Neural Correlates of Behavioral Preference for Executive and Bank Risk-taking

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ABSTRACT

We examine the effect of behavioral preference of executives on bank risk-taking using the method of neural correlation. We build a brain activity causality model related to leadership behavior. We find that behavioral preference of executives is positively related to higher bank risk-taking. More specifically, banks with behavioral preference of executives tend to have higher default risk, credit risk as well as loan risk. Furthermore, we find that the relationship is especially significant among listed banks.

Introduction

Human behavior is derived from the activity of human brain (about 75% of human brain neurons are related to conscious activity). Management decisions are essentially a series of processes that human brain processes and processes information. Management decision is a system of information generated by human activities. That is, the essence of management decision is determined by brain activity, psychological activity and behavior rule of a manager, and neural activity is the source of all management decisions. In the 70s of last century, the American psychologist George Miller put forward the concept of Cognitive Neuroscience, aiming at studying the formation and mechanism of consciousness at the level of cranial nerves. In the 90s of last century, cognitive neuroscience developed rapidly with the progress of functional magnetic resonance imaging technology and event related potential (event-related potential) technology. From cognitive neuroscience level to explain people's behavior has become a new research field, has been applied to many fields of society, psychology, economy, management, the formation of new cross subjects: Neuroeconomics, Neuromarketing and Neurofinance (Qingguo *et al.*, 2006). Decision Neuroscience is mainly about the experimental research and computational simulation of brain neural system intelligent activity in the decision-making process of sociology, management, economics which has some coincidence with Neuroeconomics and Neurofinance. Through the introduction of cognitive neuroscience and the development of decision making neuroscience, we can open the black box of decision makers from a more microscopic perspective, understanding the neural mechanism behind decision making behavior, and provide objective evidence for behavioral decision theory.

This economic crisis began as a financial crisis when banks and financial institutions took huge, reckless risks in pursuit of quick profits and massive bonuses. When the dust settled, and this brings of irresponsibility was over, several of the world's oldest and largest financial institutions had collapsed or were on the verge of doing. So,

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the global financial crisis of 2008 sparked a newly thoughts of bank risk management.

Bank executives faced widespread criticism in the wake of the financial crisis. Whether and how management overconfidence affects banks risk-taking has been an important issue in the corporate finance literature. In the existing literature, the study of managers is on the basis of Neuroleadership, Waldman *et al.*, (Waldman and Peterson 2011) described the model of brain activity causality related to leadership behavior. The human brain has the relative stability and durability, so we can in the resting state (non system thinking) through the assessment of domestic human brains and nervous system structure. In order to infer the leadership traits and the possible the role of individual organization. The neural differences between the transformational and non-transformational leaders are mainly concentrated in the prefrontal and temporal regions of the brain. With the personal vision of leadership in the right frontal areas have a social communication vision of the leader of the brain that has a higher consistency, and followers more recognition of the leader's vision of social charisma (Waldman *et al.*, 2011). The specific emotional stimuli and behavior (such as jealousy) can cause brain activation (Joseph *et al.*, 2008) external stimulus reaction in the brain. When the followers of memories harmonious leadership, activates the brain area and the social network and positive emotions associated, and memories are not harmonious leadership will activate and escape, distraction, and heart weakened and negative emotions related brain regions (Senior *et al.*, 2012).

The introduction of the influence of the brain to management research is the historical requirement and inevitable result of technological development and management progress. As White asserted, "ignoring human brain's scientific research is like breaking away from the sun to explore the solar system." Human behavior comes from the decision of the human brain (Ma and Wang, 2006), and twenty-first Century is the age of neuroscience. However, the research on the educational background and educational background of the management needs to be further studied.

Above studies examined the relation between behavioral preference of executives and corporate decisions. In other words, even though acting in the interests of shareholders, behavioral preference of executives have higher investment: they tend to over-invest when there is sufficient internal capital and under-invest if there is a shortage of internal funds. In the traditional corporate finance literature, the misalignment of managerial and shareholders' interests could be one explanation for investment distortions (Jensen and Meckling, 1979). The agency view argues that managers of a firm may over-invest for the purpose of private benefits. An open question is how the interaction of behavioral preference of executives may affect the bank risk-taking. It is likely that the severity of overconfidence may affect the relative strength of bank risk-tanking. Specifically, the misalignment of managerial may change the effect of personal characteristics of managers on investment decisions. In this paper, we empirically investigate this issue using the Individual characteristic variable from the thirty-one Chinese banks during the period 2007 to 2015.

The main goal of China's financial reforms has been to make its banks more commercially driven in their operations. However, China's central government continues to wield significant influence over the operations of many Chinese banks, primarily through the activities of the People's Bank of China (PBOC), the China Banking Regulatory Commission (CBRC), and the Ministry of Finance (MOF). In addition, local government officials often attempt to influence the operations of Chinese banks. The executives are selected under heavy influence of the respective local government. Their career changes and promotions are largely dominated by their parent company or controlling state entities including the party regime. Thus, executives of banks often pursue politically motivated goals. Thus Chinese banks provide an experimental data to study the impact management overconfidence on bank risk-taking. Such advantage does not exist in developed countries, where there is the relatively homogeneous market for bank control and hence no systemic variation in bank problem.

