External and Internal Capital Market: Substitution or Complementarity—An empirical test based on the effect of China's Land-Hong Kong Stock Connect

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Abstract: As a milestone in the opening of capital market, Land-Hong Kong Stock Connect not only has a far-reaching impact on the linkage of Shanghai, Shenzhen and Hong Kong, but also has caused a series of market effects. Based on the exogenous policy of land port link, this paper takes all A-share listed companies from 2010 to 2020 as the research object to explore the relationship between internal and external capital markets. It is found that: external capital market development can substitute for internal capital market construction, and the path of action of both mainly stems from the alleviation of financing constraints and the improvement of corporate governance efficiency; And this effect is more significant in the samples with low stock liquidity and high number of analysts; Further research shows that the substitution effect of external capital market opening on internal capital market can ultimately lead to the improvement of corporate value, which is mainly reflected in companies with low stock liquidity and high number of analysts. Based on the internal capital market, this paper explores how the opening of capital market affects the economic behavior of micro enterprises, which has strong policy implications for the Shanghai-London Stock Connect and the opening up of emerging capital markets.

Key Words: Internal Capital Market; External Capital Market; Diversified Management; Land-Hong Kong Stock Connect ; Company Value

1. Introduction

Due to the imperfection of the external capital market, the rapid development of the company group and the existence of the internal capital market, more and more attention has been paid to the internal capital market theory in recent years. Theoretically, when the external capital market is invalid or inefficient, it will lead to the effective allocation of resources through the construction of internal capital market. Although the company can build an internal capital market through diversification or corporate group, this internal capital market is not completely independent of the external capital market. From a dynamic perspective, external capital can be generated internally through equity financing, and internal capital can be returned to the external capital market through the transfer of ownership, The internal and external capital markets also often convert to each other (as shown in Figure 1). Therefore, the two may be either an alternative relationship of mutual benefit or complementary relationship [7]. Specifically, on the one hand, due to the similarities in fund raising and distribution, corporate governance, executive incentive and risk dispersion, the internal and external capital markets can replace each other. If the effectiveness of the external capital market can achieve the best capital allocation, there is no need for the existence of the internal capital market, but this is not the case. The incomplete external capital market provides the possibility for the internal capital market to create the capital optimising strategies, So that the two can form an effective alternative. When the optimal allocation of capital in the internal and external capital markets deviates from the best choice, the mutual substitution of the two will change. When the capital allocation efficiency of the internal capital market is certain,

and the allocation efficiency of the external capital market continues to improve with the development of economy and the improvement of system, the internal capital market will decrease with the improvement of the allocation efficiency of the external capital market, or even be dwarfed and disintegrated, and vice versa. In short, with the changes in the allocation efficiency of internal and external capital markets, there may be a phenomenon of mutual substitution between internal and external capital markets. On the other hand, the external capital market deviates from the optimal allocation of funds due to financing constraints and agency problems, while the internal capital market has great advantages in alleviating financing constraints and reducing agency conflicts, thus forming a complementary relationship.

If the external capital market can accurately identify the effectiveness of the internal capital market, the improvement of the external capital market can create greater financing space for diversified companies in the internal capital market to expand their own scale. In short, the internal and external capital markets can show a complementary relationship.

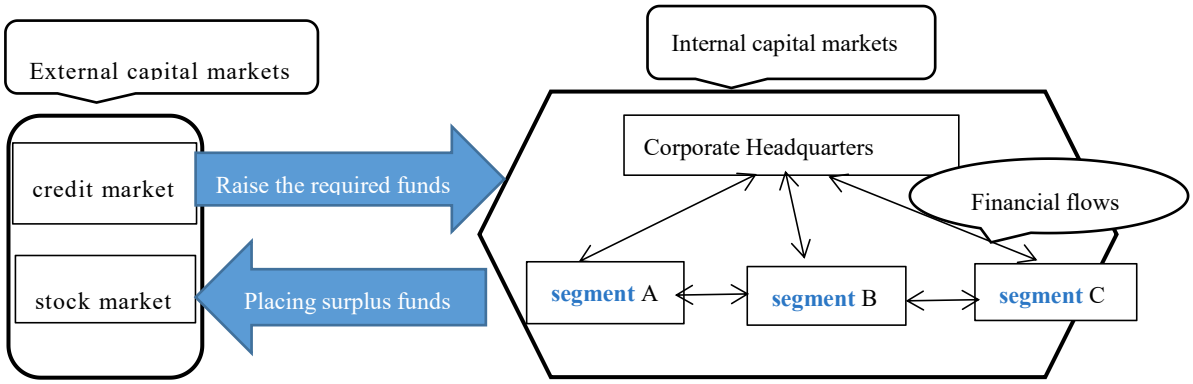

Figure 1 Conversion diagram of internal and external capital market relationship

Adhering to opening to the outside world is an important part of China's economic system reform and the focus of promoting economic development and maintaining social stability. Since the reform and opening up, Since the reform and opening up, China has always adhered to the basic state policy of opening up to the outside world, and has been promoting economic progress in deeper areas and at a higher level. Among them, the opening of capital market is one of China's policies of "bringing in" and "going out". From China's accession to the WTO in 2001, to the qualified foreign institutional investor (QFII) system in 2002, the qualified domestic institutional investor (QDII) system in 2006, to the RMB qualified foreign investor system in 2011, as well as the Shanghai-Hong Kong stock connect in 2014, the Shenzhen-Hong Kong stock connect in 2016 and the Shanghai-London stock connect in 2018, It has gradually changed the relatively closed state of China's capital market and the capital allocation efficiency of the market. So what impact will this series of reforms of opening up the external capital

