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The Real Effects of Low-for-long Interest Rates on Mainland Firms Listed in Hong Kong

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Abstract

Using financial disclosure of listed firms in Hong Kong from 2003 to 2016, this paper investigates the investment response of Mainland firms to the low-for-long interest rate environment after the Global Financial Crisis and examines whether the changes in their investment decisions reflect the mitigation of financial constraints or the manifestation of agency problems. Our difference-in-difference tests show that Mainland firms listed in Hong Kong increased investments significantly more than local firms during this period when external financing costs were reduced. Empirical evidence also shows that Mainland firms' total investments on average became more responsive to productive investment opportunities and their operating efficiency improved in the low-for-long interest rate environment when benchmarked to local firms. In addition, further tests show that Mainland firms with higher independent institutional ownership, which may be relatively less subject to agency problems, tend to exhibit higher level of investments. These empirical results support the view that the mitigation of financial constraints accounted relatively more for the surge in leverage and investment in Mainland firms listed in Hong Kong after the GFC. Nevertheless, the findings should be interpreted with caution, as they would explain the economic behaviour of Mainland firms listed in Hong Kong as a group rather than individual Mainland firms.

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1. Introduction

Amid the low-for-long interest rate environment since the recent global financial crisis (GFC), non-financial corporate debt in emerging market economies (EMEs) has risen significantly from around US\$17 trillion in 2008 to more than US\$45 trillion in 2016 (BIS, 2020). The piling up of debt by non-financial corporates has been on the radar of central banks and international organisations, as high corporate leverage would amplify the impact of a negative shock on financial markets or the real economy and subsequently pose systematic risks to the financial sector (BIS, 2016).

Hong Kong is no exception. Non-financial corporate debt¹ to GDP, a common indicator of corporate leverage for an economy, also surged dramatically from 213 percent in 2008 to 352 percent by the end of 2016. This was mainly driven by the fact that Hong Kong is an international financial centre and many multinational and non-local corporates borrow their funds in Hong Kong to finance their overseas operations. Since the economic activities and incomes of these corporates may not be fully reflected in Hong Kong's GDP, the rise of the aggregate non-financial corporate debt/GDP ratio should be interpreted with caution.

Nevertheless, the rise of the aggregate indicator calls for further investigation by looking at firm-level evidence. Based on the financial information of firms listed in Hong Kong, the rise in the leverage of the corporate sector in Hong Kong after the GFC was mainly driven by firms headquartered in Mainland China (hereinafter referred to as Mainland firms), while the leverage of listed firms headquartered in Hong Kong

¹ Credit to non-financial corporations is defined as the sum of domestic bank credit extended to non-financial corporations and cross-border credit from non-resident banks. Please refer to https://www.bis.org/statistics/totcredit/credpriv_doc.pdf for details.

(hereinafter referred to as local firms) was virtually unchanged (Figure 1). Indeed, Mainland firms listed in Hong Kong have leveraged up more significantly than local firms listed in Hong Kong, even after controlling for key determinants of leverage (size, tangibility, profitability, market-to-book and industry median leverage²) identified in Frank and Goyal (2009). Moreover, the higher leverage of Mainland firms is found to be driven mainly by investment activities.

To the extent that the rising leverage of these Mainland firms reflect their greater investment after the GFC, a better understanding on the nature, productivity and efficiency of such investments is needed from a financial stability perspective given that banks in Hong Kong have become increasingly active in Mainland-related lending. One hypothesis is that amid the low-for-long interest rate environment, Mainland firms have become less financially constrained, which has allowed them to improve their investment efficiency. To further illustrate this hypothesis, theoretically a firm would keep on investing until all the positive net-present-value (NPV) projects are exploited. However, it is widely found in the literature that external financing is costly due to information asymmetries between the insiders of the firm and outside investors. Therefore, firms might be generally financially constrained, and in such cases their investments would be sub-optimal (Fazzari, Hubbard and Peterson, 1988). Lower external financing costs as a result of low-for-long interest rate environments would mitigate some of the financial constraints of firms. With lower costs of external financing, these financially constrained firms could subsequently exploit more positive-NPV projects. The argument supports the view that although the rising leverage

² Please refer to the appendix for the definition of variables.

of Mainland firms would deserve closer monitoring, such rise may be supported by economic fundamentals.

However, it can be argued that the higher investment undertaken by Mainland firms may not be driven by economic fundamentals. For example, the agency theory could be one alternative hypothesis to explain the phenomenon: Mainland firms may have undertaken unproductive and excessive investments by mainly taking advantage of the lower financing costs amid the low-for-long interest rate environment. The agency theory suggests that managers have the incentive to embark on excessive investments and empire building, as asset growth expands managers' power by increasing the resources under their control (Donaldson and Stone, 1984; Jensen, 1986). Under this circumstance, firms tend to have more investments when external financing becomes less costly, even though these investments generate negative returns.

To explore whether the increase in investment by Mainland firms is an economically sensible response to the relaxation of financial constraints, we investigate the investment-*Tobin's q* sensitivity of Mainland firms³. The results suggest that Mainland firms' total investments become more responsive to good investment opportunities in the low-for-long interest rate environment.

