the Chinese State Council proposed measures to attract foreign investors, such as liberalization, facilitation, promotion, and protection (Jahanger, 2021). Among them, the government relaxes restrictions on establishing foreign-funded institutions and expands their business scope in China to attract high-quality overseas capital to invest in domestic enterprises and capital markets (Jahanger, 2021). Therefore, since Q3 2018, the FVC has shown an apparent upward trend.

**Table 1.** Descriptive statistics for FVC and COLC.

| | FVC | COLC | LE | AS |
|---|---|---|---|---|
| Observations | 81 | 81 | 81 | 81 |
| Mean | 3897.138 | 17.667 | 0.531 | 0.501 |
| Median | 2395.610 | 13.000 | 0.615 | 0.631 |
| Maximum | 40392.650 | 57,000 | 0.741 | 0.814 |
| Minimum | 8.270 | 1.000 | 0.131 | 0.426 |
| Standard Deviation | 5522.817 | 13.018 | 0.227 | 0.117 |
| Skewness | 4.053 | 1.040 | 2.101 | 1.001 |
| Kurtosis | 25.240 | 3.432 | 3.211 | 4.567 |
| Jarque-Bera | 1891.070*** | 15.227*** | 0.352*** | 0.433*** |

Note: *** denotes significance at the 1% level.
Source: Authors' calculation.

Table 1 presents descriptive statistics of the data. The average FVC, COLC, LE and AS values are 3897.138 (millions of dollars), 18 (approximately), 0.531 and 0.501, respectively. The skewness of FVC, COLC, LE and AS are a right-skewed distribution owing to positive skewness. Moreover, the kurtoses of FVC, COLC, LE and AS are both greater than three, which reveals that they are all peak distributions and have a much higher peak around the mean value. Furthermore, the Jarque-Bera index indicates that the distribution of FVC, COLC, LE and AS are non-normal at the 1% level, which shows that the traditional Granger causality test is not suitable. Therefore, this study used LR statistics based on the RB method to discuss the relationship between FVC and COLC. On this basis, this study performs a bootstrap subsample rolling-window test to investigate the time-varying correlation between FVC and COLC. Furthermore, to prevent potential heteroscedasticity and volatility, the natural logarithm and first-order differences were adopted.

## 5. Empirical test

Based on the VAR model, this study tested the full-sample causality of FVC and COLC, and the results are shown in Table 2. According to the SIC, the optimal lag order was set to 4. Furthermore, the bootstrap p-values show no Granger causality between FVC and COLC, contrary to existing conclusions (Nahata et al., 2014; Cheng & Schwienbacher, 2016; Suchard et al., 2021).

The full-sample causality test assumes that there is one Granger causality, but this assumption is rejected when there are structural mutations in the variables and VAR model. Due to changes in LE and AS, time-varying correlations exist between FVC and COLC (Cheng & Schwienbacher, 2016). Therefore, this study uses the Sup-F, Ave-F, Exp-F, and $L_c$ tests to capture the non-constancy feature of the two-variable VAR model (Andrews, 1993; Andrews & Ploberger, 1994; Nyblom, 1989; Hansen, 1992). Table 3 presents the results.

The Sup-F and Exp-F tests showed that FVC and COLC were unstable at 1%. In addition, the Ave-F test indicated that FVC and COLC were not consistent at the 1% level, and the VAR model was not valid at the 1% level. In addition, the $L_c$ test shows that the parameters in the VAR model follow a random walk process, meaning that the parameters are unstable during the whole sample period. Hence, subsample tests can be used to explore the unstable relationship between the FVC and COLC. Both

**Table 2.** Full-sample Granger causality tests.

| | $H_0$: COLC does not Granger cause FVC | | $H_0$: FVC does not Granger cause COLC | |
|---|---|---|---|---|
| Tests | Statistics | p-value | Statistics | p-value |
| Bootstrap *LR* test | 5.643 | 0.142 | 2.633 | 0.581 |

Note: We calculate p-value using 10,000 bootstrap repetitions.
Source: Authors' calculation.