market have on the internal capital market? The existing research theoretically expounds the relationship between the internal and external capital markets, and holds that the internal and external capital markets show various characteristics such as substitution, conflict and complementarity. With the help of the implementation of the Shanghai-Shenzhen-Hong Kong stock connect policy, this paper tests the relationship between the external capital market and the internal capital market from an empirical perspective, and solves the endogenous problem of the previous research. Therefore, this paper takes the implementation of Shanghai-Hong Kong stock connect and Shenzhen Hong Kong stock connect (hereinafter referred to as land Hong Kong stock connect) as a quasi natural experiment, and gradually includes the target company in 2014-2020 to build a Multi-period DID model to explore the following questions: first, what is the relationship between external capital market and internal capital market? Second, what is the mechanism by which the external capital market affects the internal capital market? Third, can the reform of the external capital market ultimately increase the operating performance of the internal capital market?

Based on the data of all A-share listed companies from 2010 to 2020, by constructing a Multi-period DID model, this paper finds that the development of external capital market forms an effective alternative to the construction of internal capital market, and their action path mainly comes from the easing of financing constraints and the improvement of corporate governance efficiency; The substitution effect of external capital market on internal capital market is more significant in the samples with low stock liquidity and high number of analysts; Further research shows that the substitution effect of external capital market opening on internal capital market can eventually improve the value of the company, which is mainly reflected in the companies with low stock liquidity and high number of analysts.

The main contributions of this paper are: (1) as for the economic consequences of capital market opening, there are both positive effects (investment scale, promoting economic growth, improving corporate governance and improving the quality of information disclosure) and negative Mysteries (increasing the linkage between A-share market and Hong Kong market and increasing the risk of capital market) [5,6,15], This paper discusses the impact of capital market opening on the diversification of internal capital market, so as to supplement the empirical evidence of how external capital market opening affects corporate behavior. (2) Existing studies have focused on constructing DID models with the 2014 event to focus on the impact of the Shanghai-Shenzhen-Hong Kong Stock Connect on capital market aspects such as stock market linkage [8] and stock price information content [17], and few have used multi-period DID models to examine the impact on the micro firm level. This paper, on the other hand, explores the impact of

external capital markets on internal capital markets from the perspectives of both financing constraints and corporate governance through a multi-period DID model, as well as the use of PSM tests, replacement variable definitions, replacement models and shifting sample sizes to increase the reliability of the study's findings. (3) The research on the internal capital market at home and abroad has been improved day by day. Combined with the land-Hong Kong stock connect policy implemented and deepened in China, this paper explores its possible impact on the diversification behavior of the company. To a certain extent, it broadens the research on the relevant topics of the external capital market reform on the construction of the internal capital market. While deeply revealing the specific action mechanism of the external capital market on the internal capital market (financing constraint substitution effect or corporate governance effect) and its possible economic consequences, it also enriches the existing literature on the influencing factors and economic consequences of corporate diversification. (4) Under the background of the gradual and in-depth promotion of Shanghai-Hong Kong stock connect, Shenzhen-Hong Kong stock connect, Shanghai-London stock connect and Debt-London stock connect, this paper has practical significance for further implementing the capital market opening policy.

2. Theoretical analysis and research questions

2.1. external capital market and internal capital market: financing constraint effect

The incompleteness of the capital market makes China's listed companies have a large financing constraint problem. As China's capital market is not yet perfect, the financing methods and financing channels are limited, which leads to listed companies generally facing financing constraints [2], However, enterprise groups can build an internal capital market to generate stable operating cash flow, reduce financing transaction costs and improve the effective allocation of resources, so as to alleviate the internal financing constraints of enterprises. With the successive opening of the land to Hong Kong link, the opening of the external capital market has gradually increased, the restrictions on capital flow have been relaxed or cancelled, and the entry of Hong Kong investors will inevitably lead to significant changes in the investment structure and capital allocation mode, and will inevitably affect the construction and development of the internal capital market. Firstly, the opening up of the capital market can bring in capital, broaden financing channels and increase the scale of financing. Secondly, the liquidity hypothesis [18] holds that the enhancement of stock liquidity can reduce the expected return of investors, reduce the liquidity risk premium, and finally lead to the easing of financing constraints. After the implementation of Shanghai-Hong Kong stock connect and Shenzhen-Hong Kong stock connect, the stock trading instructions are implemented rapidly, and the transaction cost continues to decline with the enhancement

of liquidity, which can effectively disperse the liquidity risk and alleviate the financing constraints. Furthermore, the negative effects of poor information and barriers to cross-border capital flows can be caused by market segmentation, policy restrictions, and differences in investors' philosophies, which in turn can increase companies' risk premiums and transaction costs, but with the implementation of the Shanghai-Hong Kong Stock Connect and Shenzhen-Hong Kong Stock Connect interoperable trading systems can change the status of market segmentation [3,19] and broaden financing channels. Finally, based on the information perspective, Hong Kong investors have mature ideas and investment experience, and have great advantages in obtaining private information. The entry of foreign capital can effectively reduce the degree of information asymmetry, improve the information content of stock price [17], and reduce the cost of external financing.

