

A research on the Evaluation of China's Listed Commercial Banks' Innovation in Service

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Abstract

Innovation in service has become a new hotspot of innovation research and service management research at the end of the twentieth century and the early twenty-first century, of which evaluation on innovation in service is an important topic in these fields. This study, through the investigation and research, taking Chinese listed commercial banks as an example, has established an evaluation index system of China's commercial banks' service innovation which has mainly evaluated on three aspects, i.e. innovation input, innovation output and innovation environment. The Analytic Hierarchy Process is introduced in this study. The related indicator data is acquired from 2012 annual reports of China's listed commercial banks. Through the analyses on the evaluation results, it is concluded that innovation input and innovation environment are positively correlated to innovation output. The purpose of setting up the evaluation index system is to measure the overall service innovation level in China's commercial banks, to figure out the status of their development and to find out the ways to improve their service innovation.

Keywords: innovation input, innovation output, innovation environment, evaluation index system, evaluation results

1. Introduction

The research on evaluation of service innovation was made originally in the 1990s, but in China it wasn't until the early twenty-first century. The main contents of research on evaluation of service innovation include the theory foundations or model of evaluation, the objectives and principles of establishing evaluation index system, the selection of evaluation indexes, the determination of weights, the data collection, the selection of evaluation methods, the analysis on evaluation results, etc. The construction of evaluation index system and survey data collection are the most important aspects in evaluation on service innovation.

In regards to the construction of evaluation index system, the international and national research achievements include European Innovation Scoreboard [EIS] (2001-2010), and those made by Hollanders & Arundel (2006), Kanerva, Hollanders & Arundel (2006), etc. There is no international research in China at present. Chen Jin (2004) made an exploratory study at the national level, while more scholars concentrated on the studies of regional level, such as Li Yanhua, Liu Xielin & Liu Jianbing (2009) who evaluated information technology in financial, real estate, culture, education and other modern service industries in Beijing from four dimensions of innovation input, innovation output, innovation economic performance, and innovation environment. Zhao Yan, Zhou Wen, Michael Dowling & Stefan Huesig (2009) evaluated totally six clusters of Knowledge-intensive Business Service [KIBS] in Regensburg area of Germany from six aspects of the innovation, i.e. the hard environment, the soft environment, the innovation network mechanism, the supply factors, the demand factors and the influence of clusters on enterprises. They found that the soft environment construction and the influence of clusters on enterprises have a strong effect on the innovation ability of the clusters' enterprises. Sun Youxia, Xiong Li, Han Changling (2010) evaluated the innovation capability of knowledge-intensive business service comprehensively in 23 regions of China by factor analysis method from five dimensions, i.e., knowledge creation ability, technology innovation ability, innovation undertaking ability, innovation basis ability and service innovation performance.

The research on the industry level are more concerned with both at home and abroad. The main research results include Arundel, Kanerva, Cruysen & Hollanders (2007), Cruysen and Hollanders (2008), Kusiak (2009), Shen Jing & Zhang Liang (2008-2011), Huang Shuwen (2010), Zhang Dehai & Liu Dwen (2010). Researches on the industry level conducted by domestic scholars are mainly concentrated in KIBS. As Chen Jin (2008) argued that, the KIBS innovation evaluation index system should include investment index, resource index and innovation effect index. His evaluation system emphasized more on innovation results and increased customers' satisfaction, patents, software copyrights and other indexes. Some scholars also made evaluation researches on the innovation in specific KIBS activities. Shen Jing et al. (2008, 2009, 2010, 2011) constructed a series of innovation evaluation index system, which integrates technological innovation and service innovation indicators from the viewpoint of utility of innovation, to evaluate China's high technology services, telecommunications, securities, banking, e-commerce and other typical KIBS. Shen Jing et al. (2009) evaluated the service innovation of China's listed state-owned commercial banks in 2007 from three dimensions of innovation input, innovation output and innovation environment. Several years passed, it is necessary to make further research on the innovation in service of China's commercial banks to make out the status quo of its development.

2. The Service Innovation Development Status of China's Commercial Banks

The service innovation of commercial banks refers to the banks' service behavior and service activities, such as the investment to the banks, personnel and technology input on research and development, improvement of the financial service quality, expansion of the scope of services, obtaining financial products patents, increasing revenue, and creating new value for customers. China's commercial banks have mainly carried out innovation behavior and activities in products, technology, organization, management and other aspects. There are some characteristics of development status.