Despite this large literature, economists have given much less consideration to the demographic characteristics of executives affect bank risk-taking. In this paper, we adopt measures of behavioral preference of executives for Chinese banks based on demographic characteristics. Exploiting a unique dataset, we investigate how age, gender, educational, background, experience and year composition of executive teams affect the bank risk-taking. And

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then, we built the OC variable to measure overconfident executives. We test whether there is any difference (and to what degree) in the bank risk-taking and behavioral preference of executives. We further examine the difference in bank risk-taking between listed banks and unlisted banks.

In this paper, we adopt the individual characteristic variable as the substitution variables, such as the executives' age, gender, education degree, education background, working experience and working years. We test whether there is any difference (and to what degree) in the bank risk with overconfident executives. We further examine the difference in risk-taking between listed banks and unlisted banks. We also build an aggregate variable OC to define the executive overconfidence and inspect the relationship between executive overconfidence and bank risk-taking. Using Chinese banks data during the period 2007 to 2015, we confirm that behavioral preference of executives increases the likelihood of bank risk-taking, particularly in listed banks. A breakdown of the sample into listed and unlisted banks shows an interesting pattern: behavioral preference of executives leads to increase bank risk-taking and listed banks have risk-taking greater than unlisted banks. Our results, therefore, suggest that the positive effect of behavioral preference of executives on bank risk-taking.

The remainder of the paper is organized as follows. Section 2 presents a brief introduction to the Chinese banking sector. Section 3 develops hypotheses about the effects of the demographic characteristics of banks' executive on risk-taking. Section 4 introduces our dataset, including descriptive statistics about the management teams over time. Our econometric approach is discussed in Section 5. We report on robustness checks in Section 6. Concluding remarks are presented in Section 7.

China's banking sector

Prior to the beginning of China's economic reform in 1978, the Chinese banking system was largely government-owned and isolated from the global economy. China's banks were generally subservient to the requirements of China's centrally planned economy. A gradual process of change has created a banking system in China with multiple categories of institutions and agencies, operating in separated markets with generally clearly delineated functions. One of the main objectives of China's banking reform has been to create incentives for its financial institutions and agencies is usually limited to those performing similar functions, but cross function rivalries do exist. However, China's banks have not been granted complete autonomy, and are frequently to comply with government directives with serious implications for their profitability and in some cases, their solvency. Several categories of banks are operating in China with different ownership structures and serving different functions. The first category includes wholly state-owned banks. The second category consists of "five largest "commercial banks—banks that were previously wholly state-owned, but were transformed into joint-stock companies, in which the Chinese central government is usually the largest stockholder. The third category encompasses a variety of local banks which is commonly known as "city commercial banks", with the provincial or municipal government as major stockholders. A fourth category is composed of Chinese joint-stock commercial banks that were created after the start of China's banking reforms and with comparatively low levels of government ownership. In addition to the legal banks, China also has an unknown number of illegal banking operations, or "underground banks," that accept deposits and offer loans to individual and businesses. Although the Chinese banking system contains a variety of types of banks, its market is dominated by the five largest banks (see Tab.1). Just under half of the total assets in China's banking sector are owned by these five banks—providing each bank with a significant share of the overall market. The 12 joint-stock commercial banks are the second largest group, with 15.6% of the market, which gives each of the 12 banks a small, but notable portion of the market. The 147 city commercial banks have 8.2% of banking assets. Except in some of China's more economically advanced cities, these banks play a minor role in the national financial markets. The over 3,300 rural financial institutions have the third largest share of the market (11.2%), but the holding of each individual institution is extremely small. Table 1 shows the Market Share of Types of Banks in China.

All of China's banks share a common system, involving senior bank officers, a board of director, and a board of supervisors. The senior bank officers are members of the Chinese Communist Party (CCP) and are appointed by the

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Table 1. Market Share of Types of Banks in China

Type of Bank	Asset Value (trillion yuan)	Market Share (%)	Number
Policy Banks	7.652	8.0	3
Five largest Banks	46.894	49.2	5
Joint-stock Commercial Banks	14.904	15.6	12
City Commercial Banks	7.853	8.2	147
Rural Commercial Banks, Rural Cooperative Banks, and Rural Credit Cooperatives	10.658	11.2	330
Foreign Banks	1.742	1.8	40
Other	5.602	5.9	?

CCP. The officers are also assigned ranks in the Chinese government's hierarchy, ranging from the equivalent of a bureau chief to a vice-minister. The professional careers of the senior bank officers are determined by the CCP and may involve moving into positions within the Party, the central or local governments, or other banks depending on the officer's performance. For example, in November 2011, Wang Hongzhan, previously People's Bank of China's (PBOC's) deputy governor was appointed as CCB's chairman and Party secretary, replacing Guo Shuqing, who was appointed the chairman of the China Securities Regulatory Commission. So, the executives of the China's banks are selected under heavy influence of the respective local government. Their career changes and promotions are largely dominated by their parent company or controlling state entities including the party regime. Thus, the executives of China's banks often pursue politically motivated goals.

Hypothesis development

In this section, we develop our hypotheses. The starting point for our research is the consideration that executive influences bank decision making. Both characteristics of individual executives and management team heterogeneity are important determinants of board behavior. The idea finds support in the work by Berger *et al*., (2015), who find that characteristics and preferences are a significant importance for board decisions and firm outcomes. Consequently, we anticipate being able to document that bank's risk-taking is affected by the management team.