Therefore, an increase in the scale and method of financing from external capital markets may reduce the company's reliance on internal capital market financing and reduce diversification, or it may create a wider scope for internal capital market financing, thus promoting diversification.

2.2. External capital market and internal capital market: corporate governance effect

With the gradual opening of the external capital market and the successive implementation of interconnection mechanisms such as land-Hong Kong stock connect, the transaction cost of external investors investing in the A-share market can be reduced, the market vitality of the A-share market is continuously enhanced, and the investor structure is constantly changing, so the corporate behavior will also change. After the implementation of land-Hong Kong stock connect, The company's behavior will change with the changes of investors, regulators, media and management's own behavior in Hong Kong, and the construction of the company's internal market is the result of the development of the external capital market and the interaction of all parties. Therefore, this paper analyzes how the opening of the external capital market, such as the Land-Hong Kong Stock Connect, has an impact on the internal capital market from the behavior changes of all parties.

First of all, the implementation of land port link is accompanied by the promulgation of a series of regulatory documents, the strengthening of the supervision of the external capital market and the improvement of the degree of investor protection, which has a spillover effect on the internal capital market. The relevant policies of Land-Hong Kong stock connect stipulate that the CSRC and the Hong Kong Securities and Futures Commission shall jointly safeguard the legitimate rights and interests of investors in cross-border investment. At the same time, the Shanghai Stock Exchange, Shenzhen Stock Exchange and Hong Kong Stock Exchange shall perform their duties of carrying

out cross market regulatory cooperation, so that the relatively well-established investor protection and market regulatory mechanism in the Hong Kong market can be transmitted to the A-share market. After the implementation of the Land-Hong Kong Stock Exchange trading mechanism, once the company has excessive investment, cross subsidies and other behaviors that damage the interests of stakeholders, it will be severely punished by external regulators. In order to avoid punishment, managers will improve the corporate governance mechanism and improve the efficiency of internal capital market management [1]. Secondly, compared with investors in the mainland capital market, Hong Kong investors' advanced investment philosophy and professional cooperation team make them have great advantages in information collection, sorting and analysis [6,17]. Therefore, in order to prevent their own interests from being infringed upon, Hong Kong investors may actively participate in corporate governance, exert their own supervisory governance effect, require management to improve the quality of accounting information and improve the efficiency of internal capital market governance. Moreover, the implementation of the land-Hong Kong stock connect and the increase of institutional investors will inevitably bring about numerous analysts, media, underwriters, and other media mediums to follow listed companies, strengthen supervision, restrict the behavior of management, improve the information environment, improve the management efficiency of internal capital market, and curb the ineffective expansion of internal capital market. Finally, the management is motivated to actively reduce opportunistic behavior, improve corporate governance efficiency and optimize resource allocation due to the strengthening of the role of external supervision and regulation [10,16].

Therefore, with the opening up of the external capital market, the implementation of the Land-Hong Kong Stock Connect, the entry of Hong Kong investors and the attention of the media, the capital allocation and management efficiency of the external capital market will be improved, and the development of the external capital market may replace the internal capital market and dwarf it and disintegrate it, or the internal and external capital markets may promote each other and grow together, improving the governance efficiency of the internal capital market and promoting the healthy development of the internal capital market.

Based on the above analysis, this paper focuses on the following questions: what is the relationship between external capital market and internal capital market, alternative or complementary? What is the mechanism of external capital market affecting internal capital market, financing constraints or corporate governance? Will the opening of the external capital market ultimately lead to the improvement of the company's value?

3. Research design

3.1. Sample selection and data sources

This paper uses multi period DID model to test the impact of external capital market on internal capital market. The trading systems such as Shanghai-Hong Kong stock connect and Shenzhen-Hong Kong stock connect were officially implemented in 2014 and 2016, and the adjustment of the company's internal capital market has a certain time lag. Therefore, the policy impact time is calculated from 2015, taking 2010-2020 as the test period, taking the target companies of Shanghai stock connect and Shenzhen Stock connect as the experimental group and non-target companies as the control group, excluding the companies transferred into the pilot scope and transferred out during 2014-2020, and excluding financial listed companies ST companies and companies with missing financial data. Finally we got 19111 samples. The continuous variables were windorized at 1% and 99% loci to eliminate the influence of extreme values; The adjusted robust standard error is obtained by clustering at the company level using Cluster software. The industry revenue data of the company comes from wind database, other financial data are from CSMAR, and the statistical analysis software is stata16.0

3.2. Model design and variable definition

The relationship between internal and external capital markets is tested by constructing multi-period DID -model (1).

$$Div_{i,t} = \beta_0 + \beta_1 Open \times Post + \beta_j Control + \sum Year + \sum Frim + \varepsilon_{i,t} \quad (1)$$

3.2.1. Explained variable(Div). Div is the company's diversification, drawing on the practice of Yang Xingquan et al. [14], it mainly includes the following two indicators: (1)(Divnum)， Actual number of cross industry operations of the enterprise；(2)Diventro=$\sum P_i \times \ln(1/P_i)$， The definition of P_i is the same as before. The larger the dientro, the higher the degree of diversification.

