Study of Syndication Network of Business Angels —Evidence of 83 Well-known Business Angels in China

Yaokuang Li*, Chunhua Zheng** & Jing Wang***

*School of Management, Hefei University of Technology, CHINA. E-Mail: liyaokuang{at}hfut{dot}edu{dot}cn
**School of Management, Hefei University of Technology, CHINA. E-Mail: anniezheng2008{at}163{dot}com
***School of Management, Hefei University of Technology, CHINA. E-Mail: 534980266{at}qq{dot}com

***Abstract*—**With the rapid development of business angel market, joint investment has become more common, which effectively promote the development of angel syndication. Currently, there are few researches on angels' syndication network, and most of them rely mainly on theoretical research. This paper conducts an empirical research on the syndication network of 83 well-known business angels in China to reveal the basic attribute and structure of the network with the method of Social Network Analysis. The results show that, the syndication network is a sparse network with a low density; the cliques are large in number, small-sized and highly overlapped. The prominent angels have higher centrality and occupy more structural holes, as a result, they are more likely to be selected to make joint investment. The business angel network gets started relatively late in China, but there is still a great potential for development. Implications for angels and entrepreneurs are also discussed.

***Keywords*—**BAN; Business Angels; China; Joint Investment; SNA.

***Abbreviations*—**Angel Capital Electronic Network (ACE-Net); Business Angel Network (BAN); Tech Coast Angels (TCA); Social Network Analysis (SNA); Telecommunication, Media and Technology (TMT).

I. INTRODUCTION

In recent years, with the fast development of the economy and the improvement of living standards in China, business angels have been constantly emerging. At present, angel investment has reached a certain scale. According to the China Business Angel Annual Report [Chinaventure, 1], angel investment in China reached 1.009 billion RMB, which, compared with the European and American counterparts, is still relatively small. At the same time, there is a great potential for the development of angel investment in China. The result of the 2013 China Private Wealth Report [China Merchants Bank and Bain, 2] shows that more than 700,000 people possess net assets over 10 million RMB in China, and the investable assets amount to 22 trillion RMB, which means that if a suitable mechanism or platform is established, they could be activated into business angels. Thus, it is of great significance to construct a business angel network in China.

Business angels are informal venture investors which are an important source of equity capital for start-ups [Mason & Harrison, 3], and they have begun to play an increasingly significant role in the entrepreneurial economy [Morrissette 4; Mason & Harrison, 5]. Business angels provide approximately 80% of capital for high-tech enterprises at the seed stage. As the main force in the venture capital market [Sohl, 6], they not only offer entrepreneurs financial capital but also potential social capital, and their professional management knowledge and social networks can provide great added value for entrepreneurial enterprises.

Kelly & Hay [7] find that joint investment is common among experienced business angels. In a broad sense, joint investment refers to two or more investors investing in the same enterprise or project, but the time to invest could be different. There are three reasons why joint investments increase rapidly among business angels: First, it can effectively reduce the risk of venture investment; second, joint investment can increase the investment opportunities and expand the number and range of investment for angels [Kelly & Hay, 8]; finally, it's an effective way of activating potential business angels [Aernoudt et al., 9].

With more and more angels adopting the method of joint investment, the interconnected network of joint investment gradually has been established. At present, research on

angels' syndication network are quite few, and most rely mainly on theoretical research, lacking empirical study. This paper uses a sample of 83 well-known Chinese business angels from an entrepreneurial magazine in China. This study will provide some relevant suggestions for the construction of the BANs in China through analyzing the basic attribute, internal structure, centrality and structural holes of the network.

II. LITERATURE REVIEW

In the United States, relevant departments and civil organizations launched a series of activities to create the Business Angel Network (BAN), with the aim of solving the matching problem between business angels and entrepreneurs and to reduce search costs. There are two types of BAN in America, one is a nonprofit network, such as the Angel Capital Electronic Network (ACE-Net), and the other is a commercial network, like Tech Coast Angels (TCA) in California. Acs & Tarpley [10] found that ACE – Net had provided a national internet database to bridge financing gaps for rapid developed enterprises. TCA is composed of investors in Los Angeles, Orange and San Diego, who made joint investment across the state come true [Payne & Macarty, 11].