**Table 3.** The results of parameter stability test.

| | FVC | | COLC | | VAR system | |
|---|---|---|---|---|---|---|
| Tests | Statistics | p-value | Statistics | p-value | Statistics | p-value |
| *Sup-F* | 155.162*** | 0.000 | 217.432*** | 0.000 | 21.862*** | 0.000 |
| *Ave-F* | 22.342*** | 0.000 | 35.984*** | 0.000 | 11.653*** | 0.001 |
| *Exp-F* | 74.957*** | 0.000 | 123.016*** | 0.000 | 9.796*** | 0.000 |
| $L_c$ | | | | | 0.715 *** | 0.006 |

Notes: We calculate p-value using 10,000 bootstrap repetitions.
***denote significance at the 1% levels, respectively.
Source: Authors' calculation.

the FVC and COLC variables are first-order single integers, which means that when there is no cointegration relationship, the VAR model after the first-order difference is unreasonable.

Nevertheless, the choice of the rolling window width is complex. A small width cannot ensure accuracy, whereas a large width may reduce the frequency of scrolls. Furthermore, Pesaran and Timmermann (2005) pointed out that the window width in the subsample test cannot be less than 20. To ensure the robustness of the empirical results, the width of the rolling window was 24. This can verify whether changes in FVC impact COLC and vice versa, hence, whether this impact is positive or negative can be empirically determined.

Figures 3 and 4 show the p-values and influential orientations of the FVC on the COLC. According to the alternative hypothesis, it is acceptable at 10% that FVC is the Granger cause of COLC during the Q3 2007 to Q4 2008 and Q1 2012 to Q4 2014 positive effects.

In 2007, China's GDP increased by 13% over 2006, mainly because the government issued many tightening monetary policies[6], which have promoted the explosive development of venture capital in China. In the same year, due to the influence of the stock market and national policy guidance, many foreign-funded institutions began to set up renminbi (RMB) funds to facilitate investment and exit in China. For instance, Sequoia Capital with the Shenzhen Innovation Investment Group jointly set up Sequoia Venture Capital Funds. As can be seen from Figure 4, we found that the extensive involvement of FVC plays the incubator role, which has a significant incubation effect on the COLC. In terms of investment and financing services, FVC solves the funds' problem of COLC by directly investing in enterprises or combining it with general investment. Second, in management consulting services, FVC provides an advanced management system and market analysis as well as enables Chinese enterprises to understand the foreign listing system deeply and further reduce information asymmetry. Third, FVC endorsement is an implicit ability that promotes Chinese enterprises' reputation globally. Fourth, if the FVC is regarded as a bearing place and

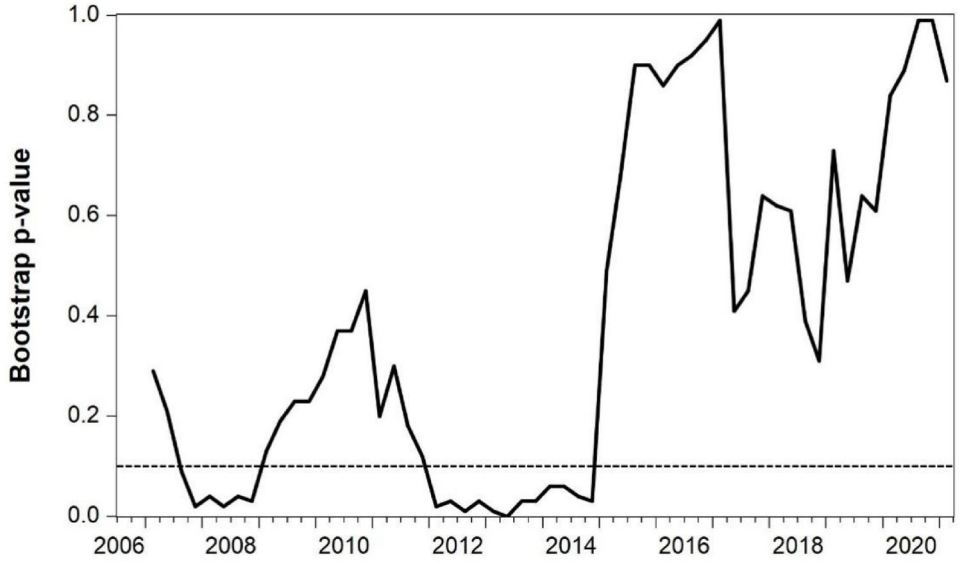


**Figure 3.** Bootstrap p-values of rolling test statistic testing the null hypothesis that FVC does not Granger cause COLC.
Source: Authors' calculation.