3.2.2. Explanatory variable (Open× Post). Open is the dummy variable of the target company. If the company is included in the target company during the sample period, Open = 1, otherwise Open = 0; Post is a dummy variable at the inclusion time point. From 2015, if it belongs to the year of the included target company, Post = 1, otherwise Post = 0. The regression coefficient β_1 of Open×Post responds to the difference in the change in the degree of diversification between the subject and non-subject firms after the opening of external capital markets, i.e. the net effect of the policy. If β_1 is negative, it indicates that external capital markets can substitute for internal capital markets, i.e. discourage firms from diversifying, and vice versa.

3.2.3. Control variables. Referring to the design of authoritative research [14], control variables mainly including company Size (Size), asset liability ratio (Lev), profitability (ROA), operating cash flow (CFO), shareholding of the largest shareholder (Shr1), dual, asset transferability (Tran), innovative investment (Intangible), enterprise age (Age),

growth opportunity (Growth), property right attribute (State), market competition (HHI), industry profit margin (Indroa), And annual fixed effect and individual fixed effect at the company level. The main variables are defined as follows:

Table 2 Definition and description of main variables

variable	Variable Definition
Divnum	Number of business sectors
Diventro	$Diventro=\sum P_i \times \ln(1/P_i)$
Open	Dummy variable: 1 if the company's stock is within the range of the land Port Stock Connect, 0 otherwise.
Post	Dummy variable, is 1 in the year after being included in the scope of the land Port Connect, and 0 in the rest
Size	Natural logarithm of total assets (Size=ln(total assets +1))
Age	The natural log of the number of years a company has been in existence
Lev	Total liabilities/total assets
Roa	Net profit/Total assets
Shr1	share proportion of the largest shareholder
Growth	(Operating income - previous period operating income)/ previous period operating income
Dual	The value is 1 when chairman and general manager become one, otherwise, it is 0
State	State-owned take 1, non-state-owned take 0
Tran	Net fixed assets/total assets
HHI	$HHI=\sum X^2_i$, Xi= Company's main business sales revenue/annual total business sales revenue of listed companies in the industry
Intangible	Net intangible assets/total assets
IndRoa	Company Roa industry annual median

4. Analysis of empirical results

4.1. Descriptive statistics

Table 3 shows the results of the descriptive statistics of the relevant variables, from the results it can be seen that Divnum has a mean (median) of 2, a maximum value of 5 and a standard deviation of 1.40; Diventro has a mean (median) of 0.2 and a standard deviation of 0.41, this result reflects that there are large differences in the diversification of listed companies in China. The mean value of Open is 0.62, indicating that Shanghai Stock Exchange and Shenzhen Stock Exchange underlying companies accounted for 60% of the total sample. In addition, we also conducted correlation coefficient analysis, and the results indicated that there was no significant problem of multicollinearity between the independent variables.

Table 3 Descriptive Statistics

variable	N	mean	sd	p50	min	max

Divnum	19111	2.370	1.400	2.000	1.000	5.000
Diventro	19111	0.380	0.410	0.200	0.000	1.440
Open	19111	0.620	0.490	1.000	0.000	1.000
Post	19111	0.520	0.500	1.000	0.000	1.000
Size	19111	22.12	1.280	21.94	19.70	26.10
Age	19111	2.770	0.370	2.830	1.610	3.400
Lev	19111	0.430	0.210	0.420	0.050	0.900
Roa	19111	0.040	0.050	0.040	-0.160	0.200
CFO	19111	0.040	0.070	0.040	-0.170	0.240
Shr1	19111	0.040	0.020	0.030	0.010	0.080
Dual	19111	0.260	0.440	0.000	0.000	1.000
Tran	19111	0.220	0.160	0.190	0.000	0.700
Intangible	19111	0.050	0.050	0.030	0.000	0.320
HHI	19111	0.060	0.090	0.020	0.010	0.410
IndRoa	19111	0.040	0.010	0.040	0.010	0.060

4.2. Basic regression analysis

Table 4 shows the empirical test results of model (1), in which columns (1) (3) are the regression results without adding control variables at the company level, and columns (2) (4) are the individual fixed effect regression results of control variables at the company level and macro level. The regression results show that Divnum and Diventro are both significantly negative in relation to the net effect of the land-Hong Kong stock connect, indicating that after the implementation of land-Hong Kong stock connect, the degree of corporate diversification can be reduced, that is, the internal capital market and external capital market show substitution effect, and the effective development of external capital market can reduce the degree of diversification of internal capital market.

