

A Study of the Impact of Excess Cash Holdings on Corporate Innovation

Pan Ma ¹

School of Economics and Management, Lanzhou University of Technology, Lanzhou, Gansu, 730000, China

Abstract: This paper investigates the relationship between excess cash holdings, product market competition and corporate innovation by using an empirical research method with a sample of A-share manufacturing companies listed in Shanghai and Shenzhen in China from 2011 to 2021. The study finds that: manufacturing companies' excess cash holdings have a positive impact on corporate innovation; product market competition positively regulates the relationship between excess cash holdings and corporate innovation, and the more intense the product market competition is, the more significant the regulating effect is. The research in this paper provides a reference for manufacturing firms to optimize corporate cash holdings and promote corporate innovation in different competitive market environments.

Keywords: level of corporate cash holdings; product market competition; corporate innovation

1. Introduction

Enterprise innovation is a topic that has been commonly mentioned in recent years, and innovation in manufacturing enterprises in particular is of paramount importance. There are many factors that affect innovation in manufacturing enterprises, among which the lack of sufficient financial resources is one of the biggest problems that prevent most enterprises from carrying out technological innovation. However, in emerging market countries such as China, where capital markets and financial systems are relatively underdeveloped, there are few opportunities to obtain external financing for R&D. As a result, internal cash holdings are the main source of funding for innovative R&D. Arrow ^[1] study shows that moral hazard and adverse selection problems due to information asymmetry prevent external financing of technological innovation inputs, and firms then use internal cash holdings. Kamien and Schwartz[2] were the first to test theoretically that firms with a need for innovation increase their cash holdings. In China, Qingquan Tang and Xin Xu[3] showed that R&D investment is dependent on firms' internal capital due to its characteristics, and explored its impact on the relationship between internal capital and investment from the perspective of equity concentration and equity structure. Xin Lu et al.[4] classified high-tech firms listed in 2007-2009 into two categories: cash-rich and cash-deficient, and found that cash-deficient firms have significant cash flow sensitivity of R&D investment, and this relationship is stronger for non-state owned firms and small-sized firms. But should

¹ Ma Pan (1996-), Male, Gansu Qingyang, Master of Science, Capital Market and Governance of Listed Companies, Lanzhou University of Technology, China; Email: 1352353469@qq.com.

excess cash be held in order to fuel the innovation activities of manufacturing companies? Does excess cash holdings facilitate or inhibit innovation? This is a question that needs to be examined in depth.

The majority view is that excess cash holdings means that a company actually holds more cash than it needs to maintain its normal business activities. In recent years there has been a general tendency for listed companies in China to hold high levels of cash reserves. Research on the relationship between cash holdings and corporate innovation has received widespread attention from domestic academics: one view is that excess cash holdings have a crowding-out effect on corporate innovation performance due to the high opportunity cost [5]. Another view is that excess cash holdings have a catalytic effect on firms' innovation performance, and that the use of internal funds can effectively alleviate financing constraints to improve corporate innovation [6]. In conclusion, there is still disagreement on the relationship between corporate cash holdings and corporate innovation, and there is still room for further exploration.

To synthesise the above analysis, this paper empirically examines the relationship between corporate excess cash holdings and corporate innovation as well as the moderating role of product market competition in enhancing corporate innovation, using a sample of Chinese manufacturing companies listed on the Shanghai and Shenzhen A-shares from 2011-2021. The findings of the study have important implications for the promotion of corporate innovation.

2. Theoretical Analysis and Research Hypothesis

2.1 Excess cash holdings and corporate innovation in manufacturing firms

On the one hand, firms choose to set aside some excess cash within the firm based on speculative motives. As there is an additional opportunity cost associated with holding excess cash assets, firms tend to invest the excess cash to generate income to compensate for this opportunity cost. However, due to the imperfection of the capital markets and the lack of capital market savvy in manufacturing companies, manufacturing companies are more inclined towards corporate innovation than risky investments in the capital markets. On the other hand, innovation activities are long-term and require significant financial support, which can be obtained from internal and external sources. In reality, adequate cash reserves are the basis for innovation, and excess cash holdings can alleviate financing constraints and ensure continued investment in innovation activities. Hu Jun et al [7] conducted an empirical study based on the data of listed companies from 2007 to 2016 and found that long-term stable cash holdings play a crucial role in the innovation activities of high-investment firms. Dai Zhenzhen et al [8] took electronic equipment manufacturing enterprises as a sample and found through empirical evidence that electronic equipment manufacturing enterprises tend to use the excess cash holdings for corporate innovation investment thus improving their competitive position. Based on the above analysis, this paper proposes the following hypotheses:

H1: Manufacturing firms' excess cash holdings have a catalytic effect on corporate innovation.