2.1 The Ability of Product Innovation Is Weak

From the 2012 annual reports, the main business of China's commercial banks concentrates on the traditional deposit and loan business. 80%-90% operating income of the 16 listed commercial banks is from the interest income, while the non-interest income is less than 10% which includes the fee, the commission, and the non-interest income. The non-interest income, i.e. intermediate business, develops slowly. The current intermediate business income is still dominated by traditional clearing, settlement, cash management, custody, foreign exchange, bank cards, payment agency and commission business and other business, but investment banking, finance, consulting and other emerging business account for a relatively small proportion in the total business income. In 2012, except ICBC whose corporate wealth management business accounts for 9.45% of its total revenue, this emerging business in other commercials is in a relatively low level. This unbalanced pattern of intermediate business income is conducive neither to diversifying risk, nor to increase the profit. It shows that, the product innovation of commercial banks in China is relatively weak. Though non-interest income is growing, but it's not fast enough to have a substantive change to the profit structure of the existing financial institutions.

2.2 The Technological Innovation Is Very Active

China's commercial banks actively have developed technological innovation, such as ATM, phone banking, online banking, and mobile banking information system. Take ICBC, which is "China's Best Personal Online Banking" and "China's Best Enterprises Online banking" nominated by USA "Global Finance", for example. Its corporate online banking transaction volume in 2012 exceeded RMB300 trillion, an increase of 17.2% higher comparing to the last year; Mobile phone bank customers over 74 million, an increase of nearly 17 times in total volume of transactions; International settlement volume close to USD2 trillion, ranking as the world's leading bank for international settlement. ICBC adheres to the principle that innovation is the driving force to promote business development. It has strengthened the construction of independent research and development of product lines. ICBC launched more than 500 new products, such as multi-currency credit cards, foreign exchange trade in private accounts with totally 4 163 financial products and the growth rate is 28%. The volume of cards that the bank issued is 470 million with RMB4.13 trillion of annual consumption.

Although the technical innovation of our commercial banks is very active, most of the existing domestic technology innovation means imitate those of other countries. They lack of independent innovation.

2.3 The Organization Innovation Is to Be Strengthened

The organizational structure of China's commercial banks is the Head-Branch system, a typical "Pyramid" type structure, with levels of head office, branch, sub-branch and business outlets, reporting up layer by layer, and down accountability. A pyramid structure is conducive to the organization running stability and controlling centralized, but such structure leads to large agencies and staff redundant which blocks the transmission of

internal information, finally results in the low allocation of resources. Thereby it reduces the bank's operational efficiency. The China's commercial banks should learn from the advanced experience of commercial banks in the developed countries, relying on mature technology platform with flat and matrix style management which will help the resources allocating process to be more effective and also accelerate the internal information transmission aiming to improve the organizational operation efficiency.

2.4 The Innovation of Management Is Relatively Backward

Generally, management innovation of commercial banks in China is relatively backward, especially credit risk management which is needed to be strengthened urgently. To create conditions for the joint-stock system transformation, the commercial banks had to consume a lot of business income to accelerate the disposal of non-performing assets which had increased the extraction amount to write-off bad debts and reserve for bad debts, resulting in huge bad loans, which probably slowing down or even reducing the net profit growth, and greatly weakened the bank's innovation ability.

At present, the service innovation level of China's commercial banks is low, and it needs to be improved so as to face the increased fierce and volatile financial environment. To improve the level of service innovation, it is very necessary to measure scientifically on the service innovation actions and activities, to evaluate the utility of service innovation, and to put forward the forward-looking developing measures.

3. The Construction of Evaluation Index System of China's Commercial Banks' Service Innovation

With reference to the ideas of Driving Force Model of service innovation (Sundbo & Gallouj, 1998), the construction of index system should be based on the following principles:

- (1) Systematics. As a whole, the evaluation index system should be able to reflect the main aspects of the service innovation of commercial banks in China or the main characteristics, not only to emphasize the scale of service innovation level, but also to improve the speed, efficiency and structure etc.
- (2) Orientation. The selections of evaluation indexes are centered on the development of commercial banks in china. The selected indicators should have direct impacts on service innovation of commercial banks in China, and should be from a scientific point of view to understand and to grasp the essence of innovation of commercial bank service systematically and accurately. They finally should make the index system a stronger force to promote the service innovation of China's commercial banks.
- (3) Simplicity. The choice of indicators should be concise, summary, representative and independent. The number of indicators should be reduced as much as possible. The comprehensive indicators should be used and the duplication of information between indicators should be avoided.
- (4) Stability. The contents of indicators should be kept relatively stable in certain period, so as to compare and analyze the service innovation and development of commercial banks in China and to forecast its future trend.
- (5) Availability. Generally speaking, the establishment of the index system should be based on the theory of sustainable development, but the availability and comparability should also be considered.

The key influencing factors of service innovation of commercial banks can be divided into three factors, i.e. innovation input, innovation output and innovation environment. According to the internal driving forces of service innovation, i.e. strategy and management, employees, innovation department and R & D department, the selected input index mainly includes three indicators, i.e. information input, R & D investment and personnel input. According to the tracks and actors of external driving force, the innovation environment index includes two indicators, i.e. cooperation of production-academy-research (technology track) and external investment (the service profession track and the public sectors). The innovation output index includes three factors, i.e. the dissemination of information and knowledge achievement, the status of non-interest income and innovation spillover benefits. There are corresponding second layer indicators underlying these first layer ones.

