Industrial Company Financialization and Innovation Level

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Abstract. At the moment, PPP is the main method of project financing. Under this model, the social capital party bears the main capital responsibility. In order to reduce the asset-liability ratio and obtain more funds, many industrial enterprises choose to participate in financial institutions. The combination of industry and finance is increasingly rich, and it can provide financial support for engineering projects through industrial funds and perpetual bonds. But what will corporate finance bring to project innovation? Innovation is a necessary condition for industrial enterprises to survive in fierce competition. However research between company financialization and innovation has not yet reached a unified opinion. This paper tests the impact of financialization on enterprise project innovation, and finds that there is a negative effect between the two. Also further research shows that the higher the degree of financing constraints, the more obvious the inhibition. This paper enriches the research on industrial enterprise financialization and project innovation.

1. Introduction
At present, the Chinese economy is in the new normal stage of the “three-phase superposition” of the growth rate shift period from the high-speed to the medium-high speed, the structural adjustment pain period and the digestive period of the previous stimulus policy. Science and technology innovation is the core of China’s innovation-driven development strategy. Therefore industrial enterprises need to increase the ratio of R&D output to accelerate industrial upgrading.

The construction project needs a lot of investment. The current government and central enterprises have huge debts. And how to raise funds has become an important issue. Financialization refers to entities which purchase shares in financial institutions or control them. Wind statistics show that 1,138 A-share listed companies purchased financial products in 2017, amounting to 1.15 trillion yuan, an increase of 38.25% over 2016.

Although financialization is developing rapidly, the theoretical research is lagging behind. Most papers research on the relationship between financialization and innovation investment, and mainly based on manufacturing companies. So what is the impact of financialization on engineering innovation? Will the effect change under different financing constraints? This paper attempts to answer the above questions.

2. Literature review
Participating financial institutions originated in the West in the 19th century. British business enterprises began to establish extensive business contacts with financial institutions (Li Xinchun, 2011)
According to the survey of Chinese entrepreneur, the current financialization of enterprises has mainly four motivations: gain more credit support, achieve multi-channel management, seek out the way out of surplus industry capital and improve entrepreneurial learning and innovation. In theory, financialization is mainly driven by lower transaction costs, synergies and optimized resource allocation (Coase, 1937) [2].

There are roughly three research topics: financing constraints, investment efficiency and company performance. Enterprises invest financial institutions can mitigate the level of financing constraints by reducing information asymmetry in external financing through information effects and decision-making effects, which can help enterprises to grasp investment opportunities and improve investment efficiency. But it may also increase the company's excessive investment and bring damage to business performance.

The level of enterprise innovation is generally measured by the number of patent applications (Wang Chaoen, 2016) [3]. Innovation level has a positive effect on improving production capacity. The main research topics are scale effect, bank competition level, financing constraints, etc. Yuan & Wang (2015) refers that valid information disclosure can alleviate corporate financing constraints, reduce agency costs and promote innovation level [4]. Studies have shown that financial subsidies and R&D output are inverted U-shaped, which means that R&D output can only be promoted when fiscal subsidies are below a threshold.

3. Theoretical analysis and research hypothesis
Industrial company's innovation activities are subject to severe financing constraints, which makes it mainly rely on internal financing (Hall, 2002) [5]. The literature has confirmed that financial development can promote innovation of enterprises. As an important dimension of financial development, financialization will play an important role in affecting innovation level. Based on financial industry's market arbitrage motives, the excess return rate has at least the following three affects of enterprise innovation: first, financing constraints will restrict company's available capital and reduce resources provide for enterprise innovation; then the excessive return of financial assets may weaken corporate innovation and further erode the incentive to invest in innovative resources; last, excessive financialization encourages companies to pay more attention to short-term interests and reduce innovation behavior.

In summary, if the enterprise invests the financial assets more, it will reduce the innovation resources and weaken the innovation level. So we put forward the first research hypothesis:

H1: When other conditions remain unchanged, there is a negative correlation between the level of financialization of industrial enterprise and its innovation level.