Consistent with this finding, Mainland firms are found to improve their operational efficiency in terms of their return on equity (ROE) and turnover relative to local firms amid the low-for-long interest rate environment. This paper further shows that firms with higher institutional ownership undertake more investments. As independent institutions with long-

³ *Tobin's q* is the ratio between a physical asset's market value and its replacement value. It was first introduced by Kaldor (1966) and subsequently used as a proxy for firm investment opportunities as it represents the future potential value of the firm.

term investments usually specialise in monitoring (Chen, Harford and Li, 2007; Ferreira and Matos, 2008), a higher institutional ownership could provide discipline and reduce agency problems. This supports the view that agency problems are not the main driver of the surge in investment among firms.

Regarding the contribution of this study, while financial stability implications of the low-for-long interest rate environment has been a key concern of policymakers after the GFC, the existing literature has largely focused on the impact on the banking sector (Altavilla, Boucinha and Peydro, 2018; Claessens, Coleman and Donnelly, 2018). This paper contributes to the literature by assessing the financial stability issue from a corporate sector perspective. One implication of this study is that while a persistent rise in corporate leverage amid low-for-long interest rate environment may raise a red flag about the healthiness of the corporate sector and cause financial stability concerns, a comprehensive assessment requires further investigations on underlying drivers of the surge in corporate leverage.

There are some caveats to this study. As agency problems are not directly testable, the above findings could only provide suggestive evidence instead of ruling out the agency hypothesis. Not only *Tobin's q* can measure investment opportunities inaccurately, but the findings on investment-*q* sensitivity may also have alternative interpretations towards agency problems if no further tests are provided. In addition, we adopt a difference-in-difference (DID)⁴ setting and compare Mainland firms to local firms. Local firms arguably

⁴ DID uses panel data to measure the differences, between the treatment and control group, of the changes in the outcome variable that occur over time. In contrast to a time-series estimate of the treatment effect (differences over time) or a cross-section estimate of the treatment effect (differences between treatment and control groups), this approach removes biases in the treatment effect that could be the result of other factors, which is reflected by change of the control group.

may not be the perfect counterfactuals for Mainland firms given their differences in firm characteristics. However, tests were conducted to show that the “parallel trend” assumption between these two groups of firms is not violated, meeting the precondition of conducting the DID test. Moreover, the assessment is for Mainland corporates listed in Hong Kong as a group rather than for individual firms. As such, the findings do not rule out the possibility that investment undertaken by individual Mainland firms may be less productive or not productive. With these caveats, caution is needed to interpret the above results.

The remainder of this paper is organised as follows. Section 2 discusses the methodology and data. Section 3 presents the empirical results. Section 4 concludes.

2. Empirical Methodology and Data

There are three types of Mainland firms listed in Hong Kong: H-shares, red-chips, and privately-owned firms. H-shares represent the shares of companies incorporated in Mainland China and listed in Hong Kong. Most H-shares are issued by state-owned enterprises (SOEs). Red-chip firms’ business, assets, markets and ownership have a strong Mainland orientation, but they are incorporated outside Mainland China. They are not regulated by the authorities in Mainland China but are nevertheless still controlled directly or indirectly by Mainland government entities. Some privately owned Mainland companies are also listed in Hong Kong, but they are not considered H-shares or red-chips. At the end of June 2016, there were 1973 listed firms in Hong Kong, of which 1002 can be classified as Mainland firms. Of them, 241 firms are H -shares, 153 are red-chips, and 608 are private firms.

We employ the DID methodology by making use of institutional differences between Mainland firms and local firms to carry out the analysis. By institutional differences, this study refers to a widely reported view that Mainland firms have more restricted access to financial markets in Mainland China⁵ and thus their decisions on investments are more sensitive to changes in external financing costs. As financial markets in Mainland China are still developing, Mainland firms often face high costs to raise external financing in the domestic markets. High adverse selection costs present hurdles for many Mainland firms in accessing financial markets. Listing in Hong Kong enables Mainland firms to raise funds in the international markets at a lower cost, particularly due to more transparent financial reporting, better corporate governance, and hence reduced information asymmetry. Unlike Mainland firms, local listed firms are likely to have greater access to different financing channels and a broader investor base. In that regard, their financing decisions will be less sensitive to the change of interest rate in Hong Kong. Such institutional difference provides a backdrop to investigate the consequence of low-for-long interest rate environment, with the identification assumption that local firms are less responsive to the changes in the external financing environment and thus can serve as counterfactuals for Mainland firms had the interest rate environment not changed.⁶ The

⁵ The financial market in Hong Kong is believed to be more mature and developed than the financial market in Mainland China. For example, see <https://www.reuters.com/article/us-hongkong-shanghai-financial-factbox/factbox-hong-kong-vs-shanghai-as-global-financial-centres-idUSTRE5B94T920091210> for a comparison between the stock markets in Hong Kong and Shanghai. As a result, Mainland firms tend to be more restricted in their access to financing than Hong Kong local firms.

⁶ DID uses panel data to measure the differences, between the treatment and control group, of the changes in the outcome variable that occur over time. In contrast to a time-series estimate of the treatment effect (differences over time) or a cross-section estimate of the treatment effect (differences between treatment and control groups), this approach removes biases in the treatment effect that could be the result of other factors, which is reflected by change of the control group.

different sensitivity of Mainland and local firms to the changes of external financial conditions is a reason why this study adopts the DID methodology.