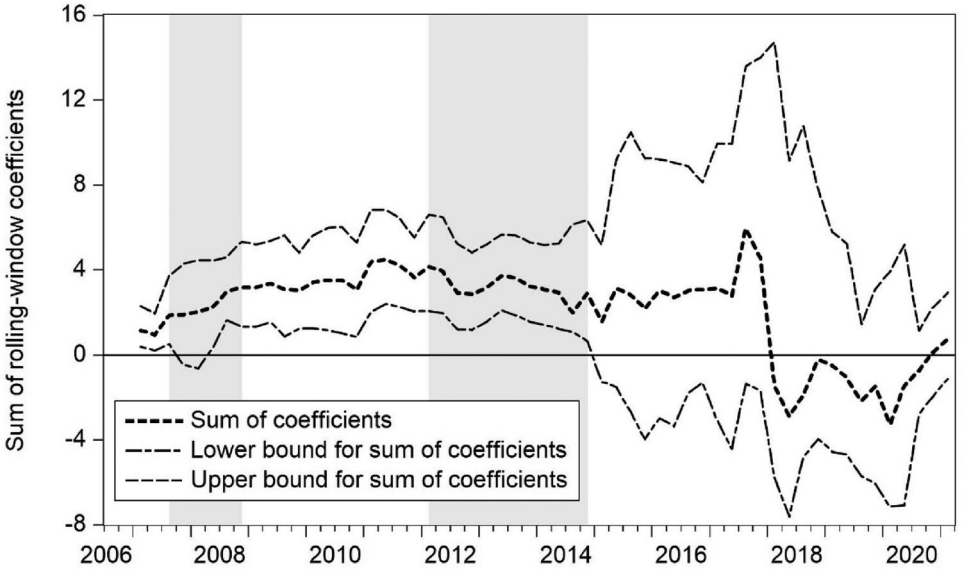


**Figure 4.** Bootstrap estimates of the sum of the rolling-window coefficients for the impact of FVC on COLC.
Source: Authors' calculation.

wind vane, the invested enterprises will gather in the FVC, a giant incubator. Therefore, investors from all countries and regions can recognize the vastness of the Chinese market and introduce various supporting policies and systems. Following the

establishment of representative offices in China by the NASDAQ Stock Exchange in September 2007, an increasing number of foreign exchanges[7] entered China, leading to a rapid increase in the COLC. Therefore, increasing FVC caused COLC to improve from Q3 2007 to Q1 2008, which is exactly the interpretation of the first block of influence in Figures 3 and 4.

In March 2007, New Century Financial, the second-largest subprime mortgage lender in the U.S., declared that it was on the verge of bankruptcy and filed for bankruptcy protection the following month. In July, Standard & Poor announced a reduction in the credit rating of subprime mortgage loans, which caused significant shocks in the global financial market. For example, in China, the Shanghai Composite Index declined 65%[8] annually from 5,265.00 to 1,820.81 in 2008. The depressed stock market has caused the FVC not to get rid of the stock market, and we found that the incubation funds available for risk reinvestment decreased significantly. Consequently, the number of COLC was sluggish.

Furthermore, owing to the adjustment of domestic capital markets, the venture capital market experienced depression after limited partners promised to contribute capital, and investment institutions and investors withdrew their investment intentions. For instance, the California Public Employees Retirement Fund, a well-known American venture capital fund, saw a 20% drop in total investment, leading to a decrease in FVC in China. The reduction in FVC would reduce the amount and scope of financing of enterprises that plan to list overseas. A lower FVC indicates equal external information. Professional knowledge in FVC can help enterprises quickly obtain valuable information that can be used to get listed in foreign countries more conveniently. Moreover, if foreign venture capital is small, companies can obtain less attention and advantage information, further affecting the process of listing overseas companies. Therefore, from Q1 2008 to Q4 2008, the reduction in FVC caused a corresponding decrease in the COLC.

The world economy showed volatility during the *Twelfth Five-Year Plan*[9] in China. From a foreign perspective, the uneven economic recovery, geopolitical tensions, and harsh natural phenomena in developed countries have pressured China's trade growth, leading to a depression in the overall economic and trade import and export situation. For example, the debt crisis in Europe, tensions between Russia and the U.S. and the European Union (EU), regional instability triggered by conflicts in the Middle East, and the Ebola outbreak in West Africa have all caused an unavoidable bottleneck in global trade. However, the Chinese government proposed capital control in 2008 and announced that four trillion RMB were invested in boosting the economy until 2010 (Qi et al., 2022). Against the background of great uncertainty in the international economic and political situation, *the four-trillion plan* makes the economy gradually recover and makes FVC optimistic about economic development. Therefore, despite the complex international situation, to realize risk hedging, FVC has invested more energy in the incubation of COLC, which shows an increasing trend.