Corporate governance research has devoted tremendous effort to studying the roles of the board of directors in recent years, and a vast body of literature discusses the composition of the board of directors specifically. Adams *et al*., (2010) provide an extensive review of the literature on the role of boards of directors in corporate governance. Regulatory attempts to increase outside director representation on the

corporate board to increase board independence, such as the Sarbanes-Oxley Act in the U.S. and the Cadbury report in the U.K. with the intention to appoint directors with greater monitoring incentives, sparked a large volume of academic research on the effect of outside directors on firm outcomes. However, the evidence for a beneficial effect of outsiders on performance has remained far from convincing so far. These studies focus on board independence in terms of inside and outside director, how this composition affects CEO turnover, CEO succession in family firms, the determinants of board size, the link between ownership structure and board composition, and the effects of outside directors on performance. Another group of studies board diversity in terms of demographic characteristics to risk-taking, firms' organizational structure, and acquisition strategies, CEO incentive.

The existing research has not reached an agreement regarding whether the executive overconfidence has positive or negative effect on the company risk; some studies have shown that the overconfidence executives will cause low efficiency for the company investment decision, and damage the interests of the company, while some hold that the overconfident executives play an important role in decision-making, gain high investment return, and effectively alleviate the agency problem (Jensen *et al.,* 1979).

We believe that executive overconfidence has a higher evaluation for their own capabilities, can effectively alleviate the agency issues, and better grasp the investment opportunities, more willing to take more risks. Hackbarth (2009) found through the theoretical analysis and model derivation that the behavioral preference of executives can weaken the problem of insufficient investment caused by the risk aversion, and behavioral preference of executives will bear more risk for the company. The behavioral preference of executives are more confident in their knowledge, experience, and ability. So they are more confident when choosing the investment projects, and prefer the higher-risk project , and

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there is even "hard effect" (Griffin *et al.,* 1992), and they like to face the difficulty. Overconfidence can motivate managers to take on more risk in the investment decision-making, so as to effectively alleviate the agency problem (Jensen *et al.*, 1979, Heaton *et al.*, 2002). Chen *et al.*, (2008) studied the influence mechanism of overconfidence on principal-agency relation, and found that under the appropriate principal-agent contract, the overconfident agent was helpful to improve the traditional principal-agent conflict, promote managers to work harder, reduce the moral hazard of agent, decrease the principal supervision strength, and lower the monitoring cost. At the same time, the behavioral preference of executives are more optimistic about the investment environment, and behavioral preference of executives always think that their ability is higher than average, and tend to overestimate the benefits and underestimate the risk (Phillips *et al.*, 1981; Shefrin *et al.*, 1985). Based on this, we put forward the following hypothesis:

Hypothesis 1: with other conditions unchanged, the bank with overconfident executives can bear the higher risk.

The bank governance is different from ordinary corporate governance. The bank management has many goals. This is considered a hot issue China's banking outshines and the steady development becomes the current international financial crisis. Due to the limited information disclosure of commercial banks and insufficient data for large-scale research, the internal governance of commercial banks becomes particularly important; therefore, the personnel management should be loyal to ownership management. In China's current economic situation, there are not many listed commercial banks. The listing threshold is higher, and the listing can cause more market constraints to the bank, and make the banks larger and well-funded with risk diversification. The enhanced information disclosure and supervision make the executives be more cautious about the risk-taking behavior, but the listed banks have larger space on the scale, mergers, management of equity capital and regulatory capital requirements. The benefit of listing for the bank financing convenience, scale extension and project investment make executives fully display their own knowledge, experience and ability, increase the banks' earnings, lower executives worry for "financial stability", so as to raise the bank default risk. Based on this, we put forward the following hypothesis:

Hypothesis 2: many benefits due to the listing (scale expanding, risk diversification and abundant capital, etc.) will encourage executives to improve the bank risk-taking behaviour.

Sample selection and construction of variables
Sample
Starting from the entire banks in China, we first remove all banks from the sample that were subject to regulate by wholly state-owned banks. Next, we split our sample that was not full disclosed the executive information. Our sample covers the Chinese 31 banks during the period 2007 to 2015, which includes 5 five largest banks, 12 joint-stock commercial banks and 14 cities commercial bank, 230 observations. Most of the banking data were hand collected. The executive refers to those released in the annual reports of the commercial bank, including the vice president, senior executives, members of the board of directors and members of the board of supervisors. We also use GMM dynamic panel estimation method to empirically test the influence of executive overconfidence on bank risk-taking. Considering there are few banks are listed as well as less executive information before 2007, we exclude the relatively data that are exist after Dec. 31, 2006. We obtain data from the China Stock Market Trading Database (CSMAR), BankScope database, and the macroeconomic data is obtained from the statistical bulletin and the website of PBOC.