In Europe, the BAN plays an intermediary role in the informal investment market. Since 1998, the European Commission has launched a famous 3-year plan to promote business angel network creation. The plan has achieved great results, according to the statistics, there being 298 BANs in Europe in the middle of 2008. Like BANs in America, the European BANs can be created by private or government entities [Mason & Harrison, 12], and the difference is that the former usually invests in the later stage of the project, while the BANs created by government are more inclined to invest in newly-established firms.

Lange et al., [13] relied on the analyses of over 40 identified best practice angel networks in the U.S. and Europe to make a systematic study of the newest and most innovative practices in angel networks. They concluded that the evolution of the BANs are divided into three phases: the traditional network, entrepreneur-centric networks and investor-centric networks. How effective are BANs? Collewaert et al., [14] stated that BANs could improve startup debt acquisition ability and reduce the influence of asymmetric information between startup and business angels. But Zu Knyphausen-Aufs & Westphal [15] found that most BANs didn't reach their expected goals. On the contrary, BANs become a barrier instead of an intermediary between business angels and entrepreneurs.

In conclusion, much work has been done in the study of BANs, mainly concentrating on two aspects: the type and operation mode of BANs. But until now, no empirical study has analyzed the basic attributes and architectural feature of BANs. This paper will study the syndication network of 83 well-known business angels in China to reveal the basic attribute and structure of the network using the method of Social Network Analysis (SNA).

III. RESEARCH DESIGN

3.1. Sample

Most angels are hidden populations, and traditional sampling methods are unable to obtain representative samples and complete data. This paper takes 83 well-known Chinese business angels from Entrepreneur magazine in China (No.5, 2012) as the research sample. The 83 well-known business angels have invested in at least 2 projects, and total investment is above one million yuan. The samples are representative because Entrepreneur is one of the most authoritative and forward-looking magazines in China. The list of the 83 well-known business angels can be seen in Table 1.

Table 1: The List of 83 Well-known Business Angels in China

Bing Xie	Jian Ding	Nan Lv	Xipei Jiang
Bo Feng	Jiang Wang	Nanchun Jiang	Xu Zhao
Bo Liu	Jiangtao Shun	Ni Yang	Xuefan Qiu
Boquan He	Jiarong Xu	Qi Ji	Xueqian Du
Boren Zheng	Jiaxi Li	Qiang Wang	Yi Shu
Changgui Zhao	Jiong Wu	Qingfeng Chen	Yinchu Wang
Daihong Lin	Jun Lei	Qinghua Hong	Ying Wu
Fan Bao	Kaifu Li	Qingyuan He	Yongqiang Qian
Fangming Zhu	Keyi Chen	Songyi Zhang	Yuan Wang
Feng Deng	Lei Yang	Tanping Lv	Yueqiao Bao
Feng Wang	Leilei Wang	Tao Tang	Yunlei Yun
Feng Yu	Lijie Wang	Xiang Li	Zhe Zhou
Fuyuan Lin	Lin Chen	Xiangning Zhang	Zhengdong Ni
Gang Mai	Liqing Zeng	Xiangyang Yang	Zhenyu Yang
Hai Wu	Luhua Rao	Xiao Wang	Zhenzhang Li
Hao Lu	Maodong Xu	Xiaofeng Chen	Zhiguo Li
Haozhi Chen	Mike Cai	Xiaolin Zhong	Zhishuo Liu
Hongjia Gong	Min Fan	Xiaoping Xu	Zhu Li
Hongwei Shun	Min Zhu	Xiaosong Liu	Zhujie Li
Hongwei Zhou	Molin Zhong	Xiaoying Liu	Ziwang Xu
Ji Zhang	Manzi Xue	Xingsheng Zhang	
Source: Entrepreneur, 2012, 5:102-104			

3.2. Method

Social network is referred to as a set of social actors and the relationships between them. SNA analyzes the relationship between network members to study the structure and attribute features of the network. SNA has become a cross-disciplinary subject with applications in diverse fields such as sociology, economics, psychology, and has produced many valuable research results. The 83 well-known business angels in China objectively formed a social network due to their joint investments. Correspondingly, this paper will analyze it from the perspective of social network.