Figures 5 and 6 describe the p-values and orientations of the effects of COLC on FVC. According to the alternative hypothesis, it can be accepted that COLC was the Granger cause of FVC from Q4 2010 to Q2 2012, Q1 2013 to Q1 2014, and Q1 2018

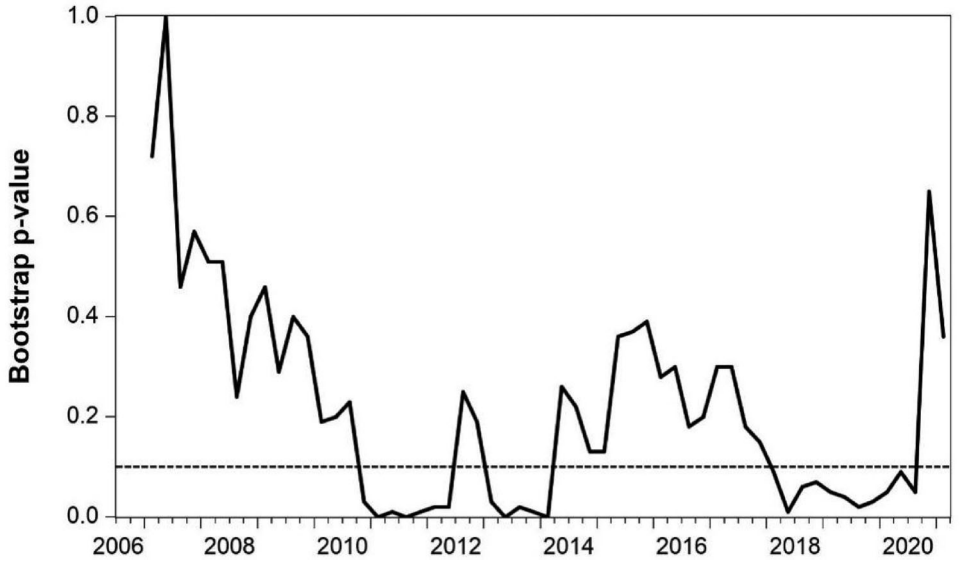


**Figure 5.** Bootstrap p-values of rolling test statistic testing the null hypothesis that COLC does not Granger cause FVC.
Source: Authors' calculation.

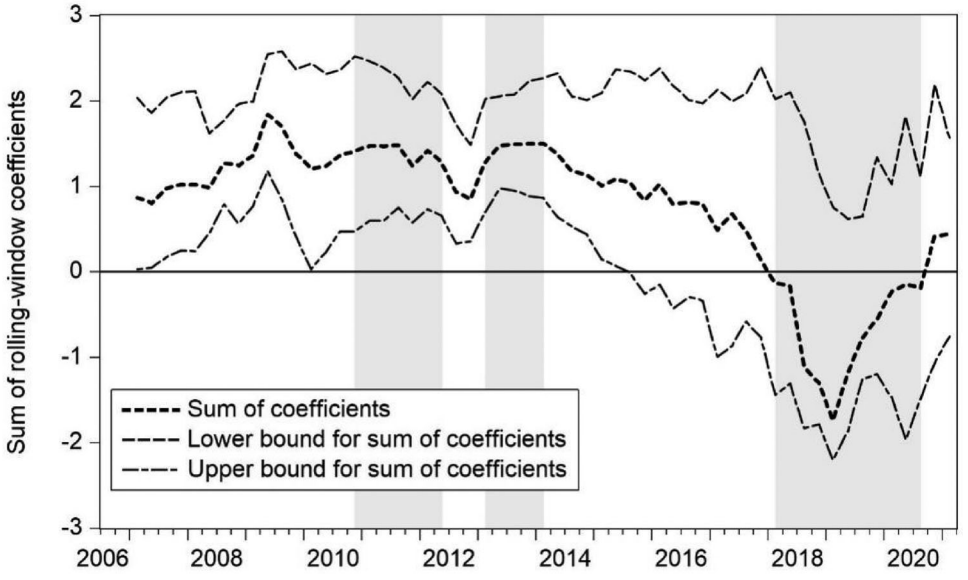


**Figure 6.** Bootstrap estimates of the sum of the rolling-window coefficients for the impact of COLC on FVC.
Source: Authors' calculation.

to Q3 2020 at the 10% significance level. Among them, only the period from Q1 2018 to Q3 2020 had negative effects, while the rest were positive.