Construction of variables
(1) Model description
We run sets of regressions using an unbalanced panel data and examine the effect of behavioral preference of executives on bank risk-taking. The regressions include one-year lag of dependent variable. Besides, independent variables are also lagged by one year. Our basic model follows:

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$$RISK_{it} = \alpha_0 + \alpha_1 RISK_{i,t-1} + \beta_1 OC_{i,t-1} + \beta_2 X_{i,t-1} + \sum_{i=14}^{18} \beta_i yr_i + \varepsilon_{i,t-1} \tag{1}$$

$$RISK_{it} = \alpha_0 + \alpha_1 RISK_{i,t-1} + \beta_1 OC_{i,t-1} + \beta_3 LIST*OC_{i,t-1} + \beta_4 X_{i,t-1} + \sum_{i=14}^{18} \beta_i yr_i + \varepsilon_{i,t-1} \qquad (2)$$

Where i denotes bank i, and t denotes time (year). The dependent variable is defined as bank risk-taking OC is denoted as the executive overconfidence. X is a vector of multiple control variables which includes at least one of the following: Size, Members, CAR, Block, GGDP, List. We adopt GMM because there are LIST and IMPLICIT variables that do not change with time. In addition, we use the two-step estimation method, which is, using the residual obtained in the first stage to build the variance-covariance matrix and then estimate the model. We further conduct the over-identifying test and interference serial correlation test.

(2) Dependent variable
In view of the date availability and financial conditions for China's banks, we construct seven proxies for banks risk-taking in our paper. They are Z-score, Shareholder-equity Ratio (LEV), Bad Loan Ratio (NPLR)), Non-performing Loan Ratio (NLR), Provision Coverage Ratio (PCR), ISCR and OSCR. With the development of banking business in our country, the credit risk has attracted more and more attention. We select the in-balance-sheet credit exposure and off-balance-sheet credit exposure to measure the credit risk of in-balance-sheet and off-balance-sheet business. The in-balance-sheet credit exposure = total maximum in-balance-sheet credit exposure / total assets, and the off-balance-sheet credit exposure = total maximum credit risk exposure/total assets. The larger the in-balance-sheet and off-balance-sheet exposure are, the greater risk the banks will bear.

The Z-score and the LEV proxy for default risk. The NPLR, the NLR and PCR proxy for loan risk. The ISCR and the OSCR proxy for credit risk. Tab.2 shows on a construction of these (and all other) variables.

(3) Independent variable
OC proxies for executive overconfidence. There are a number of ways to measure behavioral preference of executives. Past studies have used CEO ownership of company's options, media coverage, biases between manager forecasted earnings and actual earnings, Frequencies of M&A initiated by CEO (Doukas *et al.*, 2007), CEO's relative salaries (Brown *et al.*, 2007), executive's Individual characteristics (Taylor, 1975; Schrand

et al., 2012), consumer sentiment index (Oliver, 2005) and firm's current performance .

The above proxy variables have certain subjectivity for executive overconfidence, but so far there are no better proxy variables. In other words, this does not mean that all substitution variables are suitable to be proxy variables of banking executive overconfidence. Even have some great defects, e.g. China's listed companies began to implement the stock option in recent years, and the shareholding and stock option only account for a small part of the executive compensation. And China's media's reports have strong subjectivity. The enterprise prospect index and merger frequency of CEO are more suitable to measure manager optimism rather than manager overconfidence. The earnings forecast of listed company is greatly affected by the external economy and signal transmission, and other internal factors. Therefore, we combine the actual situation of China's banking on the basis of referring to the existing research at home and abroad and mainly adopts the executive's individual characteristics as the substitution variable of executive overconfidence. In the robustness test, we also use the relative proportion of executive compensation to measure overconfidence.

We focus on the executive individual characteristics as follows: (a) AGED. The older executives, compared to the younger executives, tend to avoid risk, and older executives will be more cautious due to experience in judgment (Taylor, 1975; Forbes, 2005; Jiang, 2010 and 2011; Yu *et al.*, 2013). If the executive's age is smaller than the sample mean, AGED is 1; otherwise, it is 0. (b) GENDER. Although executives have the tendency of overconfidence, female executives are more cautious and conservative (Byrness *et al.*, 1999; Faccio *et al.*, 2011 and 2015). If male executives account for more than the sample mean, GENDER is 1; otherwise, it is 0. (c) EDUCATION. The executives with higher education level are more confident about their abilities (Schrand and Zechman, 2012). If the number of executives who accept the master education is more than the sample means, EDUCATION is 1, otherwise, it is 0. (d) BACKGROUND. Executives have different education and different confidence. Those with the education background of business

administration will have enhanced awareness due to its own financial knowledge, and will be more cautious in decision-making (Malmendier and Tate, 2005a). If the number of executives with the education background of business administration is smaller than the sample mean, BACKGROUND is 1; otherwise, it is 0. (e) EXPERIENCE. Executives work in many financial institutions with rich work experience and financial decision ability, and they are more confident about its own decisions. If the number of those executives who work in many financial institutions is more than the sample mean, EXPERIENCE is 1; otherwise, it is 0. (f) YEAR. The working years of executives in the banking industry make them possess rich risk knowledge and experience, and know the dangers of high risk for financial institutions and their

career; therefore, they tend to be cautious, in order to cope with the financial crisis for financial institutions (Frank 1935, Forbes 2005). If the working year of executives in the banking industry is less than the sample mean, it is 1; otherwise, it is 0. Table 2 shows on the construction of these (and all other) variables.

Given that the Individual feature information has difference and one-sidedness, we further build the aggregate variable OC to define the executive overconfidence. Calculate the total value of the above six characteristics of executives, if the value is 5 or 6, in other words, it possesses any of these five or more features, the executive is overconfident, OC is 1, otherwise, it is 0. According to the hypothesis, the OC coefficient is positive.