With reference to Shen Jing et al. (2009)'s evaluation index system, depth interview was made with the senior industry experts and group discussions about the evaluation indicators and their weights, then the evaluation index system of service innovation was constructed. See Table 1.

Table 1. Service innovation evaluation index system, index weight and the data source of China's commercial banks

Objective	The criterion layer	The 1st layer	The 2nd layer	Weight (%)	Data available	
Service innovation evaluation index system of China's commercial banks	Innovation input A1 (0.25)	Information input B1(0.20)	Investment on banking information construction C1(1.00)	5	Not available	
		R&D input B2(0.36)	Index weight of investment on external research institutes to income C2(0.25)	2.25	Not available.	
			Index weight of investment on bank's internal research departments to income C3(0.75)	6.75	Not available.	
			Investment on employees B3(0.44)	Educational background of employees C4(0.25)	2.75	4 levels, 1 for below vocational diploma, 2 for vocational diploma, 3 for bachelor degree, 4 for master and/or doctor degree.
		Innovation output A2 (0.6)	Information dissemination and knowledge achievement B4(0.20)	Index weight of education and training to income C5(0.75)	8.25	Not available.
				Yearly applications on patent C6(0.20)	2.4	http://www.cnpatent.com/zljs.asp .
				Growth rate of application on patent C7(0.20)	2.4	Not adopted.
			Income of non-interest B5(0.49)	The quantity of published report and papers C8(0.60)	7.2	Not available.
				Non-interest income C9(0.18)	5.29	Bank's annual reports
				Growth rate of non-interest income C10(0.32)	9.41	Bank's annual reports. Non-interest income = income-interest income.
				Value creation per capita C11 (0.22)	6.47	Value creation per capita = annual income/total employees * 100%.
		Innovation spillover benefits B6(0.31)	Growth rate of Value creation per capita C12(0.28)	8.23	To be compared with that in last year.	
			Value created for other industries/enterprises C13(0.40)	7.44	Data of banks' load to companies.	
				Growth rate of Value created for other industries/enterprises C14(0.60)	11.16	To be compared with that in last year.

	Cooperation of production -academy -research B7(0.14)	Index weight of investment on cooperation with universities and research institutes to total investment on science and technology C15(1.00)	2.1	Not available.
Innovation environment A3 (0.15)	External investment B8(0.86)	Foreign direct investment C16(0.22)	2.84	(Corporate-owned stocks abroad + natural-person-owned stocks abroad + foreign capital stocks listed abroad + foreign capital stocks listed on domestic market) × stock price on the last dealing date of the year.
		Domestic venture investment C17(0.28)	3.61	(Non-state corporate-owned domestic stocks + natural-person-owned domestic stocks + common stocks in RMB) × stock price on the last dealing date of the year.
		State investment C18(0.50)	6.45	State investment = (state-owned stocks + state-owned corporate stocks) × stock price on the last dealing date of the year.

The AHP (Analytical Hierarchy Process) method is adopted to make a combination of qualitative and quantitative analysis for multiple attribute decision-making to evaluate the innovation service level of China's commercial banks.

Terming the item i for index i ; X_i for the score of index i ; Y_i for the utility value of index i ; $X_{i\max}$ for the maximum value of index i ; $X_{i\min}$ for the minimum value of index i ; using formula (1) to standardize the score of each bank in each index.

$$Y_i = \frac{X_i - X_{i\min}}{X_{i\max} - X_{i\min}} \times 100 \quad (1)$$

Finally, by multiplying the index weight to the corresponding index score of every indicator and then aggregating each score, the final score of each bank's service innovation is obtained. Since some data are not available, total score is 66.05 points with eleven available indexes. See Table 3.

4. The Process of Evaluation on China's Commercial Banks' Service Innovation

4.1 Specimen of Banks

This paper attempts to compare and evaluate objectively the service innovation of total 16 listed commercial banks, however, after reading their annual reports, only ten indicators can be obtained from them, the remaining indicator, i. e. educational background of employees can not be obtained completely among 16 banks. As this indicator is the only one in the second layer of "innovation input", in order to make the research valuable, only 9 banks are chosen, based on the identical information of employees' educational background, see Table 2. Among the specimen banks, five banks, Agricultural Bank of China (ABC), Industrial and Commercial Bank of China (ICBC), China Construction Bank (CCB), Bank of China (BOC) and Bank of Communications (BOCOM), are the state-owned commercial banks; and the other four banks, Bank of Beijing (BOB), China Merchants Bank (CMB), Industrial Bank (CIB) and China International Trust and Investment Corporation (CITIC), are the joint-stock commercial banks.