In 2010, the Chinese market became a keen investment destination for global capital. Chain operations have been a business model favored by overseas exchanges,

including department stores, restaurants, hotels, and other sub-sectors with initial overseas projects. Nevertheless, while the Chinese market is flourishing, many post-listed enterprises have been accused of financial fraud. Therefore, the internationalization of Chinese enterprises has been controlled and restricted, and COLC has tended to decline. From the perspective of financial theory, uncertainty is an essential feature of venture capital, and venture capitalists abandon investments because they anticipate high risk. In addition, venture capital-seeking cross-border investments may explore investment opportunities in emerging markets and reduce risks by using low-cost or different industries and regions. All these results show that location advantage is essential in FVC. At that time, foreign investors had lower confidence in foreign investment in China, and institutions constantly withdrew investments in the Chinese market. In addition, in 2009, China set up the Science and Technology (Sci-tech) Innovation Board on the Shanghai Stock Exchange, which canceled the profit requirement of pre-listing operation profit requirements compared with the A-share market. With the increase in domestic sectors, many entrepreneurs have begun to prepare for native listings, thus reducing the proportion of overseas listings. Furthermore, enterprises listed on the Sci-tech Innovation Board rely more on home capital, and there is little demand for foreign incubation services. With the increasing uncertainty of the international economic situation, enterprises' suspension of internationalization reduced the FVC from Q4 2010 to Q2 2012, which verified the shaded areas in the first part of Figures 5 and 6.

The global economy continued to slump in 2013. Developed countries have adopted large-scale and robust economic stimulus measures to accelerate the layout of emerging industries and seize the commanding heights of the world economy. For China, the first overseas post-listing enterprise was LIGHT IN THE BOX, a foreign trade B2C enterprise, in 2013 (NYSE, April 17th), and its opening surge made a good start for other domestic companies. Additionally, in October and November, the total number of COLC exceeded the total number in the first three quarters of 2013. This trend benefits from China's stable and relaxed economic environment, the continuous improvement of the modern market system, and government support policies for enterprises. Therefore, the internationalization of enterprises in China has accelerated, and COLC has gradually increased. In addition, as the reputation of enterprises gradually increases, many foreign investors become optimistic about the development of China, thus investing in Chinese enterprises. Moreover, as the economies of various countries exit the downturn, overseas capital markets continue to strengthen, and the exit mechanism could bring wealth profit after listing. Hence, from 2013:Q1 to 2014:Q1, COLC was positively correlated with FVC. And these impacts coincide with the second part of Figures 5 and 6.

In March 2018, U.S. President Donald Trump signed a memorandum announcing the imposition of a 25% tariff on Chinese goods worth $60 billion, which started the first shot of the trade war with China. The U.S. government passed the *Foreign Company Accountability Act* in December 2020, which stipulates that all foreign enterprises may not be listed in the U.S if they do not comply with audit standards. The problematic international political situation brought trade pressure, and the global spread of the pandemic caused trade stagnation. At the beginning of 2020, COVID-19 emerged in Wuhan, China.

On January 31st, the World Health Organization (WHO) declared that Covid-19 constituted a public health emergency of international concern (PHEIC). Although the WHO did not recommend trade restriction measures, some contracting countries implemented temporary controls on exporting specific categories of commodities and adopted entry and exit control measures against China. With the epidemic's severity, the number of countries with trade restrictions increased and gradually strengthened the scope and intensity of control measures. These measures cast a shadow on the Chinese economy and pressure on foreign trade. Owing to the epidemic's persistence and economic downturn, COLC has decreased significantly. However, in 2020, China adhered to the opening-up principle and promoted the promulgation of laws and regulations, such as *the Export Control Law* and *the Measures for Foreign Investment Safety Review*. These laws further urge domestic enterprises that fail to list overseas firms to focus on the domestic market. Under the guidance of domestic macro-circulation policies, enterprises that initially planned to be listed abroad were listed at home. However, a reduction in COLC does not weaken the optimism of foreign investors in the Chinese market.