Table 2. Variable Definitions

Dependent Variable (proxies for bank risk-taking)	
Z	standard deviation of return on assets/ (return on assets + shareholders' equity/total assets)
LEV	shareholders' equity /total assets
NPLR	Non-performing loans /total loan
NLR	(client loan advances - loan depreciation reserves) /total assets
PCR	The balance of loan depreciation reserves / Non-performing loans
ISCR	total maximum in-balance-sheet credit exposure / total assets
OSCR	off-balance-sheet credit exposure/total assets
Independent Variable (proxies for behavioral preference of executives)	
OC	1 if the executive meets the under variable of at least 5 or 6, 0 otherwise
AGE	1 if AGE is lower than the sample mean, 0 otherwise
GENDER	1 if GENDER is greater than the sample mean, 0 otherwise
EDUCATION	1 if EDUCATION is greater than the sample mean, 0 otherwise
BACKGROUND	1 if BANCKGROUD is lower than the sample mean, 0 otherwise
EXPERIENCE	1 if EXPERIENCE is greater than the sample mean, 0 otherwise
YEAR	1 if YEAR is greater than the sample mean, 0 otherwise
Control Variable	
SIZE	Ln (total assets)
MEMBER	Ln (the number of director on the board)
CAR	Capital adequacy ratio
BLOCK	1 if the registered shareholder's ownership of up 25% and 0 otherwise
GGDP	(Nominal GDP this year- Nominal GDP last year) / Nominal GDP last year
LIST	1 if the banks are listed banks and 0 otherwise

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Table 3. Summary statistics

Variable	Mean	Median	Standard deviation	Min	Max	N
Z	0.0265	0.0234	0.0144	0.0029	0.0943	230
LEV	6.0947	5.9104	1.6254	2.2406	16.0318	230
NPLR	1.1671	0.9900	0.7031	0.3300	5.6200	230
NLR	47.5307	48.0122	7.6961	16.0132	61.312	230
PCR	245.2149	229.200	102.4053	48.2900	537.70	230
ISCR	93.3742	97.8038	8.9035	52.0192	100	218
OSCR	23.2349	20.725	17.3417	0	123.5821	218
OC	0.0652	0	0.2474	0	1	230
SIZE	13.4022	13.4017	1.7735	9.6594	16.8413	230
MEMBER	3.3426	3.3673	0.1856	2.3979	3.8918	230
CAR	12.4648	12.0600	3.0040	5.7700	38.0900	230
BLOCK	0.5870	1	0.4935	0	1	230
GGDP	13.9715	12.5527	5.6752	3.279	33.9263	230
LIST	0.6435	1	0.4800	0	1	230

Table 4. Correlation matrix

	AGE	GENDER	EDUCATION	BACKGROUND	EXPERIENCE	YEAR
AGE		0.1301	0.2296	0.1660**	0.1699*	0.5773***
GENDER	0.0123		0.1289*	-0.1688**	0.0754	0.0681
EDUCATION	0.0389	0.0041		0.1576**	0.228***	0.1194*
BACKGROUND	0.1568**	-0.1074	0.1443**		0.2486***	0.3111***
EXPERIENCE	0.0615	-0.0291	0.1691**	0.2095***		0.1632**
YEAR	0.2651***	0.0154	0.1416**	0.3038***	0.0623	

(4) Control variable

We construct X proxies for behavioral preference of executives as a control variable , we select some factors that influence the bank risk-taking behavior proved by the previous scholars through research. And we take the influence factors in different levels into account (including basic operating conditions, the characteristics of the board and management, institutional constraints, market constraints): (1) SIZE. Use the logarithm of total assets to measure the bank size (Boyd *et al*., 2009; Song *et al*., 2011). (2) MEMBERS. Use the logarithm of the total number of executives in the annual report to measure the members. (3) CAR. Use the CAR released in the annual report. (4) BLOCK. Use the shareholding ratio of all registered shareholders (including the direct holding and indirect holding), and if there is no registered shareholder who holds more than 25%, the value is 1; otherwise, it is 0. (5) GGDP. GGDP this year-GGDP last year/GGDP last year (Louzis *et al*., 2012; Xu *et al.,* 2012). Table 2 shows on the construction of these (and all other) variables.

(5) Descriptive statistics

Table 3 shows summary of descriptive statistics for all variables in regression analyses. The dependent variable, independent variable and control variable are reported. We conduct the statistical test in the difference in maximum, minimum, mean (t-test), median and standard deviation of all variables. The "Z" and "LEV" are measured by fault risk. The "Z" is greater than 0 and has not abnormal. The "NPLR", "NLR" and "PCR" are measured by loan risk. The minimum of NPLR is 0.33, the maximum of NPLR is 5.6200, which indicates that the quality of assets is different among different banks. The minimum of PCR is 48.29, the maximum is 537.70, and the mean is 245.2149. The index is testing whether the bank's finance is stable and the risk is controllable. The best ratio status of PCR is 100%. However, considering of more cautious demand, the CBRC requires reaching 150%. The "ISCR" and "OSCR" are measured by credit risk.

(6) Correlation analysis

Table 4 shows correlation matrix of variables. Both Spearman test and Pearson test are significantly positively correlated with EXPERIENCE, EDUCATION, and BACKGROUND, suggesting that the most bank executives have the background of administration. YEAR and AGE, EDUCATION and EXPERIENCE are significantly positively correlated with each other. There is no EXPERIENCE are significantly positively correlated with each other. There is no inconsistent correlation in the test, suggesting that the two variables are good substitute proxy for behavioral preference of executives.