Table 2 lists each bank's total capital stock scale and its structure. The total number of capital stocks of Industrial and commercial bank amount to 349 619 million shares, which is the largest one in the total capital shares. Bank of Beijing's equity is up to total 8 800 million shares, which is the smallest one in total capital shares. All the five

state-owned listed commercial banks possess more total share capital than those of four stock commercial banks. Firstly, in 2012, the state ownership and state-owned corporate shares of ICBC, ABC, CCB and BOC account for the proportions nearly 60% or more of the total capital shares. Secondly, all the state-owned listed commercial banks have foreign equity or foreign capital stocks listed abroad with proportions close to 10% but less than 40%, while the proportion of their common share in RMB is below 10%. This indicates that the four state-owned listed banks mainly rely on state investments to carry out business activities and service innovations. On the contrary, the non state-owned banks like CITIC, China Merchants Bank, Industrial Bank and Bank of Beijing, have common stocks in RMB with the proportions more than 65%. China Merchants Bank does not have state investments. Bank of Beijing, Industrial Bank and CITIC Bank have state investments but below 15% of their own total shares. Bank of Beijing and the Industrial Bank don't have foreign investments, whereas CITIC and China Merchants Bank have foreign investments but below 32%. This signifies that the non state-owned banks rely mainly on domestic venture capital to operate and conduct service innovation. The only exception of state-owned banks is Bank of communications, whose foreign shares account for 47.15%, and common shares in RMB 44.05%, while its state ownership or state-owned corporate shares is only 8.81%.

Table 2. The capital stock composition of the specimen banks

Specimen banks	State-owned and/or state corporate owned shares		Foreign stocks and/or foreign capital stocks listed abroad		Common stocks in RMB		Total	
	No. of shares	Percentage (%)	No. of shares	Percentage (%)	No. of shares	Percentage (%)	shares	Percentage (%)
ICBC	247 281 662 146	70.73	86 794 044 550	24.83	15 543 050 830	4.44	349 618 757 626	100%
ABC	268 484 705 904	82.66	30 738 823 096	9.46	25 570 588 000	7.88	324 794 117 000	100%
BOC	189 052 193 085	67.72	83 622 276 395	29.96	6 472 873 785	2.32	279 147 343 365	100%
CCB	148 501 891 381	59.40	91 915 429 499	36.76	9 593 657 606	3.84	250 010 978 586	100%
BOCOM	6 541 810 669	8.81	35 011 862 630	47.15	32 709 053 346	44.04	74 262 726 645	100%
CITIC	213 835 341	0.46	14 882 162 977	31.81	31 691 328 716	67.73	46 787 327 134	100%
CMB	0	0.00	3 910 478 000	18.12	17 666 130 885	81.88	21 576 608 985	100%
CIB	1 789 459 400	14.09	0	0	10 912 098 434	85.91	12 701 557 934	100%
BOB	314 901 592	3.58	0	0	8 485 257 947	96.42	8 800 159 639	100%

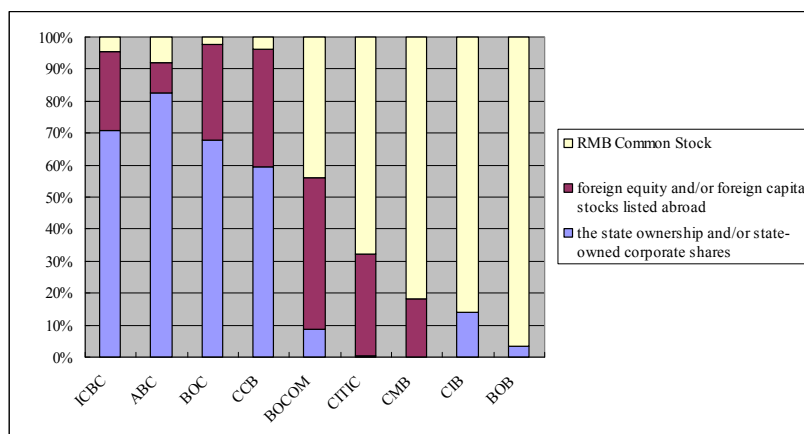


Figure 1. The structure of capital shares of specimen banks

4.2 Result of Evaluation on Specimen Banks' Service Innovation

As to the results of evaluation on specimen banks' service innovation in 2012, please see Table 3.