3.3. Data Source and Processing

Secondary data sources such as media reports, historical data, and internet materials are an important means of sociological quantitative research. This method has been used in many studies because of its virtues, such as low cost and easier access [Jun Liu, 16]. We collect relevant information on 83 well-known business angels by using this method. There are three main data sources for this paper: Entrepreneur magazines, Baidu Encyclopedia and news report. In order to examine the validity and dependability of the data, we make a field research on the China Youth Angel Association to gain the raw data of some members of 83 well-known business angels. The results basically accord with the collected data, which indicates that the secondary data in this paper is feasible.

This paper collected information on 689 investment projects made by the 83 well-known business angels, among which 77 were joint investment projects. We build an 83*77 order matrix based on the collected data, in which, the row data refers to business angel and the column data refers to investment projects. In this 0-1 matrix, 0 means the business angel didn't invest in the project, 1 means that the business angel invested in the project. We draw a syndication network graph with UCINET as shown in Figure 1. The circles represent business angels and blocks represent projects.

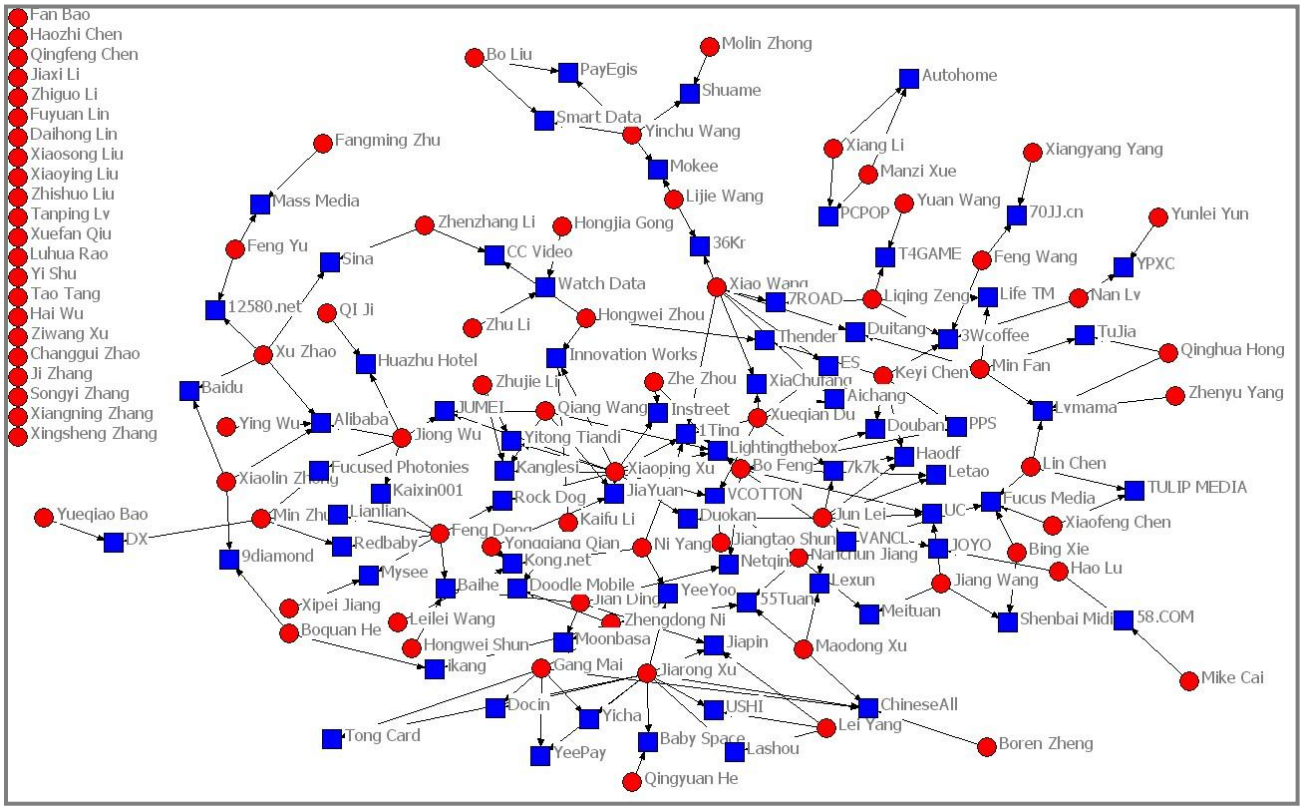

Figure 1: Syndication Network of 83 Well-known Business Angels in China (2-mode)

3.4. Fundamental Analysis

The 83 well-known business angels prefer to invest in projects in the field of TMT (Telecommunication, Media and Technology). The choice of investment industry depends on the characteristics of the industry, its prospects, and business angels' preferences as well. Most of them choose a field where they have gained a lot of experience, and some angels even publicly expressed that they only want to invest in projects in a specific industry.