Empirical results

We conducted logistic regression to investigate whether the behavioral preference of executives increases the likelihood of investment. The dependent variable is indicator variable bank risk-taking. Independent variables include measures for behavioral preference of executives, the interaction of overconfidence with bank risk-taking, and control variables for bank characteristic. We divide the banks' risk into three groups according to the banks' risks facing the economy. The "Z" and "LEV" are measured by fault risk. The "NPLR", "NLR" and "PCR" are measured by loan risk. The "ISCR" and "OSCR" are measure by credit risk. We run the logistic regression for the each personal characteristics sample respectively. Other control variables include "SIZE", "MEMBERS ", "CAR", "BLOCK", "GGDP" and "LIST " , as defined in the previous section.

Table 5 shows the results of the logistic regression. We test the relationship between executive overconfidence and bank risk-taking without considering whether the banks are listed. The proxy for overconfidence is each personal characteristics to the model. The result is showed as follows:

Table 5. Logistic regression of behavioral preference of executives and banks risk-taking

	Default Risk (1)		Loan Risk (2)			Credit Risk (3)	
	Z	LEV	NPLR	NLR	PCR	ISCR	OSCR
L(RISK)	-0.3167***	0.0354	-0.0912*	-0.0597	0.0682	-0.0755	-0.2698***
	(-6.03)	(0.95)	(-1.83)	(-1.07)	(1.01)	(-1.18)	(-4.08)
AGE	0.0007***	0.0152	-0.0103*	0.2980***	-0.9960	0.2785*	0.5863**
	(3.72)	(1.27)	(-1.72)	(3.08)	(-0.93)	(1.90)	(2.05)
GENDER	-0.0004	-0.0636**	-0.0144	0.1513	-1.3560	0.2054	0.1114
	(-0.87)	(-2.08)	(-0.95)	(0.56)	(-0.46)	(0.62)	(0.17)
EDUCATION	0.0027	0.3295	0.3459*	-3.0898	-31.1184	1.1545	37.1387***
	(0.40)	(0.71)	(1.70)	(-0.83)	(-0.76)	(0.23)	(3.42)
BACKGROUND	-0.0109*	0.7277*	0.0125	-6.6630*	-107.6662***	-26.8681***	-8.8951
	(-1.76)	(1.66)	(0.06)	(-1.94)	(-2.65)	(-6.22)	(-0.98)
EXPERIENCE	0.0048	-0.3186	0.2068*	0.7487	-45.7355**	1.8029	6.7181
	(1.26)	(-1.31)	(1.81)	(0.38)	(-2.16)	(0.76)	(1.31)
YEARW	-0.0014***	0.0602**	-0.0281**	-0.1025	5.1394*	0.4394	-0.8289
	(-3.38)	(2.19)	(-2.14)	(-0.43)	(1.94)	(1.35)	(-1.23)
SIZE	-0.0002	-0.2450***	0.1951***	0.7854	-2.2398	1.5202**	-1.5792
	(-0.18)	(-4.30)	(7.50)	(1.59)	(-0.41)	(2.17)	(-1.15)
MEMBERS	-0.0095	0.4472	-1.1712***	8.7758***	99.6535***	-1.9726	-15.5692*
	(-1.64)	(1.18)	(-6.47)	(2.63)	(2.62)	(-0.44)	(-1.71)
CAR	-0.0018***	0.4602***	0.0209	-0.7749***	0.0595	-0.0751	-0.3171
	(-3.76)	(14.21)	(1.35)	(-2.77)	(0.02)	(-0.20)	(-0.41)
BLOCK	0.0008	-0.2494**	-0.0834	-2.0525**	27.7778**	-0.5687	-6.5198**
	(0.46)	(-2.14)	(-1.45)	(-2.05)	(2.48)	(-0.41)	(-2.38)
GGDP	-0.0001	0.0259	-0.0123	-0.2200	10.0869***	1.2312***	-0.6441
	(-0.20)	(1.08)	(-1.11)	(-1.06)	(4.34)	(5.00)	(-1.25)
LIST	0.0085***	0.3013*	-0.3768***	-3.4220**	-4.1607	2.4507	-0.8545
	(3.24)	(1.76)	(-4.56)	(-2.37)	(-0.25)	(1.28)	(-0.24)
_cons	0.1490***	-0.6762	4.9343***	24.8505*	-380.0535**	32.1957*	35.9002
	(6.24)	(-0.41)	(6.47)	(1.71)	(-2.34)	(1.67)	(0.92)
adj. R2							
F							
N	209	209	209	209	209	185	185

The coefficient of "AGE" is positive and significant in the regression for "Z" "NLR " "ISCR" and "OSCR". This suggests that the young executives who have a higher level of overconfidence than older executives. The result holds for young executives are more likely to choose with higher risk in order to obtain high income. These results are consistent with previous studies such as Berger *et al.,* who demonstrate that younger executive teams increase portfolio risk.