Table 3. Result of evaluation on specimen banks' service innovation in 2012

Objective	The criterion layer	The 2nd layer	ICBC	ABC	BOC	CCB	BOCOM	CITIC	CMB	CIB	BOB
Service innovation evaluation index system of Chinese commercial banks	Innovation input	Education background of employees	0.7	0	1.75	1.09	1.99	2.71	*2.75	2.64	2.22
		Yearly applications on patent	*2.40	0.36	0.18	1.09	0.14	0.04	0.22	0.01	0
		Non-interest income	*5.29	3.55	4.85	4.77	1.2	0.61	1.1	0.67	0
	Innovation output	Growth rate of non-interest income	0	1.14	0.46	1.54	1.5	1.77	2.99	*9.41	8.98
		Value creation per capita	3.26	2.05	3.1	3.49	4.23	*6.47	5.58	6.1	0
		Growth rate of Value creation per capita	5.08	5.17	4.8	5.49	5.25	4.07	0	8.16	*8.23
		Value created for other industries/enterprises	*7.44	5.19	3.82	5.82	2.73	1.36	1.32	1.03	0
		Growth rate of Value created for other industries/enterprises	1.66	1.26	0	2.21	3.02	1.96	3.91	*11.16	1.16
		Innovation environment	Foreign direct investment	2.42	0.58	1.64	*2.84	1.16	0.43	0.36	0
	Domestic investment risk		0.73	0.85	0	0.41	2.3	1.89	*3.61	2.63	0.97
	State investment		*6.45	4.72	3.47	4.29	0.2	0.01	0	0.19	0.02
	Total score	66.05	35.43	24.87	24.07	33.04	23.72	21.32	21.84	42	21.58
Rank		2	4	5	3	6	9	7	1	8	

The Comparison of results of evaluation on service innovation of some listed China's commercial Banks between 2007 and 2012, please see Table 4.

Table 4. The comparison of results of evaluation on service innovation of some listed China's commercial banks in 2012 and 2007

Year	Scores/Rank	CIB	ICBC	CCB	ABC	BOC	BOCOM	CMB	BOB	CITIC	CMBC	HXB
2012	Scores 66.35	42	35.43	33.04	24.87	24.07	23.72	21.84	21.58	21.32		
	Rank	1	2	3	4	5	6	7	8	9		
2007	Scores 66.77		34.88	40.19		26.91	25.18	33.35	23.34	32.14	22.44	20.43
	Rank		2	1		5	6	3	7	4	8	9

Table 3 shows that in 2012, CIB has the strongest ability of service innovation, and after CIB, the state-owned commercial banks as ICBC, CCB, ABC, BOC and BOCOM rank No.2 to No.6, while the other joint-stock

commercial banks, i.e. CMB, BOB and CITIC, rank No.7 to No.9.

By comparison with Shen Jing's results(2009), the state-owned commercial banks still have more advantages than the joint-stock commercial banks in overall aspects of service innovation after five years development, however, the attention should be paid to CIB, one of the joint-stock commercial banks in 2012, who becomes the strongest one by means of comprehensive innovation ability. Its innovation input (employees' educational background), innovation output (growth rate of non interest income, value creation per capita, growth rate of value creation per capita, growth rate of value created for other industries/enterprises) and innovation environment (domestic risk investment) are in better condition than those of most other banks, which is worthy of in-depth analysis.

5. The Correlation Analyses on the Innovation of China's Listed Commercial Banks

5.1 Evaluation on Innovation Input of China's Listed Commercial Bank

As to the Structure of employees' educational background of specimen banks, please see Table 5.

Table 5. The structure of employees' educational background of specimen banks

The 2nd layer index	Educational background	Index weight	ICBC	ABC	CCB	BOC	BOCOM	BOB	CMB	CIB	CITIC
	below										
	vocational diploma	1	0.159	0.255	0.125	0.080	0.056	0.080	0.019	0.017	0.024
Educational background of employees	vocational diploma	2	0.365	0.359	0.343	0.274	0.259	0.230	0.200	0.169	0.198
	bachelor degree	3	0.438	0.350	0.482	0.577	0.615	0.540	0.669	0.737	0.641
	master and/or doctor degree	4	0.038	0.036	0.051	0.069	0.069	0.150	0.119	0.077	0.137
	Scores		2.355	2.167	2.458	2.635	2.698	2.760	2.902	2.874	2.890

From Table 5, it shows that the five state-owned commercial banks have been ranked backward in "Educational background of employees" comparing with the four joint-stock commercial banks. The score of ICBC is the lowest in 2012 with the employees of bachelor degree and up accounting for 47.6%, and master and/or doctor degree only 3.8% thereof; while CIB, whose score is the highest, has employees of bachelor degree and up accounting for 81.4%, master and/or doctor degree 7.71% thereof. There is no doubt that, higher education level means better professional quality which is the source of human resources in service innovation. By comparing this index, the specimen joint-stock commercial banks have higher proportion of high quality employees than the state-owned ones, which means the former has more advantages in human resources. This may cause by the historical reasons that the state-owned commercial banks have more elder staffs with lower educational background and more branches.