2.2 Excess cash holdings, product market competition and firm innovation

The study of the relationship between excess cash holdings and firm innovation cannot avoid the competitive product market environment in which firms operate. On the one hand, product market competition has an information effect, and the transparency of corporate information is enhanced when competition is fierce, so that corporate owners and external investors have an invisible monitoring effect on agents through the comparison of transparent information. This enables agents to regulate their own behaviour and to deepen their understanding of the firm's objectives, so that they can use the firm's excess cash resources to invest in innovations that are more beneficial to the firm's future development, thus strengthening the role of excess cash holdings in promoting innovation. On the other hand, according to market process theory, when external market competition is intense, the original market equilibrium will be broken, thus making the product market move towards a higher equilibrium. Corporate profits. In a competitive market environment, the only way for firms to gain competitive advantage is to increase their investment in innovation. When firms face severe financing constraints, the risk of uncertainty is even greater. To avoid the risk of predation and obsolescence, firms often tend to hold excess cash to cope with possible market changes. Under the effect of product market competition, the relationship between excess cash holdings and the promotion of firm innovation will be further strengthened. Based on the above analysis, this paper proposes the following hypothesis:

H2: Other things being equal, product market competition positively moderates the relationship between a firm's excess cash holdings and firm innovation.

3. Research design

3.1 Sample selection and data sources

The initial research sample of this paper is the A-share listed companies in the manufacturing industry in Shanghai and Shenzhen in China during the period from 2011 to 2021, and all sample data are obtained from the Guotaian database. The sample was processed as follows: (1) Excluding the sample companies in the financial and insurance categories, ST and PT. (2) The continuous variables were subjected to an upper and lower 1% tailing process. The processing software used in this paper is Stata16 and Excel.

3.2 Description of variables

3.2.1 Explanatory variables.

The explanatory variable in this paper is corporate innovation (Rd), which is measured by the ratio of R&D investment to current operating income.

3.2.2 Explanatory variables

(i) Excess cash holdings (Excash)

Excess cash holding is the core explanatory variable of this paper. In the selection of variables, we refer to the method of Oplear et al [9] and use model 1 to construct the expected model of enterprise cash holding. The absolute value of the residuals from the model regression is used as a proxy variable for excess cash holdings, with a larger indicator indicating a higher level of excess cash holdings. The larger the indicator, the higher the level of excess cash holdings. The closer the indicator is to zero, the closer the firm's excess cash holdings are to normal levels.

$$Lncash = \beta_0 + \beta_1Size + \beta_2Cf + \beta_3Nwc + \beta_4Growth + \beta_5Capex + \beta_6Lev + \beta_7Div + \sum Year + \varepsilon \tag{1}$$

(ii) Product market competition (Pcm)

For the measurement of the degree of product market competition, this paper mainly uses the Lerner index to measure the monopoly position of enterprises in the market, the Lerner index is calculated by the formula (price - marginal cost)/price. The Lerner Index is calculated as (price - marginal cost)/price. Because marginal cost itself is difficult to measure, this paper uses the profit margin instead, where Pcm = (operating revenue - operating costs - selling expenses - administrative expenses)/operating revenue. Its value varies between 0-1, the smaller the value of Pcm, the smaller the market power in the industry, the greater the competition faced by enterprises.

3.2.3 Control variables

As the relationship between excess cash holdings and corporate innovation can be affected by many factors, this paper refers to [2] Yu Yike et al. study in the selection of control variables to select corporate return on assets (Roa), Tobin's q, company size, total asset turnover, and the number of years the company has been listed as control variables. Detailed variable definitions and calculations are shown in Table 1.

| Table 1 | | Definition of variables |
|---|----------------|--|
| Variable name | Variable Codes | Variable definition and calculation methods |
| Corporate Innovation | Rd | R&D investment / Current operating revenue |
| Excess cash holdings | Excash | Absolute value of residuals from regression of model (1) |
| Product market competition | Pcm | Lerner Index, pcm = (operating revenue - operating costs - selling expenses - administrative expenses) / operating revenue |
| Size of business | Lnsiz | Natural logarithm of the company's total assets at the end of the year |
| Number of years the company has been listed | Age | Year of observation minus the natural logarithm of the year of incorporation plus 1 |
| Return on assets | Roa | Return on Assets = Net Profit / Total Assets |
| Tobin q | TobinQ | Market value of business/total assets |
| Total asset turnover ratio | Turn | Operating income/total assets |
| Annual dummy variables | Year | Takes a value of 1 when the business is in that year, 0 otherwise |