The coefficient of "GENDER" is negative and significant in the regression for "LEV", suggesting that male executives have a higher level of default risk than female executives. These results are consistent with previous studies such as (Faccio, Marchica *et al.*, 2011), who document that firms run by female CEOs have lower leverage, less volatile earning, and a higher chance of survival than firms run by male CEOs. However, the results show that the coefficient of the interaction term is significantly negative only for "LEV". It is not significant for the other risk, which means that the influence factors are not absolute for gender.

The coefficient of "EDUCATION" is positive and significant in the regression for the "OSCR". This suggests that the higher educational attainment increases Individual s' propensity to take the risk in financial decisions, especially the Off-Balance Sheet Activities with higher risk and yield. These results are consistent with previous studies that higher education increases participation in stock market investments.

The coefficient of "BACKGROUND" is negative and significant in the regression for the "Z" and "ISCR", while positive and significance in the regression for the "LEV". These results show that the higher background reduces behavioral preference of executives to take the lower risk, suggesting that the executives who have professional knowledge will stronger risk consciousness and choose lower risk projects.

Table 6. Logistic regression of behavioral preference of executives and banks risk-taking

	Default Risk (1)		Loan Risk (2)			Credit Risk (3)	
	Z	LEV	NPLR	NLR	PCR	ISCR	OSCR
L(RISK)	-0.3144***	0.0191	-0.0910**	-0.0491	0.0356	-0.0683	-0.2522***
	(-6.05)	(0.52)	(-1.99)	(-0.91)	(0.56)	(-1.05)	(-3.95)
OC	0.0106***	-0.4488**	0.3818***	1.3940	-56.4873***	4.6889**	12.4983***
	(3.50)	(-2.29)	(4.05)	(0.91)	(-3.20)	(2.19)	(3.24)
SIZE	-0.0023***	-0.1446***	0.1818***	0.4726	0.5792	2.1205***	-1.0462
	(-3.50)	(-3.45)	(8.94)	(1.28)	(0.14)	(3.88)	(-1.06)
MEMBERS	0.0002	0.1088	-0.8634***	10.5462***	52.7725*	-1.1225	-0.0871
	(0.05)	(0.33)	(-5.86)	(3.77)	(1.67)	(-0.28)	(-0.01)
CAR	-0.0018***	0.4559***	0.0229	-0.6972***	0.1329	-0.0924	-1.0340
	(-3.79)	(14.80)	(1.57)	(-2.62)	(0.04)	(-0.24)	(-1.45)
BLOCK	0.0020	-0.3029***	-0.0726	-1.9024*	34.9037***	1.0435	-7.2734***
	(1.24)	(-2.72)	(-1.36)	(-1.95)	(3.28)	(0.73)	(-2.79)
GGDP	0.0001	0.0322	-0.0044	-0.3252	8.3071***	1.2300***	-0.4513
	(0.38)	(1.36)	(-0.41)	(-1.59)	(3.77)	(4.72)	(-0.88)
LIST	0.0104***	0.2438	-0.3694***	-3.8246***	-8.6585	1.7159	0.8056
	(4.04)	(1.51)	(-4.76)	(-2.75)	(-0.55)	(0.88)	(0.23)
_cons	0.0846***	1.3355	3.1101***	35.6675***	-274.9063*	37.1310*	20.3483
	(3.74)	(0.85)	(4.95)	(2.60)	(-1.92)	(1.87)	(0.55)
adj. R2							
F							
N	209	209	209	209	209	185	185

Table 7. Logistic regression of behavioral preference of executives and banks risk-taking

	Default Risk (1)		Loan Risk (2)			Credit Risk (3)	
	Z	LEV	NPLR	NLR	PCR	ISCR	OSCR
L(RISK)	-0.3161***	0.0171	-0.0868*	-0.0493	0.0233	-0.0655	-0.2386***
	(-6.07)	(0.47)	(-1.89)	(-0.91)	(0.36)	(-0.98)	(-3.88)
OC	0.0148***	0.0094	0.7330***	1.2290	-90.9246***	5.1331	29.4609***
	(3.61)	(0.04)	(5.46)	(0.58)	(-3.68)	(1.60)	(5.68)
LIST	0.0118***	0.4073**	-0.2638***	-3.8812***	-20.4126	1.8569	6.5549*
	(4.31)	(2.37)	(-3.18)	(-2.61)	(-1.21)	(0.88)	(1.83)
OC*LIST	0.0089	-0.8994**	0.6708***	0.3486	-69.3536**	-0.7513	-33.3602***
	(1.52)	(-2.48)	(-3.68)	(0.11)	(2.01)	(-0.19)	(-4.68)
SIZE	-0.0025***	-0.1752***	0.1610***	0.4836	2.4825	2.1007***	-1.9847**
	(-3.75)	(-4.07)	(7.63)	(1.26)	(0.58)	(3.76)	(-2.03)
MEMBERS	0.0001	0.1442	-0.8398***	10.5218***	53.6206*	-1.0203	2.3558
	(0.03)	(0.45)	(-5.69)	(3.74)	(1.69)	(-0.26)	(0.31)
CAR	-0.0019***	0.4528***	0.0170	-0.6935***	0.7855	-0.0988	-1.1190
	(-3.91)	(14.95)	(1.16)	(-2.58)	(0.25)	(-0.26)	(-1.63)
BLOCK	0.0018	-0.3298***	-0.0921*	-1.8944*	36.9235***	1.0520	-8.4806***
	(1.10)	(-2.99)	(-1.72)	(-1.93)	(3.43)	(0.73)	(-3.35)
GGDP	0.0002	0.0338	-0.0031	-0.3265	8.1567***	1.2313***	-0.3248
	(0.44)	(1.45)	(-0.29)	(-1.59)	(3.69)	(4.70)	(-0.66)
_cons	0.0868***	1.1817	3.2854***	35.7289***	-319.4042**	36.7400*	21.7299
	(3.82)	(0.77)	(5.21)	(2.60)	(-2.19)	(1.83)	(0.60)
adj. R2							
F							
N	209	209	209	209	209	185	185