The correlation analysis is made on the score of Value Creation per Capita and the score of Educational Background. The results in 2012 show that, except ICBC and BOB, the other banks' are all positively related between these two indicators, see Figure 2. It is concluded that in general, Value Creation per Capita is positively related to Educational background. The higher level of educational background the staffs possess, the higher value creation per capita will be. For example, non state-owned joint-stock commercial banks as CMB, CIB and CITIC, their employees have higher educational background comparing to the five state-owned commercial banks, and the higher the value creation per capita they have.

Obviously, it can effectively create more profits for banks if they pay more attention to employees' educational background. In view of this, the state-owned commercial banks should continue to recruit talented staff with high education degree. Unnecessary human resources should be cut off by means of information construction and business process optimization such as increasing ATMs and self-service banks, improving and upgrading Internet banking, etc.. These help relieve the employees' pressure at the counters, cutting branches properly which can improve the value creation per capita.

There is a positive correlation between value creation per capita and employees' educational background. But in 2012, not all banks have such results. On the Y axis is ICBC, whose employees' educational background is the lowest score, but its value creation per capita is 3.26; while on the X axis is the BOB with the lowest value creation per capita, but its employees' educational background score is 2.22. This may be due to the largest scale of ICBC's total capital share and its largest operating income amounts of RMB 536.945 billion, while ICBC's staff is 427 356, slightly less than that of the biggest ABC's. The smallest in total capital share is BOB, who also has the least business income of RMB2.781 69 billion, and the least staffs of 8 259 person.

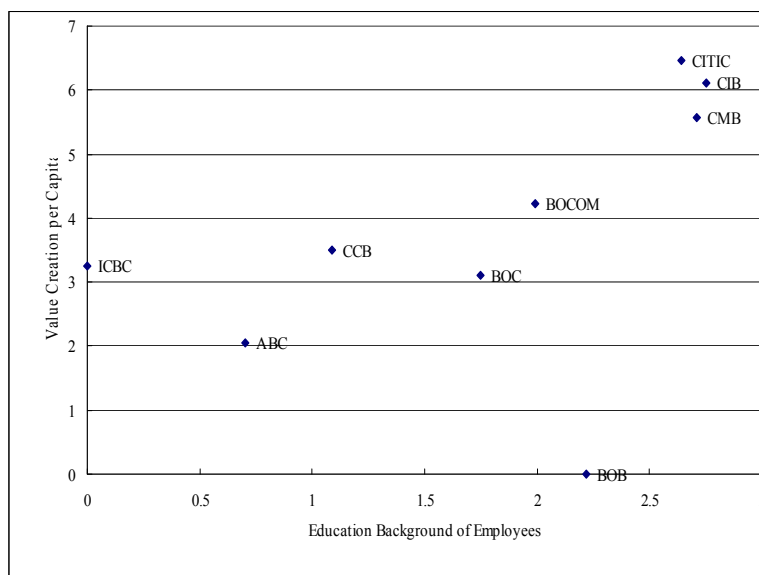


Figure 2. The correlations of value creation per capita and employees' education background

5.2 Evaluation on Innovation Output of China's Listed Commercial Banks

In the evaluation index system of China's listed commercial banks, weight of innovation output is 0.60 which indicates that the service innovation level mainly depends on innovation output. Non-interest income, innovation spillover benefits, information dissemination and knowledge achievements have been used to evaluate China's listed commercial banks' service innovation in this study.

5.2.1 Relations between Non-Interest Income and Service Innovation Evaluation

Table 3 shows five listed state-owned commercial banks rank at the top five on the non-interest income score which means that the state-owned commercial banks earn significantly more non-interest income than that of the listed joint-stock commercial banks, while the four joint-stock commercial banks have higher growth rate of non-interest income than that of the listed state-owned ones. This shows that, the non-interest income in the listed state-owned commercial banks mainly depends on the advantages of the scales of their own, but the growth rate is lower than the listed joint-stock banks whose innovation ability is relatively stronger.

By analyzing the relationship between banks' non-interest income and service innovation evaluation score, there is, to a certain extent, a positive correlation between non-interest income and the overall level of service innovation, i.e. the higher non-interest income, the higher level of service innovation. Their relationship is shown in Figure 3.

One more special bank is CIB, its non-interest income scale is not large, but the growth rate of non-interest income is the highest, see Figure 4, therefore, its score of service innovation is the highest. It shows that this bank has excellent speed of development in intermediate business.

Therefore, the listed state-owned commercial banks still need to develop their intermediate businesses and the financial derivatives so as to improve the proportion of non-interest income.