In contrast, these investors believe that the practice of accelerating the transformation and development of Chinese enterprises has excellent potential. In addition, foreign investors believe that even if COLC decreases, enterprises will eventually embark on globalization, thus continuing to invest and incubate Chinese enterprises. Therefore, from Q1 2018 to Q3 2020, COLC negatively correlated with FVC. Up to now, all the reasons in Figures 5 and 6 have been explained.

In sum, the bootstrap full-sample test shows no mutual influence between FVC and COLC, which is not robust because the parameters are presumed to be constant in the VAR models. In addition, parameter stability tests were applied to examine whether there was a non-stable relationship between these two variables, and the results indicated structural mutations in the FVC, COLC, and VAR models. Therefore, the subsample test should analyze the non-constant correlation between FVC and COLC. The empirical results indicated that there is a causal relationship between FVC and COLC. First, FVC has a positive impact on COLC, which means that when FVC is low in China, the problem of information asymmetry becomes more prominent. In addition, FVC can play the role of incubator and accelerate the COLC process as investment increases. However, this view cannot be held during periods of negative influence. The negative impact is that under a severe international economic and trade background when FVC is higher, the panic of entrepreneurs and the expectation of bubbles in the market would suspend the listing. Both positive and negative effects exist from COLC to FVC. With a higher COLC, a higher FVC implies that foreign investors can recognize the potential of enterprises in China. Moreover, the negative correlation between COLC and FVC proves that COLC has decreased due to political factors and epidemic situations: however, it does not affect investor sentiment. Unlisted enterprises strive to improve their internationalization and profit levels so that foreign investors can remain optimistic about the Chinese market.

## 6. Conclusion

This study used full-sample and sub-sample tests to analyze the interaction between FVC and COLC. The empirical results show that FVC is positively correlated with

COLC, and FVC acts as a government role to influence COLC. FVC solves the funds' COLC problem by investing directly in enterprises in terms of investment and financing services. In addition, the FVC provides an advanced management system and market analysis for Chinese enterprises in management consulting services. Furthermore, forced FVC endorsements can enhance the reputation of domestic enterprises. Finally, if the FVC is regarded as a bearing plate and wind vane, the invested enterprises would gather in the FVC, which is a giant incubator. In addition, there were both positive and negative influences of COLC on FVC. The negative correlation shows that, although Chinese enterprises make efforts to improve their quality and profitability, foreign investors are confident in their future.

Exploring the relationship between FVC and COLC can provide some reference suggestions to investors, related enterprises, and government departments. First, FVC positively influences COLC, which means that foreign investors, who play the incubator role, should invest more funds in Chinese enterprises to be listed to get more wealth effects after listing. Furthermore, investors can quickly have funds for a new investment round after they exit the market to realize capital flow and help them benefit the most. Second, as a bubble exists in the market, enterprises should thoroughly investigate the external market before listing. Essentially, these enterprises can obtain information from FVC to solve the problem of information asymmetry. Third, they could refer to other listed enterprises to avoid management and production issues caused by blind listings. Finally, the government should further relax the FVC entry policy and provide more thoughtful landing services. Relevant departments should strengthen the management of risk capital sources and increase control of enterprises' governance ability. Domestic enterprises can be smoothly listed overseas in these ways, thus providing a virtuous circle of foreign capital inflow and enterprise listings.

## Notes

1. The 4th industry evolutionary is based on the division of different stages of industrial development, which is the era of using information technology to promote industrial change, that is, the era of intelligence.
2. The World Investment Report 2021 is published by the United Nations Conference on Trade and Development (UNCTAD).
3. Tokyo Stock Exchange, Frankfurt Stock Exchange, London Stock Exchange, American Stock Exchange, Nasdaq Stock Exchange, New York Stock Exchange, Hong Kong Stock Exchange, and Singapore Stock Exchange.
4. *Regulations on Foreign Investors' Mergers and Acquisitions of Domestic Enterprises*
5. The data excluding banking, securities, and insurance
6. 6 interest rate hikes and 9 deposit reserve increases
7. London Stock Exchange, New York Stock Exchange, Tokyo Stock Exchange, Singapore Stock Exchange, Korea Stock Exchange
8. Data from the Wind database
9. The period of *Twelfth Five-Year Plan* is from 2012 to 2015

## Disclosure statement

No potential conflict of interest was reported by the authors.

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