The 83 well-known business angels also preferred to invest in projects located in Beijing, Shanghai and Guangzhou. Investment allocation not only reflects the development of innovation and entrepreneurship in this city, but also reflects the angels' preference for the city. The 83 well-known business angels like to invest in the residence or cities which have well developed economies and technology. The hotspot cities have strong entrepreneurial atmosphere and abundant investment channels, attracting more venture capital, which is advantageous to startup project financing.

The business angels tended to cooperate with people who share similar investment preferences. For example, Gang Mai and Jiarong Xu who are among 83 well-known business angels both prefer to invest in the internet industry, so they have the chance to cooperate with each other several times, Docin web is one of their representative joint investments. Exchange of experience becomes a major channel to avoid risk and reduce losses in the investment, which accounts for the reason some angels will turn first to experienced persons who have worked with them before. Results show that it's relatively common for colleagues to invest in the same project. For example, Yongqiang Qian, Qiang Wang and Xiaoping Xu were the founders of the New Oriental; later, they jointly invested in China's popular matchmaker's network, Jiayuan.com.

IV. SYNDICATION NETWORK ANALYSIS

4.1. Basic Attributes Analysis

This paper transforms 2-mode data to 1-mode data with UCINET [Borgatti et al., 17] as figure 2 shows. Results show that, 61 of the 83 well-known business angels have joint investments. The value between every two business angels represents the times they have ever cooperated. For example, the number 4 between Qiang Wang and Xiaoping Xu illustrates that they have made joint investments 4 times. Table 2 shows that most angels are lacking sustainable cooperation; only 13.76% angels have invested together more than one time.