Under Hong Kong’s currency board system, Hong Kong dollar interest rates must closely follow the rates set by US Federal Reserve. This allows us to use the changes of Fed Funds Rate as an exogenous variation in the external financing costs in Hong Kong. After the GFC, a very accommodative monetary policy was adopted by US Federal Reserve and the target rate remained within the range 0.00–0.75% between December 2008 and December 2016. Thus, we classify the years from 2009 to 2016 as the period with low-for-long interest rate, which constitutes the “post period” in the DID setting.

Given the above institutional setting, a DID approach is employed to study the difference in responses of local firms and Mainland firms listed in Hong Kong, which compares the changes in Mainland firms before and after the low-for-long policy rate period, with those of local firms. Essentially, local firms serve as counterfactuals to Mainland firms if the policy rate had not been kept low for a prolonged period. The model is specified as follows:

$$y_{i,t} = a \times Post_t \times Mainland_i + b \times Controls_{i,t} + \alpha_i + \tau_t + \varepsilon_{i,t}, \quad (1)$$

where i indexes firm and t indexes year. Variable y is the outcome variable, such as firm leverage, investments and cash holdings. “Post” equals one for the period after 2009 and zero for the period prior to 2009. “Mainland” equals one for firms that are defined as Mainland firms. “Controls” include variables that are specific to each dependent variable. The expression α represents firm fixed effect and τ represents time fixed effect. The coefficient of interest is a , which captures the treatment effect with respect to the counterfactual proxied by the control group.

Such a DID setting is not without caveats. First, the standard DID approach requires the control group to be unaffected by the policy changes. Although we argue the institutional difference between Mainland and local firms isolate local firms from the low-for-long interest rate environment, such assumption may not necessarily hold. If the control firms are also affected by the policy change, our DID framework may fail to identify the impact of low-for-long interest rates⁷. Second, Mainland and local firms are substantially different in firm characteristics. Although “parallel trend” assumption is satisfied, we are fully aware that local firms may not be the first-best counterfactuals for Mainland firms. Thus, propensity-score matching (PSM) is adopted to eliminate observable firm-level differences between Mainland and local firms which could have driven their differential reactions to the low-for-long interest rate environment. PSM was first introduced by Rosenbaum and Rubin (1983) and has been widely used in research to estimate average treatment effects. Specifically, we estimate, for each firm, the probability of being a Mainland firm as of the end of 2008. The estimation is based on a logit model in which the dependent variable equals one when the firm is a Mainland firm and zero otherwise. The control variables include firm size, leverage, tangibility, and market-to-book. We perform a nearest-neighbour, one-to-one matching, i.e., we match each Mainland firm with a local firm that has the closest value of propensity score with replacement⁸. The DID estimation

⁷ If local firms also conduct more investment in the low-for-long interest rate environment, the actual effect on Mainland firms would have been larger than the estimated effect. Thus, this concern does not work against our conclusion.

⁸ PSM with replacement allows untreated cases to be matched to more than one treated case. This is preferred in many settings (Roberts and Whited, 2013) and serves as a worthwhile robustness test (Shipman, Swanquist and Whited, 2017).

based on the PSM sample is likely to better capture the impact of the changing financing condition, rather than unobserved firm characteristics, on the corporate decisions⁹.

Our sample of firms is obtained from Bloomberg and Wind Database, including all listed firms in Hong Kong from 2003 to 2016. After excluding firms that only existed before 2008 or listed after 2009, this study ends up with a sample of 522 Mainland firms and 730 local firms. The main characteristics of the sample are shown in Table 1.

3. Empirical Results

To show that the corporate leverage of Mainland firms is indeed more sensitive to the changes of monetary policy, we first conduct the DID tests for book leverage and market leverage. Table 2 presents our DID regression results. Columns (1) and (2) use book leverage while columns (3) and (4) are based on market leverage. The coefficient estimates in columns (1) and (3) show that Mainland firms, on average, increased book leverage by 0.029 and market leverage by 0.014 in the period with low policy rates, compared to local firms. The results are robust when “industry*year” fixed effects are added in columns (2) and (4). Given that the average book leverage of Mainland firms is around 0.26 before the GFC, such increase accounts for roughly 11% of the original leverage. The regression results suggest that after controlling for all other determinant factors of leverage such as size, profitability, tangibility, market-to-book and industry

⁹It should be worth noting that although PSM is widely used in research, it is not without limitation. For example, the results highly depend on the choice of matching variables and matching specifications. Technical issues are also raised by a few subsequent studies, e.g., Abadie and Imbens (2016).

median leverage (Frank and Goyal, 2009; Frank and Goyal, 2015), Mainland firms still increased leverage significantly, as benchmarked to local firms.