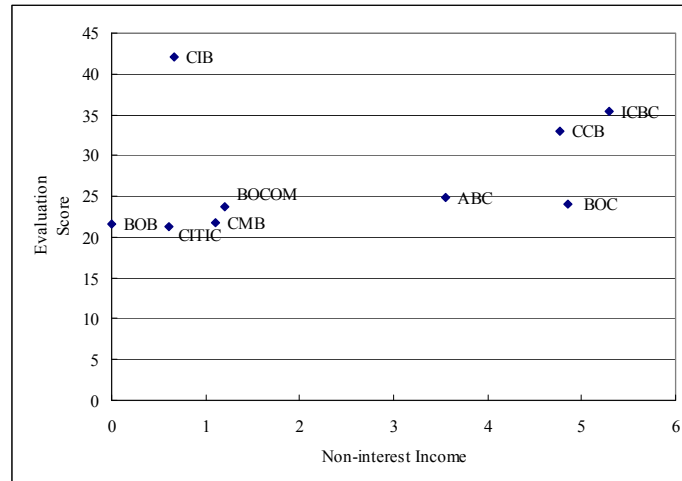


Figure 3. Relationship between evaluation score of service innovation and non-interest income

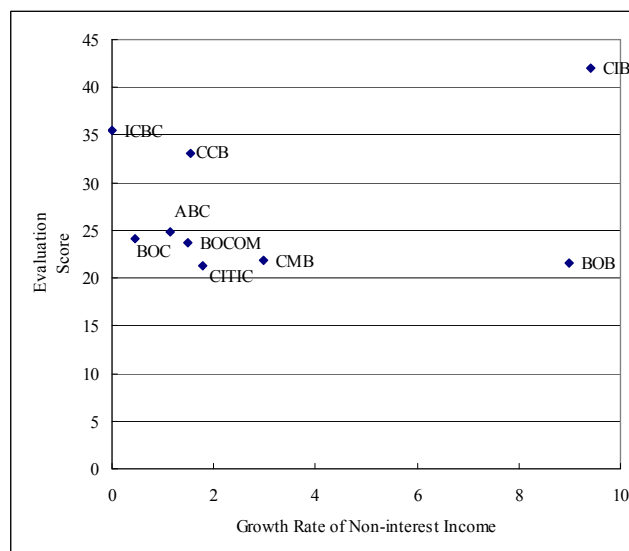


Figure 4. Relationship between evaluation score of service innovation and growth rate of non-interest income

5.2.2 The Relationship between Evaluation Score of Service Innovation and Value Created for Other Industries/Enterprises and Its Growth Rate in Specimen Banks

The index of Value Created for Other Industries/Enterprises and its growth rate in the listed commercial banks reflect the innovation spillover effect to a certain extent. In Figure 5, the five state-owned listed commercial banks occupy obvious advantages in the total amount of loans to companies, but their growth rate is relatively low. For example, ICBC has the biggest corporate amount of loan, but its growth rate is relatively low; while CIB has a relatively low corporate amount of loan, but its growth rate is the highest. This is due to, on one hand, the listed joint-stock commercial banks have low loan bases to customers and can maintain a relatively high growth rate, but more importantly, on the other hand, they have obvious advantages in credit system, product innovation, risk management and technology innovation which are better than those of state-owned listed commercial banks. Therefore, the state-owned listed banks should learn advanced management ideas and methods from the listed non state-owned commercial banks to promote further development of credit business, and reduce the bad debt risks, so as to improve the ability of value created for other industries/enterprises.

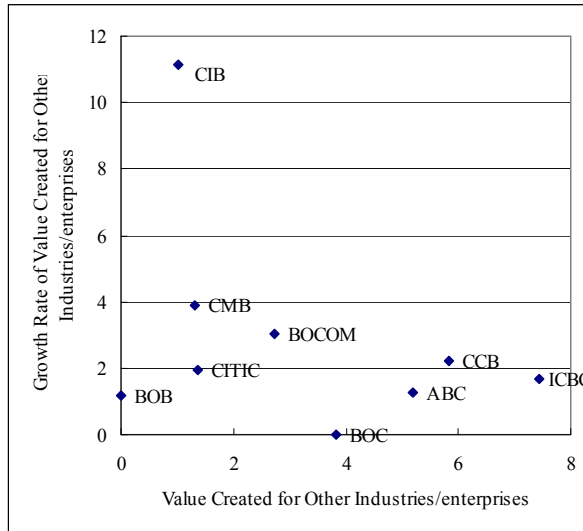


Figure 5. The relationship between value created for other industries/enterprises and its growth rate by specimen banks

5.2.3 Information Dissemination and Knowledge Achievement

The patents of commercial banks reflect the banks’ information dissemination capability, knowledge achievement transformation ability and the ability of technical innovation in a certain extent. With the scores of patent application, except ICBC who gets 2.4, the other banks all obtain low scores. As shown in Figure 6, ICBC has 502 pieces of patent applications, while CMB, the listed non state-owned commercial bank has the number of 49 pieces, ranking No.4, followed by ICBC, CCB and ABC. The state-owned commercial banks have more granted patents than those of the non state-owned ones because of their longer operating history, but the non state-owned commercial banks have stronger surpassing strenthes.