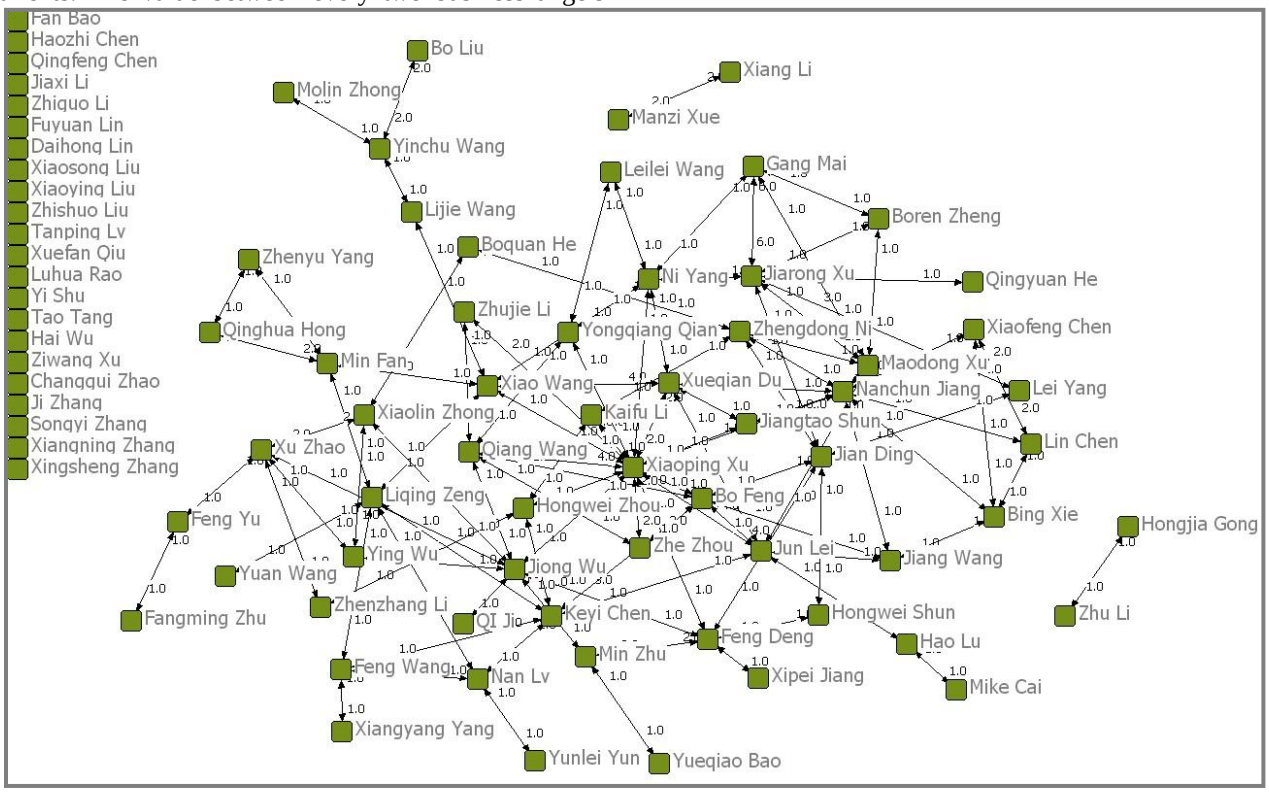

Figure 2: Syndication Network of 83 Well-known Business Angels in China (1-mode)

Table 2: The Times of Cooperation Analysis

The times of cooperation	1	2	3	4	5	6	Total
The number of the ties	188	18	4	6	0	2	218
Percentage (%)	86.24	8.26	1.83	2.75	0.00	0.92	100

Network density is measured by comparing the actual number of ties with the potential number that would occur if the members in the network connected with each other. The density of the syndication network is 0.04, which infers the network is sparse with only 4 % links. Network distance refers to the shortest path between two actors, and the average distance is measured by counting the number of links that if any two members of the network would connect. The syndication network ranges from 1 to 8 in distance, the average distance being 3.457. Distance-based cohesion Compactness is an index measuring the cohesiveness of the network, ranging from 0 to 1, in which larger values indicate greater cohesiveness, and vice versa. The clustering coefficient is an important element reflecting the degree of aggregation of the network nodes; this syndication network has a high clustering coefficient, thus indicating a high probability of condensing subgroups.

Table 3: The Value of Basic Attributes Analysis

Basic attribute	Value
Density	0.040
Shortest distance (among reachable pairs)	1.000
Longest distance (among reachable pairs)	8.000
Average distance (among reachable pairs)	3.457
Distance-based cohesion (Compactness)	0.168
Clustering coefficient	0.685

4.2. Internal Structure Analysis

A clique is a subset of actors who have direct connections with one another and no additional network member can be added who also has direct connections with everyone in the subset [Vilpponen et al., 18]. The members in the same clique are more closely linked with each other than outsiders. The data display shows that there are 26 cliques in the syndication network, but the size is small, with each clique containing 3 or 4 members. Normative networks tend to lack large cliques that are often found in utilitarian organizations [Tichy, 19]. The more members a clique has, the harder it is to come to an investment agreement.