While the rising trend in the leverage of Mainland firms may be one good reason for examining the financial stability implications, a comprehensive investigation should examine whether and to what extent the funds raised were put into productive investment, as these would directly affect firms' debt-servicing ability. If Mainland firms have deployed the funds to more efficient usage, such concerns on their corporate vulnerability may be less than the sole evidence suggested by the rising leverage. To shed light on this question, we examine the investment and cash policies of listed firms. Table 3 presents our DID regression results using total investments scaled by total assets, cash holdings scaled by total assets and interest expenses scaled by total debt. The coefficient estimates in columns (1) and (2) show that Mainland firms, on average, increased total investment by 1.4% - 1.5% of book assets. The coefficients on cash holdings in columns (3) and (4) of Table 3 are close to zero, suggesting that Mainland firms did not build up cash more aggressively than local firms in the low-for-long interest rate environment. Furthermore, the coefficients on interest expenses in columns (5) and (6) also reduce significantly, suggesting that Mainland firms were able to finance the investments by borrowing more cheaply in the low-for-long interest rate environment. In addition to the regression analysis, we also graphically show the differences between investments by Mainland firms and local firms. Specifically, we compute the differences in the means of investment measures of Mainland and local firms and plot the time-series of these differences with 95% confidence intervals around the mean values. As shown in Figure 2, the investment difference between Mainland and local firms is indistinguishable from zero (or close to zero) before the GFC,

and then surge dramatically afterwards. Such pattern confirms with the assumption of our identification strategy, in which the investment of Mainland and local firms are expected to demonstrate “parallel trend” before the adoption of low policy rates so that that local firms can serve as good counterfactuals for Mainland firms.

The results on corporate investments and cash holdings indicate that the purpose of fund raising for Mainland firms was to finance investments. As discussed previously, the surge in investments can be explained either by the hypothesis based on the financial constraints or the other one based on agency theory. While the former hypothesis constitutes a view that these investments are economically efficient, the latter one suggests that such increase in investments cannot be fully attributed to the availability of good investment opportunities. Differentiating the two hypotheses, however, is quite difficult empirically as there are no direct measures of investment efficiency or agency problems. Nevertheless, the investment sensitivity to *Tobin’s q* is a widely adopted measure in the literature to examine the responsiveness of investments to good investment opportunities (McLean, Zhang and Zhao, 2012; Chen, Ghoul, Guedhami and Wang, 2017; Wang , Luo, Tian and Yan, 2020). This sensitivity captures the intuition that investment should and should only be responsive to good investment opportunities (measured by *Tobin’s q*) in the ideal world. Any deviation from such one-to-one responsiveness reflects market imperfections and investment inefficiency. In our DID setting, we run the following regression:

$$\begin{aligned}
 Investments_{i,t} = & a \times Mainland_i \times Post_t \times q_{i-1,t} + b \times Mainland_i \times Post_t + c \times Mainland_i \\
 & \times q_{i-1,t} + d \times Post_t \times q_{i-1,t} + e \times Controls_{i,t} + \alpha_i + \tau_t \\
 & + \varepsilon_{i,t} \qquad \qquad \qquad (2)
 \end{aligned}$$

where i indexes firm and t indexes year. The dependent variable is the investment conducted by firms. “*Post*” equals one for the period after 2009 and zero for the period before that. “*Mainland*” equals one for firms that are defined as Mainland firms and zero otherwise. q represents *Tobin’s q*. The expression α represents firm fixed effect and τ represents time fixed effect. The coefficient of interest is a , the coefficient for the triple interaction term, which captures the treatment effect for investment- q sensitivity with respect to the counterfactual proxied for by the control group. A positive coefficient of this term indicates that investments tend to be more responsive to good investment opportunities. As shown in Table 4, the coefficients for the triple interaction terms for columns (1) and (2) are both significantly positive, suggesting that the investments undertaken by Mainland firms became more responsive to good investment opportunities in the low-for-long interest rate environment.

One potential concern is the above results are driven by an unobservable shock coinciding with the timing of interest rate cut that affects local and Mainland firms differently. Although we do not have a perfect identification strategy for this issue, we perform PSM as a robust check for our analysis. We estimate, for each firm, the probability of being a Mainland firm as of the end of 2008. The estimation is based on a logit model, in which the dependent variable equals one when the firm is a Mainland firm and zero otherwise. The control variables include firm size, leverage, tangibility, and market-to-book. We perform a nearest-neighbour, one-to-one match—that is, we match each Mainland firm with a local firm that has the closest value of propensity score with replacement. Using the PSM sample, we re-estimate the regression model (2) and the results on investments and investment efficiency are presented in Table 5. As shown in

columns (1) and (2) of Table 5, Mainland firms continued to deliver a higher level of investment changes than matched local firms in the years after GFC. The investments of Mainland firm also became more responsive to good investment opportunities, as suggested in columns (3) and (4) of Table 5.

Although the above test suggests high investment sensitivity to good investment opportunities, it cannot fully rule out that agency problems may be one driver. First, *Tobin's q* could be a proxy for variables other than investment opportunities, such as cash flows. A firm with severe agency problem would intend to invest more whenever excess cash flow is generated. Thus, a higher investment-*q* sensitivity does not necessarily indicate an improvement in investment efficiency if *Tobin's q* measures something other than good investment opportunities. Second, a firm with agency problem often exhibits the features of a financially constrained firm because higher cost associated with agency problem makes it harder to access the financial markets¹⁰. The investment of such firms would also become more responsive to investment opportunities once financial constraints are mitigated. In order to provide further evidence to disentangle the two hypotheses, we conduct two additional tests.