Table 4 basic regression analysis

	(1)	(2)	(3)	(4)
	Divnum		Diventro	
Open×Post	-0.104***	-0.113***	-0.019**	-0.021**
	(-3.68)	(-4.03)	(-2.20)	(-2.40)
Size		0.244***		0.058***
		(7.68)		(5.61)
Lev		0.233**		0.055
		(2.05)		(1.46)
Roa		-0.272		-0.079
		(-1.26)		(-1.16)
CFO		0.205*		-0.009
		(1.93)		(-0.26)
Shr1		-2.264		-0.982
		(-1.15)		(-1.53)
Dual		-0.002		0.003
		(-0.08)		(0.30)

Tran		-0.061		-0.071
		(-0.44)		(-1.56)
Intangible		0.384		0.160
		(0.93)		(1.14)
Age		0.611***		0.183***
		(3.63)		(3.29)
HHI		0.216		-0.018
		(0.59)		(-0.14)
IndRoa		2.466		0.585
		(1.62)		(1.27)
state		0.078		0.023
		(0.80)		(0.74)
_cons	2.233***	-4.710***	0.338***	-1.382***
	(91.34)	(-5.94)	(47.33)	(-5.37)
Year	YES	YES	YES	YES
Firm	YES	YES	YES	YES
N	19111	19111	19111	19111
r2_a	0.039	0.068	0.044	0.065
F	24.470	15.759	24.778	13.542

Notes：t statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.3. Robustness test

This paper carries out a series of robustness tests to increase the credibility of the conclusion. The specific test methods are as follows:

4.3.1. Propensity Score Matching Method (PSM)

The selection of the underlying companies prior to the implementation of the Land-Hong Kong Link was not random, and there were already differences between the underlying companies and the subject companies, and the degree of internal capital market construction was also different, so the accuracy of the multi-period DID estimation would be reduced, and to improve its accuracy, this paper uses the propensity score matching method (PSM) to match the corresponding control group for the subject companies. Therefore, this paper uses the company-level control variables in the benchmark regression as the basis for matching according to the one-to-one nearest neighbour with put-back principle, and finally obtains a sample of 14,492. The matched samples were then used to re-run the regression test, as shown in columns (1)-(2) of Table 5, and the findings were consistent with the base regression.

4.3.2. Replace the explanatory variable.

In order to prevent the regression results from being affected by different measures, diversification was redefined using the propensity to diversify (Divdum, 1 when the company diversifies, 0 otherwise) and the Herfindel index (Divhhi, Divhhi $=\sum P_i^2$, $P_i=$ company's category i main business revenue/total operating revenue, the smaller the

Herfindel index, the higher the degree of diversification), and the regression results (columns 3 and 4 of Table 5) were consistent with the previous section.

4.3.3. Replace model

Considering that the monetary policy and industrial policy issued in each year have a differentiated impact on the financing environment and investment opportunities of Companies in different industries, which not only cause the continuous periodic changes of coal, steel and other industries, but also affect the investment intention of investors. These influencing factors entering the residual term may cause errors in the regression results. In order to prevent the impact of industrial policy and monetary policy on the industry, Based on the research of Yue Pan et al. [11], the fixed effect of multiplying the industry by the year is controlled on the basis of model (1), so as to eliminate the impact of other policy changes on the regression results. The regression results are shown in column (5) (6) of table 5, the net effect of land-Hong Kong stock connect (Open × Post) remains significantly negative.

4.3.4. Change sample range

Before the implementation of land-Hong Kong stock connect, companies with qualified foreign institutional investors (QFII) and cross listing (A+H) had differences with other companies in terms of regulatory system, information environment and governance efficiency. However, the previous analysis did not exclude the impact of foreign investors. Therefore, in order to improve the robustness of the conclusion, This paper excludes the samples with QFII holdings and A+H cross-listings to re-estimate model (1), and the results are shown in columns (7)-(10) of Table 5, which is consistent with the previous conclusions.

Table 5 robustness test

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	PSM inspection		Replace the explained variable		Replace the model		Transform sample range: Remove A and H shares		Excluding QFII holdings	
	Divnum	Diventro	Divdum	Divhhi	Divnum	Diventro	Divnum	Diventro	Divnum	Diventro
Open×Post	-0.121***	-0.016**	-0.068***	0.010*	-0.128***	-0.022**	-0.115***	-0.021**	-0.110***	-0.024***
	(-3.40)	(-2.08)	(-6.50)	(1.94)	(-4.43)	(-2.46)	(-3.98)	(-2.37)	(-3.71)	(-2.62)
_cons	-4.745***	-1.642***	-1.534***	1.414***	3.669	0.117	-3.721***	-1.022***	-3.663***	-1.037***
	(-5.10)	(-11.84)	(-5.82)	(8.66)	(1.25)	(0.14)	(-4.70)	(-3.82)	(-4.53)	(-3.76)
Control	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year×Ind	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO
N	14492	14492	19111	19111	19111	19111	18591	18591	17540	17540

r2_a	0.071	-0.141	0.067	0.044	0.073	0.069	0.066	0.063	0.066	0.065
F	13.406	49.263	15.111	9.910	8.174	7.769	15.127	12.688	14.284	12.677