Everett & Borgatti [20] has mentioned that the number of cliques that an actor belongs to could be seen as a new measure of centrality -- clique overlap centrality. This paper

found that there exist 20 members in two or more cliques. These 20 members act as bridges to effectively promote the flow of resources and information between cliques. In particular, Xiaoping Xu is a member of 11 cliques, who keeps in touch with most of the cliques and plays a leading role in the network. The cliques are not mutually isolated but contacted with each other because of the existence of overlapping clique members, as shown in Figure 3. Examining clique and clique overlap allows us to gain a deeper insight into the cohesive subgroup structure of the syndication network of 83 well-known business angels.

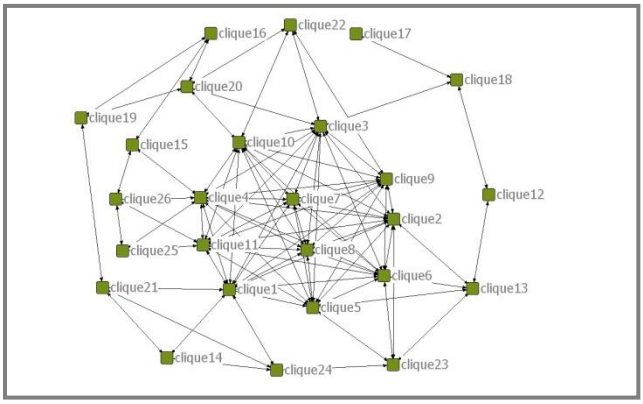

Figure 3: Clique-by-Clique Overlap

From the perspective of internal structure, the syndication network is composed of cliques that link with each other through weak connections. Each clique is a small social network; they are in a different position and play a different role. The members in the same clique generally share a similar investment philosophy and investment criteria. The analysis of cliques is helpful to understand the structure and operation of the syndication network.

4.3. Centrality Analysis

Network position significantly influences the extent of members to obtain resources and information. Centrality is one focus of social network analysis, reflecting members' position and influence. Members with high centrality have more direct access to others. On the contrary, members with low centrality are inactive and generally on the periphery of the network [Wasserman et al., 21]. A number of studies take centrality as a key measure to reflect the distribution of relationships and to identify key members in the network.

This paper identifies key members based on indexes of point centrality and betweenness centrality. Point centrality, representing an angel's gregariousness, is calculated by summing the weights of all edges directly connected to an individual's node [Opsahl et al., 22]. The member with a high point centrality value reflects that he or she is active in the network and has the largest number of ties to other business angels. A member with high degree centrality is often the focal individual to whom others go for advice or others consider a friend from whom they can gain support. Betweenness centrality quantifies the number of times a node acts as a bridge along the shortest path between two other nodes. It's often used to measure the ability of an actor to control resource flow in the network.

Table 4: Top 20 in the Point Centrality Analysis and Betweenness Centrality Analysis

Angels	Degree	Angels	Degree	Angels	Betweenness	Angels	Betweenness
Xiaoping Xu	21	Jiong Wu	8	Xiaoping Xu	628.256	Xu Zhao	120.100
Jiarong Xu	14	Feng Deng	7	Xiao Wang	406.862	Bo Feng	115.749
Bo Feng	12	Ni Yang	7	Jiong Wu	308.235	Yinchu Wang	109.000
Jun Lei	10	Liqing Zeng	6	Nanchun Jiang	189.745	Min Fan	108.000
Xueqian Du	10	Jian Ding	6	Jun Lei	189.187	Jiarong Xu	107.471
Gang Mai	9	Xu Zhao	6	Keyi Chen	185.899	Jian Ding	106.486
Xiao Wang	9	Maodong Xu	6	Feng Deng	160.667	Hongwei Zhou	88.028
Nanchun Jiang	9	Min Fan	5	Lijie Wang	159.000	Maodong Xu	81.165
Qiang Wang	9	Xiaolin Zhong	5	Ni Yang	153.271	Zhengdong Ni	67.699
Keyi Chen	8	Zhengdong Ni	5	Liqing Zeng	132.457	Xueqian Du	62.701