We first show that the operating efficiency of Mainland firms improved after the GFC by conducting DID on ROE and turnover (sales scaled by total assets). ROE measures the return to equity holders. As the empire-building incentives of managers tend to erode the interests of equity holders, agency problems will lead to a deterioration of ROE. At the

¹⁰ Agency problems within firms make managerial actions different from the value-maximizing objectives of the firms (Jensen, 1986; Masulis, Wang, and Xie, 2007). When making investment decisions ex ante, outside investors tend to take these costs into consideration and increase their required rates of return. In this case, firms with higher agency costs will face higher external financing costs, which lead to further financial constraints.

same time, turnover measures the efficiency in utilizing existing assets. An amplification of agency problems will result in lower turnover. The significantly positive results reported in Table 6 suggest that Mainland firms experienced higher operating efficiency after GFC, benchmarked to local firms. This is consistent with the previous claims that Mainland firms became more responsive to good investment opportunities and the surge in investments was not driven by agency problems.

In addition, we collected the data on institutional ownership in Hong Kong listed firms from Capital IQ and divided the sample into two categories according to their average institutional investor ownership during the sample period. As independent institutions with long-term investments usually specialize in monitoring (Chen et al., 2007; Ferreira and Matos, 2008), a higher institutional ownership could provide more effective discipline on firms with agency problems. Since monitoring reduces agency problems, higher investments in firms with higher institutional investor ownership would support the view that financially constrained firms are able to take up more investment opportunities in the low-for-long interest rate environment. On the contrary, if we identify higher level of investments in firms with lower institutional investor ownership, this will lend more support for the arguments on agency problems. More specifically, firms with institutional ownership above the median of the sample are classified as firms with high institutional ownership. We thus run the DID regression where the treatment firms are those with high institutional ownership and control firms are those with low institutional ownership.

In Table 7, the dummy variable IIO is equal to 1 if the firm belongs to the group with high institutional ownership and 0 otherwise. As indicated by columns (1) and (2), firms with higher institutional investor ownership increased their investments by 1% (of

total assets) more than Mainland firms with lower institutional investor ownership. This is consistent with the conjecture that the mitigation of financial constraints, instead of the amplification of agency problems, accounts for the surge in leverage and investments among Mainland firms.

4. Conclusion

This paper provides empirical evidence to explain the surge in corporate leverage among Mainland listed firms in Hong Kong during the low-for-long interest rate environment after the GFC. Using difference-in-difference tests, this study finds evidence to support the view that the rise in leverage of Mainland firms was driven mainly by investment activities.

This paper further examines whether the rise in investment of Mainland listed firms in Hong Kong was driven by the increase in their investment efficiency due to the relaxation of financial constraints or by some unproductive motives (such as empire-building incentives of managers). Empirical findings suggest that the former may have higher explanatory power for the phenomenon, suggesting that the leverage and investments taken by Mainland firms listed in Hong Kong can on average be supported by economic fundamentals. One implication of this study is that while a persistent rise in corporate leverage amid the low-for-long interest rate environment may raise a red flag about the healthiness of the corporate sector and cause financial stability concerns, a comprehensive financial stability assessment requires further investigations on underlying drivers of the surge in corporate leverage. The financial health of Mainland firms should be assessed continuously and more research in this area is needed, given the increasing

exposure of Hong Kong's financial sectors to Mainland firms and the prolonged low-for-long interest rate environment.

Appendix: Variable Definitions

Assets: The amount of book assets.

Cash flow: Operating cash flow scaled by book assets.

Cash holdings: The sum of cash and marketable securities scaled by book assets.

IIO: Institutional ownership in the firm.

Intangible: Investments in intangible assets scaled by book assets. Intangible assets refer to those assets that cannot be physically touched or seen and are key assets of today's "knowledge economy". Examples of intangible assets are software, design, market research, R&D, training, and business processes in various aspects.

Industry-median: The median book leverage of the industry.

Interest expenses: Interest expenses scaled by total debts.

Investments: Total investments scaled by book assets.

Book leverage: Total book debt/(total book debt + book value of equity).

Mainland: A dummy variable that equals one if the firm's domicile or major business is in Mainland China and zero otherwise.

Market leverage: Total book debt/(total book debt + market value of equity).

Post: A dummy variable that equals one for the period after 2008, and zero otherwise.

Q: Tobin's q, defined as (total assets + market value of equity – book value of equity)/book assets.

ROA: Net income/total book assets.

ROE: Net income/total equity.

Sales growth: The growth rate of sales.

Size: Log(assets).

SOE: A dummy variable that equals one if the controlling shareholder of the firm is the government, and zero otherwise.

Tangibility: Property, plant, and equipment divided by book assets.

Turnover: Sales scaled by total assets.

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Figure 1 Corporate Leverage of listed firms in Hong Kong

This figure plots the weighted average leverage of all non-financial local and Mainland firms listed in the Hong Kong Stock Exchange from 2004 to 2018. Leverage is defined as the debt-to-equity ratio. The data source is HKMA staff estimates with data from Bloomberg.