Notes：t statistics in parentheses $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

5. Mechanism analysis and extension test

The previous study found that the opening of the external capital market can effectively replace the development of the internal capital market. Specifically, the implementation of land-Hong Kong stock connect can reduce the degree of diversification of the company. Whether the path of action is one of financing constraints or corporate governance, or both, needs to be further explored. Therefore, in this part, this paper will deeply investigate the mechanism of the two and the heterogeneity analysis of the differential impact of internal and external capital markets, and on this basis, try to explore the economic consequences caused by the substitution of internal and external capital markets.

5.1. External capital market and internal capital market:mechanism analysis

This paper believes that the opening of external capital market can effectively alleviate financing constraints, improve corporate governance efficiency, and then form an effective substitution effect for the development of internal capital market. Therefore, in order to verify the action path of the two, refer to the intermediary effect model of Zhonglin Wen et al. [13] and Xuanyu Jiang[4], and take the agency index KZ index of financing constraints and the agency index of corporate governance manipulated earnings management as intermediary variables to build an intermediary effect model to verify how the opening of external capital market affects the construction of internal capital market. The specific intermediary effect model is as follows:

$$MED_{i,t} = \alpha_0 + \alpha_1 Open \times Post_{i,t} + \alpha_j Cotnrol + \sum Year + \sum Frim + \varepsilon_{i,t} \quad (2)$$

$$Div_{i,t} = \gamma_0 + \gamma_1 Open \times Post_{i,t} + \gamma_2 MED + \gamma_j Cotnrol + \sum Year + \sum Frim + \varepsilon_{i,t} \quad (3)$$

Among them, Med is an intermediary variable, including KZ index and manipulated earnings management (EM). Based on the research of Zhihua Wei et al. [12], KZ index constructs the financing constraint index according to the company's operating net cash flow CFO, cash dividend div, cash holding cash, asset liability ratio Lev and corporate value Tobin's Q. Manipulation earnings management (EM) uses the Jones model to estimate earnings management based on the research of Huilong Liu et al. [7]. Specifically, first add variables TA (operating profit minus net cash flow from operating activities), ASS (total assets), △REV(difference between sales revenue at the beginning and end of the period), △ REC (difference between accounts receivable at the beginning and end of the period), PPE (net fixed assets), and then estimate parameters α_1、α_2、α_3 by industry year according to model (4). Finally, the manipulated earnings management is

calculated according to model (5). The greater the EM value, the higher the degree of manipulation earnings management.

$$TA / ASS_{i,t-1} = \alpha_1 / ASS + \alpha_2 \Delta REV_{i,t} / ASS_{i,t-1} + \alpha_3 PPE_{i,t} / ASS + \varepsilon_{i,t} \quad (4)$$

$$EM = \left| TA_{i,t} / ASS_{i,t-1} - \left[\hat{\alpha}_1 / ASS_{i,t-1} + \hat{\alpha}_2 (\Delta REV_{i,t} - \Delta REC_{i,t}) / ASS_{i,t-1} + \hat{\alpha}_3 PPE_{i,t} / ASS_{i,t-1} \right] \right| \quad (5)$$

The test was carried out according to the following steps, that is, the regression of model (1) was carried out first, and then the test of model (2) and model (3) was carried out on the premise that β_1 was significant. If α_1 and γ_2 Both are significant, indicating that the opening of non external capital market can effectively replace the internal capital market by alleviating financing constraints and improving corporate governance. At this point, if γ_1 significant (not significant), indicating that financing constraints or corporate governance have played a partial (complete) intermediary effect. The specific test results are shown in Table 6.

(1) - (3) of table 6 are listed as the intermediary test results of financing constraints, and (4) - (6) are listed as the intermediary test results of corporate governance. As can be seen from table 6, the coefficients of Open×Post in columns (1) and (4) are significantly negative, indicating that the opening of capital market can effectively alleviate financing constraints, inhibit manipulative earnings management and improve the efficiency of corporate governance; The coefficients of KZ in column (2) and (3) are significantly positive, indicating that the opening of the capital market can indeed reduce the construction of the internal capital market by alleviating the financing constraints, and the coefficients of EM in column (5) and (6) are significantly negative, indicating that the opening of the capital market can effectively inhibit the manipulative earnings management and reduce the construction of the internal capital market; Meanwhile Open×Post in columns (2)(3) and (5)(6) are both significantly negative, a result that suggests that alleviating financing constraints as well as improving corporate governance (inhibiting manipulative earnings management) are partial mediators of the substitution of external capital markets for internal capital markets, according to Zhonglin Wen's [13] mediating effects model.