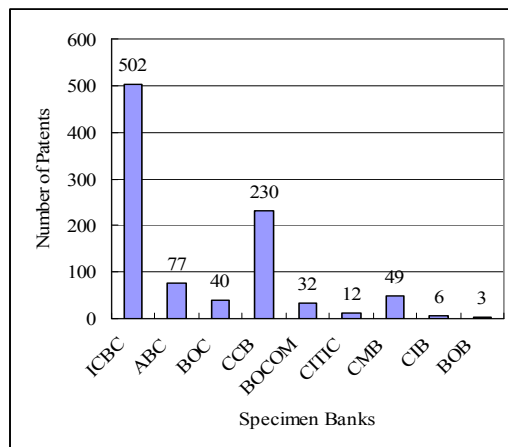


Figure 6. Patents granted in China of specimen banks until 2012

On the whole, China’s banks have not paid enough attention to application of patents. Intellectual property rights are the vital assets in modern economic society, but they have been in a state of loss in China’s banking industry. In the increasingly fierce market competition, especially in the face of the competition from foreign banks, China’s commercial banks should pay more attention to applications and registrations of financial patents to accumulate further service innovation.

5.3 Evaluation on Innovation Environment of China’s Listed Commercial Banks

Development of banks’ service innovation depends on good external environment. From Table 2 and Figure 1, at

present, the state-owned commercial banks have more obvious advantages in access to foreign direct investment and state investment comparing with the listed joint-stock banks, but much lower proportion of shares in domestic venture capital investment.

5.3.1 The State Investments Focus Almost Entirely on the Listed State-Owned Commercial Banks

State investment is an important pillar of strength for the development of commercial banks, which is closely related to the sensitivity of the banking industry itself. It is seen from Table 2, the relevant state investment are mainly concentrated in the state-owned commercial banks, while joint-stock commercial banks have barely state investments. From Table 3, the highest score of state investment in the four non state-owned joint-stock commercial banks is only 0.19, lower than those of all state-owned commercial banks, which is determined by the ownership of the state-owned commercial banks.

5.3.2 More Foreign Direct Investments to the State-Owned Commercial Banks

In a whole, the state-owned commercial banks have won higher scores in foreign investment than non state-owned joint-stock commercial banks. This reflects that the joint-stock reform of state-owned commercial banks have promoted the diversification of investors. All state-owned banks should make full use of this advantage to establish corporate governance and to promote the improvement of innovative management system.

5.3.3 Less Domestic Investments to the State-Owned Commercial Banks

In the domestic investment index, the highest score is 3.61 points for CMB followed by 2.63 points for CIB. In general, the joint-stock commercial banks are more easily to obtain domestic investment. CMB, as a representative of non state-owned joint-stock commercial banks, has not gained state investment, and has little foreign direct investment. These banks have large management autonomy and relatively perfect corporate governance structure, so the external innovation environment is better.

In a word, the state-owned commercial banks have superior innovation environment than the joint-stock commercial banks.

6. Conclusion and Suggestion

It is concluded that innovation inputs-"Educational background of employees (C4)", innovation environment-"Foreign direct investment (C16) and State investment (C18)" have positive correlations to the innovation output- "Growth rate of non-interest income (C10), Value creation per capita (C11) and Growth rate of value creation per capita (C12)".

With the comparison of listed joint-stock commercial banks, the listed state-owned commercial banks have certain advantages in service innovation mainly in the fields of capital structure, scale and etc., which depend on the allocation of national resources and preferences of national policy, and have disadvantages in personnel quality. In addition, all China's commercial banks need to strengthen the innovation of intermediate products, improve human resource system, emphasize personnel training and make full use of foreign and domestic venture capital to enhance their core competitiveness.

Suggestions:

- (1) It is suggested that the listed state-owned commercial banks should increase the input of innovation. That is, the banks should optimize the employees' educational background by increasing the proportion of masters' and doctors' staffs, to provide powerful source for service innovation.
- (2) For the non state-owned joint-stock commercial banks, restricted by their equity structure, their innovation environment is relatively weak. They can only make full use of their domestic venture capital and improve their efficiency vigorously to make great achievement in service innovation.
- (3) For the state-owned commercial banks, it is recommended that they should use sufficiently the absolute advantage of state ownership, state corporate shares and foreign investments to produce more innovation output.
- (4) All China's commercial banks should make more innovations of new financial products and financial services to increase non-interest income and its proportion in operating income. Then try to optimize the structure of business income.

Since some evaluation indexes cannot be obtained from the annual report of China's listed commercial banks and other sources, the evaluation system and the evaluation results of this study have certain limitation. The universal applicability of the evaluation index system proposed in this study is to be verified and also adjusted. Revision and supplement are necessary when it is applied to other fields of enterprises.

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