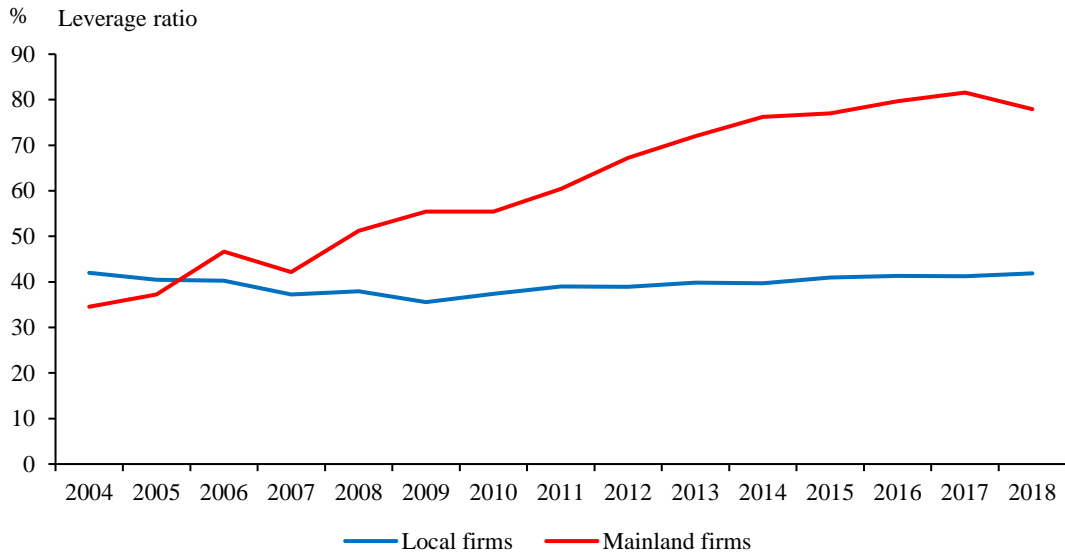


Figure 2 Investment Mean Difference between Mainland and Local Firms over Time

This figure plots the investment mean difference between Mainland and local firms with 95% confidence intervals.

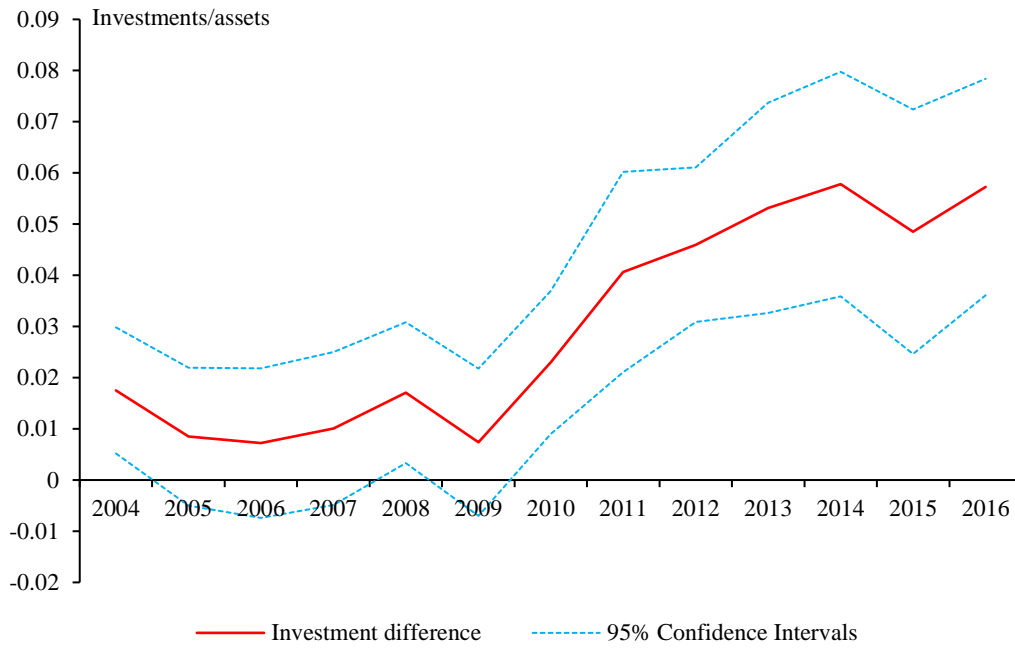


Table 1: Summary Statistics

This table reports the summary statistics of firm characteristics for Mainland and local firms separately in the whole sample. All values are winsorized at the 1% and 99% level. ***, **, * denote significance level at 1%, 5%, and 10%, respectively.