Faced with different financing constraints, the impact of financialization on the level of innovation may be different. In the face of higher financing constraints, enterprises will tend to invest in financial assets to obtain short-term returns, thus inhibiting innovation. When the degree of financing constraints is low, the financial gains obtained will be used for innovation to alleviate the inhibition. So the second hypothesis is:

H2: The impact of corporate financialization on innovation level changes with different financing constraints. When financing constraints are strong, financialization shows a restraining effect on the level of innovation, whereas it shows a mitigating effect on the level of innovation.

4. Empirical research design
4.1. Sample selection and data source
We choose data from Shanghai-Shenzhen A-share listed industrial company in 2013-2017 as a sample. After removing data missing companies, the final sample is 3175.

4.2. Variable selection
Innovation is the explained variable, expressed by patent applications of the enterprise.
Financial is the explanatory variable, which is expressed by a dummy variable of whether or not to configure financial assets or a continuous variable of the ratio of the financial asset to the total assets. Financial assets mainly include trading financial assets, real estate investments, long-term financial equity investments, etc.

X is the control variable. We choose natural logarithm of total assets (Lnsize), asset-liability ratio (Lev), net profit margin (Roa), fixed asset intensity (Fixed), company age (Lnage), operating cash flow (CFO), loan ratio (Loan) and main business income growth (Growth) as variables. The detailed definition is shown in Table 1.

| Variable nature | Variable name | Variable description |
|-----------------|---------------|----------------------|
| Explained variable | Level of innovation | Number of patent applications (Ln Patent) |
| Explanatory variables | Financial | Dummy variable that takes a value of 1 when holding a financial asset, otherwise it takes a value of 0 |
| | Lnsize | Continuous variable: ratio of financial assets to total assets |
| | Lev | Ratio of total liabilities to total assets |
| | Fixed | Ratio of fixed assets to total assets |
| Control variable | Lnage | Use the recent year minus the company registration year plus 1 and take the logarithm |
| | CFO | Ratio of net cash flow to total assets |
| | Loan | Ratio of total borrowings to total assets |
| | Growth | Ratio of main business income growth |

### 4.3. Descriptive statistics

Table 2 shows the descriptive statistics of main variables in this paper. The maximum value of logarithm of patent applications is 7.7205 and the lowest is 0.6931, indicating that the level of innovation between enterprises is quite different. The maximum value of financialization under the continuous variable is 0.3066, the minimum value is 0, indicating that the degree of financialization of enterprises differs much. Under the dummy variable, the mean value is 0.8576, greater than 0, indicating that most companies have financial behavior.

| Variable name | N  | Mean | Median | P1    | P25   | P75   | P99   | Sd   |
|---------------|----|------|--------|-------|-------|-------|-------|------|
| Lnpatent      | 3175 | 3.8528 | 3.7842 | 0.6931 | 2.9957 | 4.6540 | 7.7205 | 1.3794 |
| Financial (Dummy variable) | 3175 | 0.8576 | 1.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.3495 |
| Financial (continuous variable) | 3175 | 0.0308 | 0.0079 | 0.0000 | 0.0010 | 0.0317 | 0.3066 | 0.0614 |
| Lnsize        | 3175 | 22.3302 | 22.0879 | 20.1336 | 21.3426 | 23.0471 | 26.8397 | 1.3849 |
| Lev           | 3175 | 1.1562 | 0.4830 | 0.0704 | 0.3084 | 0.7137 | 11.6791 | 2.3967 |
| Fixed         | 3175 | 0.2128 | 0.1838 | 0.0097 | 0.1054 | 0.2882 | 0.6576 | 0.1446 |
| Lnage         | 3175 | 3.1172 | 2.8693 | 1.6149 | 2.5721 | 3.2011 | 4.7542 | 0.8883 |
5. Empirical research and analysis of results

Due to the lag of the innovation indicators, the explanatory variables all use the data of one lag phase. Drawing on the research design of Li & Tao (2013) [6] and Liu Yunguo & Liu Wei (2007) [7], we use this model to test:

$$\text{Innovation} = \beta_0 + \beta_1 \text{Financial} + \Sigma a_i X_i + \epsilon$$