3.3 Model construction

In order to verify the relationship between excess cash holdings and firm innovation, this paper draws on the approach of Yu Desheng and Li Xing[10] to explore product financialization and firm innovation, and constructs model (2) as follows: $Rd_{i,t} = \beta_0 + \beta_1Excash_{i,t} + \beta_2Controls_{i,t} + \sum Year + \varepsilon_{i,t}$

To verify the moderating effect of product market competition on the relationship between excess cash holdings and firm innovation, other things being equal, this paper follows the method used by Desheng Yu and Xing Li[10] to verify the moderating effect and constructs model (3) as follows: $Rd_{i,t} = \gamma_0 + \gamma_1Excash_{i,t} + \gamma_2Pcm_{i,t} + \gamma_3Excash_{i,t} * Pcm_{i,t} + \gamma_4Controls_{i,t} + \sum Year + \varepsilon_{i,t}$

where $Excash_{i,t} * Pcm_{i,t}$ denotes the cross product term and Controls denotes a set of control variables listed previously; ε is the stochastic perturbation term of the model.

4. Empirical Results and Analysis

4.1 Descriptive statistics

| Table 2 Descriptive statistics of the variables | | | | | |
|---|-------|-------|-----------|--------|--------|
| Variables | Obs | Mean | Std. Dev. | Min | Max |
| Rd | 16945 | 4.613 | 3.56 | 0.07 | 21.48 |
| Excash | 16945 | 0.167 | 0.078 | 0.011 | 0.358 |
| Pcm | 16945 | 0.138 | 0.104 | -0.113 | 0.489 |
| TobinQ | 16945 | 2.081 | 1.227 | 0.882 | 7.998 |
| Turn | 16945 | 0.628 | 0.34 | 0.136 | 2.132 |
| Roa | 16945 | 0.052 | 0.048 | -0.099 | 0.205 |
| Lnisze | 16945 | 22.02 | 1.163 | 20.025 | 25.595 |
| Age | 16945 | 2.833 | 0.345 | 1.74 | 3.482 |

From the descriptive statistics of the variables, it can be seen that the average value of enterprise innovation (the ratio of R&D investment to current operating income) is 4.613, which indicates that the innovation intensity of manufacturing enterprises in China is still very weak, with the minimum value of 0.07 and the maximum value of 21.48. It can be seen that there is a great difference in the innovation ability of different enterprises, which needs to be further strengthened. The maximum and minimum values of excess cash holdings are 0.011 and 0.358 respectively, indicating that the excess cash holdings of enterprises differ significantly among different manufacturing enterprises.

4.2 Regressivity analysis

| Table 3 Regression results | | |
|----------------------------|--------------------|-----------------------|
| | (Model 2) | (Model 3) |
| Variables | Rd | Rd |
| Excash | 2.339*** (3.43) | 4.890*** (5.45) |
| Pcm | | 0.339 (0.34) |
| Excashpcm | | -17.077*** (-4.19) |

| | | |
|----------------|-----------------------|-----------------------|
| TobinQ | 0.058** (2.30) | 0.063** (2.51) |
| Turn | -1.985*** (-12.73) | -2.108*** (-13.31) |
| Roa | -7.026*** (-10.01) | -4.145*** (-4.59) |
| Lnsiz | -0.181* (-1.83) | -0.117 (-1.14) |
| Age | -0.291 (-0.63) | -0.302 (-0.66) |
| Year | Yes | Yes |
| Constant | 9.353*** (3.80) | 7.967*** (3.20) |
| Observations | 16,945 | 16,945 |
| R-squared | 0.110 | 0.121 |
| Number of name | 2,658 | 2,658 |
| adj_R2 | 0.120 | 0.120 |
| F | 23.37 | 23.37 |

Note: ①* denotes 10% level of significance, ** denotes 5% level of significance, *** denotes 1% level of significance; ② t-statistics after Robust correction are in parentheses.