	Mainland firms			Local firms			Mean Difference
	Mean	Median	Std	Mean	Median	Std	
	N=522			N=730			
Size	22.38	22.34	1.91	21.07	20.99	1.76	1.31***
Tangibility	0.28	0.23	0.22	0.23	0.16	0.22	0.05***
Book leverage	0.27	0.25	0.21	0.19	0.13	0.19	0.08***
Market leverage	0.24	0.18	0.23	0.21	0.12	0.23	0.03***
Tobin's q	1.75	1.14	2.53	1.76	0.98	3.68	-0.01**
ROA	0.03	0.04	0.15	-0.01	0.03	0.24	0.04***
Cash holdings	0.19	0.14	0.16	0.19	0.14	0.17	0.00***
Total investments	0.12	0.08	0.16	0.09	0.05	0.13	0.03***

Table 2: Low-for-long interest Rate Environment and Corporate Leverage

This table presents the results of the DID regressions on corporate leverage between Mainland and local firms before and after the GFC. The dependent variable y is book leverage for columns (1) through (2), and market leverage (3) through (4). Post is a dummy variable which equals one for the period after 2008 and zero otherwise. Mainland is a dummy variable that equals one if the firm is headquartered in Mainland China and zero otherwise. Size is the logarithm of total assets. Tangibility is property, plant, and equipment divided by total assets. Book leverage is the total book debt divided by the sum of total book debt and book value of equity. Market leverage is the total book debt divided by the sum of total book debt and market value of equity. ROA is net income scaled by total assets. Industry-median is the yearly industry median leverage. Numbers in the parentheses are standard errors corrected for heteroscedasticity and firm level clustering. (***, **, * denote significance level at 1%, 5%, and 10%, respectively).

	Book Leverage		Market Leverage	
	(1)	(2)	(3)	(4)
Mainland*Post	0.029*** (0.006)	0.030*** (0.006)	0.014** (0.006)	0.018*** (0.006)
Size	0.043*** (0.002)	0.043*** (0.002)	0.073*** (0.002)	0.072*** (0.002)
Tangibility	0.155*** (0.009)	0.168*** (0.009)	0.161*** (0.009)	0.189*** (0.010)
Market-to-book	-0.004*** (0.001)	-0.004*** (0.001)	-0.008*** (0.001)	-0.008*** (0.001)
ROA	-0.107*** (0.007)	-0.107*** (0.007)	-0.081*** (0.007)	-0.081*** (0.007)
Industry-median	0.378*** (0.046)		0.332*** (0.047)	
Year FE	YES		YES	
Firm FE	YES	YES	YES	YES
Industry*Time FE		YES		YES
Observations	13,074	13,065	13,086	13,077
Adj R-squared	0.627	0.630	0.687	0.694

Table 3: Low-for-long interest Rate Environment and Corporate Policies

This table presents the results of the DID regressions on corporate investments and cash holdings between Mainland and local firms before and after the GFC. The dependent variable is investments scaled by assets for columns (1) through (2), cash holdings scaled by assets in columns (3) and (4), and interest expenses scaled by total debt in columns (5) and (6). Post is a dummy variable which equals one for the period after 2008 and zero otherwise. Mainland is a dummy variable that equals one if the firm is headquartered in Mainland China and zero otherwise. Size is the logarithm of total assets. Tangibility is property, plant, and equipment divided by total assets. ROA is net income scaled by assets. Book leverage is the total book debt divided by the sum of total book debt and book value of equity. Cash flow is the operating cash flow scaled by total assets. Numbers in the parentheses are standard errors corrected for heteroscedasticity and firm level clustering. (***, **, * denote significance level at 1%, 5%, and 10%, respectively).

	Investments		Cash holdings		Interest expenses	
	(1)	(2)	(3)	(4)	(5)	(6)
Mainland*Post	0.014** (0.005)	0.015*** (0.005)	-0.003 (0.005)	-0.003 (0.005)	-0.028** (0.013)	-0.024* (0.013)
Size	0.007*** (0.002)	0.009*** (0.002)	-0.038*** (0.002)	-0.037*** (0.002)	-0.040*** (0.005)	-0.038*** (0.005)
Tangibility	0.007 (0.008)	0.000 (0.009)	-0.187*** (0.008)	-0.194*** (0.008)	-0.065*** (0.020)	-0.055*** (0.021)
Market-to-book	0.003*** (0.000)	0.003*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.003** (0.001)	0.002** (0.001)
ROA	0.009 (0.006)	0.009 (0.007)	0.028*** (0.006)	0.026*** (0.006)	0.029* (0.015)	0.025 (0.015)
Leverage	-0.016* (0.009)	-0.011 (0.009)	-0.111*** (0.008)	-0.109*** (0.008)	-0.048** (0.020)	-0.047** (0.020)
Cash flow	-0.022** (0.009)	-0.022** (0.009)	0.082*** (0.008)	0.083*** (0.008)	0.060*** (0.021)	0.060*** (0.021)
Year FE	YES		YES		YES	
Firm FE	YES	YES	YES	YES	YES	YES
Industry*Time FE		YES		YES		YES
Observations	13,089	13,080	13,094	13,085	13,082	13,073
Adj R-squared	0.356	0.363	0.608	0.612	0.211	0.218

Table 4: Low-for-long Interest Rate Environment and Investment- q Sensitivity

This table presents the results of the DID regressions on corporate investment- q sensitivity between Mainland and local firms before and after the GFC. The dependent variable is investments scaled assets. *Post* is a dummy variable which equals one for the period after 2008 and zero otherwise. *Mainland* is a dummy variable that equals one if the firm is headquartered in Mainland China and zero otherwise. Controls include size, tangibility, market-to-book, ROA, book leverage and cash flow. Numbers in the parentheses are standard errors corrected for heteroscedasticity and firm level clustering. (***, **, * denote significance level at 1%, 5%, and 10%, respectively).