Therefore, the above results show that the opening of the external capital market can effectively alleviate the corporate financing constraints and improve the efficiency of corporate governance, so as to form an effective substitute for the internal capital market, that is, inhibit the construction of the internal capital market (inhibit the degree of corporate diversification).

Table 6 external capital market and internal capital market: mechanism analysis

	(1)	(2)	(4)	(5)	(6)	(8)
	financing restriction			corporate governance		

	KZ	Divnum	Diventro	EM	Divnum	Diventro
Open×Post	-0.920***	-0.105***	-0.018**	-0.015***	-0.112***	-0.021**
	(-9.95)	(-3.74)	(-2.11)	(-2.65)	(-3.99)	(-2.41)
KZ		0.006*	0.002**			
		(1.93)	(2.14)			
EM					-0.108***	-0.038***
					(-2.89)	(-3.24)
_cons	59.824***	-4.944***	-1.490***	-1.410***	-4.761***	-1.418***
	(21.03)	(-6.12)	(-5.68)	(-9.10)	(-5.97)	(-5.49)
Control	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Firm	YES	YES	YES	YES	YES	YES
N	19111	19111	19111	19111	19111	19111
r2_a	0.445	0.068	0.066	0.327	0.069	0.066
F	245.304	14.600	12.632	214.929	15.238	13.089

Notes：*t* statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Secondly, the paper further elaborates on the financing constraints and corporate governance mechanisms in terms of stock liquidity and analyst tracking numbers. Previous studies have shown that stock liquidity is negatively correlated with the cost of equity capital. The enhancement of liquidity can reduce the liquidity risk premium and the expected return of investors, and then reduce the financing constraints faced by companies. After the implementation of land-Hong Kong stock connect, it can effectively disperse liquidity risk, reduce transaction costs and alleviate financing constraints. Therefore, compared with those with high stock liquidity, the financing constraint effect of land-Hong Kong stock connect is more significant in the group with low liquidity. In addition, the implementation of land-Hong Kong stock connect and the increase of institutional investors will inevitably lead to the tracking of listed companies by media intermediaries such as multimedia, analysts and underwriters, strengthen the supervision of listed companies, restrict the opportunistic behavior of management, improve the company's information environment and improve the efficiency of internal capital market management. Then, in the group with a large number of analysts, the corporate governance effect of land-Hong Kong stock connect is more significant. Therefore, this paper introduces stock liquidity (SL, daily average stock turnover rate) and analyst tracking number (FR, the number of analysts or analyst teams who have tracked and analyzed the company within a year) for grouping test, so as to support the financing constraints and corporate governance mechanism mentioned above.

(1)- (4) of table 7 are listed as stock liquidity groups, from which we can see that the substitution effect of external capital market on internal capital market mainly occurs in the group with low stock liquidity (Open×Post vs. Divnum and Diventro are significantly negative at the 1% level and 5% level, respectively), which is consistent with expectations. (5) - (8) in Table 7 are grouped by the number of analysts. The results show that the effect of external capital market on internal capital market is more significant in the group with higher analysts than in the group with

lower number of analysts (Open×Post vs. Divnum and Diventro are all significantly negative at 1% level), that is, the opening of the external capital market can bring more analysts' tracking, which can effectively change the corporate governance environment and improve the management efficiency of the internal capital market. The above results show that after the implementation of land-Hong Kong stock connect , the substitution effect of external capital market and internal capital market is more significant in the group with high stock liquidity and the group with low number of analysts, which corresponds to the financing constraint mechanism and corporate governance mechanism mentioned above.

Table 7 external capital market and internal capital market: heterogeneity analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	stock liquidity				Analyst tracking number			
	high	low	high	low	high	low	high	low
	Divnum	Divnum	Diventro	Diventro	Divnum	Divnum	Diventro	Diventro
Open×P	-0.038	-0.104***	-0.002	-0.019**	-0.127***	-0.047	-0.030***	0.010
ost	(-0.92)	(-2.83)	(-0.13)	(-2.22)	(-4.43)	(-1.53)	(-3.44)	(1.04)
_cons	-1.944**	-4.549***	-0.811***	-1.003***	-2.459***	-3.780***	-1.149***	-1.021***
	(-2.15)	(-3.66)	(-2.79)	(-4.97)	(-3.53)	(-6.89)	(-5.42)	(-6.07)
Control	YES	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES	YES
Firm	YES	YES	YES	YES	YES	YES	YES	YES
N	9415	9509	9415	9509	8941	10170	8941	10170
r2	0.074	0.045	0.077	0.043	0.067	0.059	0.075	0.058
F	8.536	5.995	7.787	14.700	21.935	21.733	24.810	21.283

Notes：t statistics in parentheses $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

5.2. External capital market and internal capital market: an extension test

The previous study found that the development of external capital market can effectively alleviate financing constraints, improve corporate governance efficiency and form an effective substitute for internal capital market, and this effect is more significant in the group with low stock liquidity and the group with high number of analysts. In order to further test the implementation performance of land-Hong Kong stock connect, This paper further introduces the indicator of firm value (Tobin's Q) as the explanatory variable to verify the value effect of external capital markets replacing internal capital markets. As the enhancement of firm value has a lagged effect, this paper uses a one-period lagged explanatory variable (Open×Post×Divnum in period t-1). The results of the test are shown in Table 8.