Table 3 reports the results of the panel regressions on firms' excess cash holdings, product market competition and firm innovation. The second column indicates the relationship between excess cash holdings and corporate innovation, where the correlation coefficient of excess cash holdings is 2.339, which is significant at the 1% level, indicating that excess cash holdings of manufacturing firms listed in China have a significant role in promoting corporate innovation, verifying hypothesis 1. Excess cash holdings of manufacturing firms reduce the financing constraint in innovation investment, thus allowing firms to have sufficient funds for longer-cycle innovation R&D activities, resulting in the strengthening of the innovation capability of manufacturing firms.

The third column of Table 3 reflects the moderating effect of product market competition in the relationship between excess cash holdings and firm innovation, and the results show that the coefficient of the cross product term is -17.007, which is significant at the 1% level. In other words, the less competitive the product market is, the weaker the positive effect of excess cash holdings on firm innovation, and conversely, the weaker the inhibitory effect on the positive relationship between the two. The hypothesis of H2 is verified. According to the information effect of product market competition, an increase in product market competition makes firms disclose more information to the outside world, which is equivalent to imposing an "invisible oversight" on executives, which on the one hand alleviates agency conflicts and on the other hand avoids short-sightedness.

5. Conclusions and Recommendations

5.1 Research findings

This paper explores the impact of excess cash holdings on corporate innovation based on the perspective of product market competition, using a sample of manufacturing companies listed in Shanghai and Shenzhen A-shares from 2011 to 2021, and draws the

following main conclusions: (1) Excess cash holdings of manufacturing enterprises have a catalytic effect on corporate innovation. The long cycle of corporate innovation activities and the high capital requirements of enterprises can effectively alleviate the financing constraints of enterprises and provide continuous financial support for their innovation activities. (2) Product market competition moderates the relationship between excess cash holdings and corporate innovation. The more competitive the product market is, the more significant the positive impact of excess cash holdings on corporate innovation, which is conducive to enhancing corporate innovation. The positive effects of the governance and predation effects of product market competition dominate. In terms of the governance effect, the more competitive the product market is, the better the external governance mechanism of the firm, which can curb the short-sighted and self-interested behaviour of executives and thus increase the investment in corporate innovation. In terms of the predatory effect, the more competitive the product market is, the more companies will take the initiative to increase their investment in innovation in order to prevent themselves from being "predated" by other companies in the same industry.

5.2 Countermeasures and suggestions

Based on the findings of this paper, the following suggestions are made: (1) Manufacturing enterprises can appropriately hold more funds than they need for normal operation according to their own situation, so as to alleviate the financing constraints in their innovation activities and reserve good funds for their innovation activities. (2) Enterprises should reasonably plan to retain corporate cash flow and formulate reasonable innovation strategies according to the degree of product market competition in the industry they operate in.

Reference

- [1] Arrow K J. Economic Welfare and the Allocation of Resources for Invention[J]. social science electronic publishing, 1962.
- [2] Kamien M I, Schwartz N L. Self-financing of an R and D project[J]. Am. Econ. Rev.; (United States), 1978, 68:3(3):252-261.
- [3] Tang Qingquan, Xu Xin. Corporate R&D investment and internal funds--a study from Chinese listed companies[J]. China Accounting Review, 2010, 8(03):341-362.
- [4] Lu X., Zheng Y. F., Li J. M. A study on the impact of financing constraints on corporate R&D investment--empirical evidence from high-tech listed companies in China[J]. Accounting Research, 2013(05):51-58+96.
- [5] Lydia Guo. The impact of financialization of manufacturing on innovation investment: "crowding out effect" or "reservoir effect"? [J]. Modern Economic Inquiry, 2017(12):49-59.
- [6] Yu Yike, Guo Jing, Zhang Zaijie et al. Real estate crowding, cash holdings and firm innovation performance[J]. Statistics and Decision Making, 2020, 36(03):159-163.
- [7] Hu J, Li Q, Zeng Y. The smoothing effect of cash holdings on R&D investment: A product market competition perspective[J]. Journal of Management Engineering, 2021, 35(06):150-162.
- [8] DAI Zhenzhen, CHENG Kequn. Cash holdings, R&D investment and firm competitiveness[J]. Journal of Guangxi University of Science and Technology, 2019, 30(04):118-126.
- [9] Opler T, Pinkowitz L, Stulz R, et al. The determinants and implications of corporate cash holdings[J]. Journal of financial economics, 1999, 52(1): 3-46.
- [10] Yu, Desheng, Li, Xing. Corporate financialization, product market competition and corporate innovation[J]. Financial Development Research, 2021, No.471(03):20-25.