	Investments	
	(1)	(2)
Mainland*Post* q	0.006*** (0.002)	0.005** (0.002)
Mainland* q	0.001 (0.002)	0.001 (0.002)
Post* q	0.005 (0.007)	0.009 (0.007)
Mainland*Post	-0.002* (0.001)	-0.003** (0.001)
Controls	YES	YES
Year FE	YES	
Firm FE	YES	YES
Industry*Time FE		YES
Observations	12,875	12,788
Adj R-squared	0.431	0.419

Table 5: Robustness: Propensity Score Matching

This table presents the results of the DID regressions on corporate investments and investment- q sensitivity using a propensity-score matched sample. The dependent variable is investments scaled assets. $Post$ is a dummy variable which equals one for the period after 2008 and zero otherwise. $Mainland$ is a dummy variable that equals one if the firm is headquartered in Mainland China and zero otherwise. q is *Tobin's q*. Controls include size, tangibility, market-to-book, ROA, book leverage and cash flow. Numbers in the parentheses are standard errors corrected for heteroscedasticity and firm level clustering. (***, **, * denote significance level at 1%, 5%, and 10%, respectively).

	Investment		Investment- q sensitivity	
	(1)	(2)	(3)	(4)
Mainland*Post* q			0.005** (0.003)	0.004* (0.003)
Mainland*Post	0.013** (0.006)	0.011* (0.006)	0.003 (0.008)	0.004 (0.008)
Mainland* q			0.001 (0.002)	0.001 (0.002)
Post* q			0.000 (0.002)	-0.000 (0.002)
Controls	YES	YES	YES	YES
Year FE	YES		YES	
Firm FE	YES	YES	YES	YES
Industry*Time FE		YES		YES
Observations	7,899	7,899	7,433	7,433
Adj R-squared	0.292	0.299	0.314	0.321

Table 6: Low-for-long interest Rate Environment and Firm Operating Efficiency

This table presents the results of the DID regressions on ROE and turnover between Mainland and local firms before and after the GFC. The dependent variable is ROE for columns (1) through (2), and turnover in columns (3) and (4). Post is a dummy variable which equals one for the period after 2008 and zero otherwise. Mainland is a dummy variable that equals one if the firm is headquartered in Mainland China and zero otherwise. Size is the logarithm of total assets. Tangibility is property, plant, and equipment divided by total assets. ROA is net income scaled by assets. Book leverage is the total book debt divided by the sum of total book debt and book value of equity. Cash flow is the operating cash flow scaled by total assets. Numbers in the parentheses are standard errors corrected for heteroscedasticity and firm level clustering. (***, **, * denote significance level at 1%, 5%, and 10%, respectively).

	ROE		Turnover (sales/assets)	
	(1)	(2)	(3)	(4)
Mainland*Post	0.039*** (0.014)	0.049*** (0.015)	0.134*** (0.018)	0.133*** (0.018)
Size	0.064*** (0.005)	0.070*** (0.005)	-0.164*** (0.007)	-0.172*** (0.007)
Tangibility	-0.071*** (0.023)	-0.050** (0.024)	-0.012 (0.028)	0.021 (0.029)
Market-to-book	0.009*** (0.002)	0.008*** (0.002)	0.006*** (0.002)	0.006*** (0.002)
Leverage	-0.306*** (0.022)	-0.302*** (0.022)	0.058** (0.028)	0.052* (0.028)
ROA			0.188*** (0.022)	0.194*** (0.022)
Year FE	YES		YES	
Firm FE	YES	YES	YES	YES
Industry*Time FE		YES		YES
Observations	14,083	13,988	14,053	13,958
Adj R-squared	0.204	0.217	0.508	0.510

Table 7: Investments and Institutional Ownership

This table presents the results of the DID regressions on corporate investment and investment-q sensitivity between Mainland SOEs and non-SOEs before and after the GFC. The dependent variable y is investments scaled by assets. $Post$ is a dummy variable which equals one for the period after 2008 and zero otherwise. IIO is a dummy variable that equals one if the firm's institutional ownership is above median of the sample and zero otherwise. $Size$ is the logarithm of total assets. $Tangibility$ is property, plant, and equipment divided by total assets. ROA is net income scaled by assets. $Book\ leverage$ is the total book debt divided by the sum of total book debt and book value of equity. $Cash\ flow$ is operating cash flow scaled by total assets. Numbers in the parentheses are standard errors corrected for heteroscedasticity and firm level clustering. (***, **, * denote significance level at 1%, 5%, and 10%, respectively).

	Investments	
	(1)	(2)
IIO*Post	0.010** (0.005)	0.009* (0.005)
Size	0.010*** (0.002)	0.011*** (0.002)
Tangibility	0.008 (0.009)	0.001 (0.009)
Market-to-book	0.006*** (0.001)	0.006*** (0.001)
ROA	0.004 (0.007)	0.004 (0.007)
Leverage	-0.013 (0.009)	-0.007 (0.009)
Cash flow	-0.023** (0.009)	-0.023** (0.009)
Year FE	YES	
Firm FE	YES	YES
Industry*Time FE		YES
Observations	12,740	12,740
Adj R-squared	0.358	0.366