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"EXPERIENCE " is not significant for the "Z " , "LEV " , "ISCR " and "OSCR " . Once again, the coefficients of the interaction of overconfidence with "PCR " is only significantly negative for the banks, suggesting that the executives who worked for many types of financial institutions increase the likelihood of default risk and credit risk and lower the likelihood of loan risk. In China, the executives of banks are selected under heavy influence of the respective local government. Their career changes and promotions are largely dominated by their parent company or controlling state entities including the party regime. Thus, the executives of banks often pursue politically motivated goals. As a result, in order to get better promotion and improve performance, the banks' executives use their experience and social networks in different areas to carry out the risk business.

The coefficient of "YEAR" is negative and significant in the regression for the "Z", "NPLR" and "OSCR", while positive and significant in the regression for the "LEV". They suggest that the executives of longer working years who have a lower level of overconfidence than those shorter working years. This result means that overconfident executives are less likely to default risk, loan risk, and credit risk. Because that the credit risk and loan risk is directly monitored by supervision department, in order to maintain the reputation and less promotion possibility, the older executives may choose to maintain lower credit risk and loan risk and achieve safe investment.

Table 6 shows the results of the logistic regression. We test the relationship between executive overconfidence and bank risk-taking without considering whether the banks are listed. The proxy for overconfidence is OC to the model. The coefficient of "OC" is negative and significant in the regression for the "LEV" and "PCR", while it is positive significant for "Z", "NPLR", "NLR", "ISCR" and "OSCR". This suggests that overconfidence executives who tend to choose a higher sensitivity of investment strategy. The result holds for overconfidence measures, which means that overconfident executives are more likely to over-invest and have a higher lever risk-taking.

Table 7 shows the results of the between executive overconfidence and bank risk-taking with considering whether the banks are listed. The proxy for overconfidence is OC to the model. We use "OC*LIST" as the proxy for executives' confidence who are list banks. The coefficient of the interaction of overconfidence positive for "Z" and "NPLR", while it's significantly negative for "LEV", "PCR" and "OSCR". Comparing the listed banks and the unlisted banks shows that the coefficient of the interaction term "OC*LIST" is significantly positive only for the listed banks. It is not significant for the unlisted banks. In general, the listed banks in China face more effective stock ownership incentive and shareholders' supervision. Therefore, behavioral preference of executives causes more distortion in investment decision in these banks.

Robustness test

In order to ensure the effectiveness of the model to estimate the results, we also conduct a number of robustness tests.

First, measure the substitution of executive overconfidence index. This paper refers to Hayward and Hambrick (1997), Jiang (2009) to determine whether the executives are overconfident; given that the number of executives are different, we choose to use the annual report to the public of the executives of the top five statistical analysis as the bank's executive representative (the top five executives have important status in the senior management, also facilitate the comparison between banks), the "total compensation of top five executive/total compensation of all executives" to measure whether the executive is overconfident; the higher index value suggests that executives are more confident.

Second, measure the substitute of a proxy variable of bank risk-taking. Replace the regression result of the model (1) under variable with. Under the influence of control variables, analyze the one term and quadratic term natural logarithm of executive compensation, and the empirical test results have no substantial change. Third, when testing the relationship between the executive overconfidence and bank risk-taking, take the single feature to measure the executive overconfidence as the explanatory variables and put it in the model and test, and respectively add the list test.

In a word, the empirical test results do not change due to the change of measure index after adopting different measurement indexes for bank risk-taking and executive overconfidence, indicating that the conclusion of this paper has better robustness.

Conclusions

Existing literature has documented a positive relation between behavioral preference of executives and bank risk-tanking. In this paper, we raise the question of how the composition of bank's executive team affects risk taking using the data in China during 2007-2015, with a particular focus on default risk, loan risk, and credit risk. Unlike previous papers, we take a team perspective and only focus on managers, rather than non-executive directors. Especially, we analyze six dimensions of team composition: age, gender, education, background, experience and year, and then we further build the aggregate variable OC to define the behavioral preference of executives.

We find that on average there is a significant positive relation between behavioral

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preference of executives and bank risk-taking in Chinese risk-banks. However, this positive relationship is driven by the listed banks. By contrast, this relation is not significant for the unlisted banks. These results hold after controlling for possible endogeneity problem. The result is also robust to alternative measures of overconfidence and bank taking. Analysis indicates that listed banks exhibit significantly greater than unlisted banks.

Overall, our results suggest a significant impact on the relation between behavioral preference of executives and bank risk-taking. In general, the listed banks in China face more effective stock ownership incentive and shareholders' supervision. Therefore, behavioral preference of executives causes more distortion in investment decision in these banks. Our evidence implies that the investment distortion caused by behavioral preference of executives behavior can be alleviated through elevated supervision.

Acknowledgement

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