It can be seen from table 8 that the substitution effect of external capital market on internal capital market can effectively improve the value of the company, and this value enhancement effect mainly occurs in the samples with low stock liquidity and a large number of analysts. It also further verifies that the development of external capital market can effectively alleviate the

financing constraints of internal capital market, improve the efficiency of corporate governance, and then improve the value of the company.

Table 8 external capital market and internal capital market: expansibility test

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	全样本		股票流动性				分析师跟踪人数			
			高	低	高	低	高	低	高	低
Open×Post×Divnum	0.077***		0.058	0.071***			0.060***	0.083*		
	(4.32)		(1.09)	(4.48)			(4.84)	(1.85)		
Open×Post×Diventro		0.203***			0.095	0.173***			0.165***	0.225
		(2.84)			(0.83)	(2.70)			(2.72)	(1.20)
Divnum	-0.086***		-0.090***	-0.074***			-0.026	-0.072***		
	(-3.79)		(-3.37)	(-3.24)			(-1.62)	(-2.87)		
Diventro		-0.223***			-0.243**	-0.163**			-0.047	-0.191**
		(-2.94)			(-1.99)	(-2.38)			(-0.87)	(-2.36)
Open×Post	0.029	0.094**	0.342**	-0.101*	0.401***	-0.036	-0.064	0.229*	-0.019	0.297**
	(0.67)	(2.01)	(2.50)	(-1.81)	(2.89)	(-0.71)	(-1.38)	(1.84)	(-0.42)	(2.57)
_cons	16.429***	16.446***	25.000***	13.837***	25.023***	13.851***	8.344***	30.428***	8.331***	30.483***
	(7.33)	(7.33)	(27.42)	(8.42)	(4.26)	(8.37)	(17.82)	(35.60)	(17.88)	(35.76)
Control	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	16353	16353	7333	9020	7333	9020	7794	8559	7794	8559
r2	0.182	0.181	0.185	0.270	0.184	0.269	0.430	0.223	0.429	0.223
F	52.616	52.406	39.311	34.195	23.072	33.957	42.091	58.268	41.881	58.146

Notes：*t* statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

6. Conclusion

As a milestone in the opening of the capital market, the land Hong Kong stock connect has not only had a far-reaching impact on the linkage of Shanghai, Shenzhen and Hong Kong, but also caused a series of market effects. It is a key topic of concern for scholars and policy makers at home and abroad.This paper examines the relationship between the external and internal capital markets using a multi-period DID model with the exogenous policy shock of Shanghai-Hong

Kong Stock Connect and Shenzhen-Hong Kong Stock Connect (referred to as Land-Hong Kong Stock Connect), selecting all A-share listed companies for the period 2010-2020. The research finds that: (1) the development of the external capital market forms an effective alternative to the construction of the internal capital market, and this conclusion is still valid after a series of robustness tests such as PSM; (2) After the implementation of Land-Hong Kong Stock Connect, the external capital market can effectively alleviate the financing constraints, improve the corporate governance efficiency of the internal capital market, and then form a substitution effect on the internal capital market; (3) The substitution of external capital market for internal capital market mainly occurs in the samples with low stock liquidity and high number of analysts; (4) Further research found that the substitution of external capital market for internal capital market can bring value enhancement effect, and this effect is mainly reflected in the samples with low stock liquidity and high number of analysts. Based on the above findings, this study shows that after the implementation of the Land-Hong Kong Stock Connect, the external capital market can effectively alleviate the financing constraints, improve the efficiency of corporate governance, replace the ineffective construction behavior of the internal capital market, enhance the ability of the capital market to guide the behavior of the real economy, and improve the efficiency of the capital market. It plays a positive role in maintaining the healthy and stable development of China's capital market. At the same time, it also provides a corresponding experience reference for the Shanghai-London Stock Connect and the opening up of emerging capital markets to the outside world.

The policy implications of this paper are as follows: (1) the implementation of Land Hong Kong stock connect can increase capital supply, change the current situation of market segmentation, reduce liquidity risk, and then alleviate the financing constraints faced by the company. At the same time, with the enhancement of supervision in Shanghai, Shenzhen and Hong Kong, the increase of attention of external media, the change of investor structure and the change of management behavior, it can effectively improve the efficiency of corporate governance, The company should reasonably construct the internal capital market according to the development of the external capital market and improve the company value of the internal capital market. (2) The implementation of Land Hong Kong stock connect will help alleviate the financing constraints, reduce the opportunistic tendency of management, improve the efficiency of corporate governance, and finally promote the healthy development of China's internal and external capital markets. Therefore, as an effective external governance mechanism, Land Hong Kong stock connect should pay full attention to the capital allocation role of the external capital market. Under the background of emphasizing that the capital market serves the real economy, it should constantly deepen the opening-up policy of the capital market, promote the mutual integration and development of domestic and international capital markets, and improve the opening-up function of the capital market.

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