(1)

5.1. Empirical analysis

Columns 2 and 3 of Table 3 test hypothesis 1 and the results show that the regression coefficient is significantly negative, regardless of the degree of financialization represented by a dummy variable or a continuous variable. The coefficient under the dummy variable is -0.171, which shows that financial enterprises have lower levels of innovation than those who do not participate in financial institutions. The coefficient under the continuous variable is -1.623, which shows that the higher the degree of financialization of the entity, the lower the level of company innovation. Thus hypothesis 1 is proved.

Among the control variables, the operating cash flow and firm size show a significant positive correlation with corporate innovation, while other control variables are negatively correlated, which is basically consistent with the existing literature.

In order to test hypothesis 2, we construct the financing constraint indicator according to the calculation method of Hadlock & Pierce (2010) [8]. The calculation formula is:

$$\text{SA} = 0.043 \times \text{Size}^2 - 0.737 \times \text{Size} - 0.04 \times \text{Age}$$

(2)

Size is the natural logarithm of the company's total assets and Age is the company's life. The larger the index, the more serious the financing constraints the company faces. We sort by the median of the company’s SA index, the group 1 is the top 50% of companies facing lower financing constraints and group 2 is the last 50%. Then we reuse model (1) for regression analysis.

Regression results show that when under the dummy variable the financialization coefficient in group 1 is -0.122, while in group 2 is -0.266. And under the continuous variable, the financialization coefficient in group 1 is -1.378, while in group 2 is -1.968. Highly negatively correlated at 1% significance level, except group 1 under the dummy variable at 5%. This shows that the higher the degree of financing constraints of the company, the stronger the inhibition of innovation level. We can also find that the financialization coefficient’s absolute value of group 1 is lower than that of the full sample, so the inhibition is alleviated, and hypothesis 2 is proved.

| Table 3. Multiple regression analysis |
|-------------------------------------|
| | Dummy variable | Continuous variable | Dummy variable | Continuous variable |
| | Sample | Full sample | Full sample | Group 1 | Group 2 | Group 1 | Group 2 |
| Financial | -0.171*** | -1.623*** | -0.122** | -0.266*** | -1.378*** | -1.968*** |
| | (-0.0516) | (-0.293) | (-0.0543) | (-0.102) | (-0.399) | (-0.422) |
| Lnsize | 0.541*** | 0.538*** | 0.670*** | 0.520*** | 0.673*** | 0.517*** |
| | (-0.0139) | (-0.0136) | (-0.0409) | (-0.024) | (-0.0408) | (-0.0237) |
| Lev | -0.0446*** | -0.0462*** | -0.0291*** | -0.0982*** | -0.0302*** | -0.101*** |
| | (-0.00764) | (-0.00763) | (-0.0071) | (-0.0342) | -0.0071 | -0.034 |
| Fixed | -1.210*** | -1.332*** | -0.194 | -1.669*** | -0.28 | -1.818*** |
| | (-0.139) | (-0.141) | (-0.203) | (-0.195) | (-0.205) | (-0.198) |
To make the conclusions of this paper more stable, we use dividend payout ratio and asset-liability ratio to measure the difference in the degree of financing constraints faced by enterprises. Industrial company with high dividend payout ratio and asset-liability ratio is defined to have low financing constraints. The results are consistent with Table 3.

7. Analysis conclusion
This paper tests the impact of financialization on innovation, and the result is that financialization has an inhibitory effect on innovation. In addition, grouped by financing constraints, industrial enterprises with higher financing constraints have more obvious inhibitory effects. Financing is very important for industrial enterprise projects, but considering its impact on innovation, enterprises need to make trade-offs between the two. In the past, domestic study mostly used innovation input to measure engineering innovation level. But we consider patent outputs, which can enrich the research on the economic consequences of industrial enterprise financialization. One shortcoming is that this paper don’t measure the quality of enterprise innovation.

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