Table 5: Descriptive Statistics for each Measure

	Mean	Std Dev	Sum	Variance	Minimum	Maximum
Degree	3.277	3.739	272	13.983	0	21
Betweenness	47.301	97.194	3926	9446.587	0	628.256

Table 4 shows that there are 17 angels within the top 20 with high values both in point centrality analysis and betweenness centrality analysis. The 17 angels are obviously active in the network, and they can control information effectively. Particularly, Xiaoping Xu has the highest value in centrality analysis, representing the key member with a powerful mediating effect to promote interaction in the network. On the other hand, data in table 4 indicate that resources in the network are unequally distributed, and the most angels are on the periphery of the syndication network. This syndication network is a highly centralized network, for a small percentage of angels have a high percentage of relationships in the network [Chinowsky et al., 23].

4.4. Structural Holes

Structural holes are present in an actor's network of relationships when a focal actor is tied to others who are not themselves connected [Burt, 24]. When it comes to structural holes, it involves at least three members for A, B, C. Supposing that A and B are linked, B and C are linked, but A is not associated with C, we define this as a structural hole (Burt, 2009). B occupies the position of hole, so he or she has a better access to information and enjoy comparative

advantages. In recent years, some empirical studies show that actors who bridge structural holes have gained prominent advantages.

Burt calculated structure holes contain four aspects: effective size, efficiency, constraint and hierarchy. Effective size is an index to measure the nonredundancy of the network, calculated by subtracting the redundancy form the size of the individual network. Efficiency is a relative index; the efficiency of a point is the ratio of effective size to actual size. Constraint refers to a member's ability to utilize and coordinate the network. Hierarchy measures the centrality of the member; those with high hierarchy are generally key members in the network.

Table 6: Top 20 in Effective Size Analysis

Business Angel	Effective Size	Efficiency	Constraint	Hierarchy
Xiaoping Xu	10.506	0.657	0.389	0.537
Nanchun Jiang	6.596	0.66	0.407	0.294
Jiong Wu	6.396	0.711	0.457	0.341
Ni Yang	5.792	0.724	0.448	0.126
Bo Feng	5.221	0.653	0.568	0.441
Jun Lei	4.741	0.593	0.601	0.491
Maodong Xu	4.630	0.661	0.511	0.22
Jian Ding	4.583	0.655	0.547	0.38
Keyi Chen	4.092	0.585	0.568	0.333
Jiarong Xu	3.882	0.485	0.627	0.515
Liqing Zeng	3.650	0.521	0.538	0.349
Xiao Wang	3.641	0.520	0.627	0.455
Feng Deng	3.615	0.516	0.589	0.479
Zhengdong Ni	3.417	0.569	0.625	0.467
Xueqian Du	3.328	0.475	0.587	0.353
Qiang Wang	3.269	0.467	0.633	0.362
Jiang Wang	3.167	0.633	0.632	0.157
Xu Zhao	3.100	0.517	0.607	0.343
Yongqiang Qian	2.958	0.592	0.634	0.059
Hongwei Zhou	2.810	0.562	0.654	0.338

The results show that the members in table 6 are almost identical to those in table 4, which reflects that people who occupy more structural holes have higher centrality as well. It's necessary to maintain a wealth of structural holes in one's network, because the position of a hole has a better access to information and provides comparative advantages; having different structural holes will improve the diversity of one's personal network. Structural holes, acting as a bridge, promote the flow of information and bring business angels from opposite sides of the hole together to make investments.

V. Results and Discussions

The syndication network is a sparse network, in which the majority of business angels lack direct contact and sustainable cooperation, hindering information sharing in the network. The analysis reflects that angel investment gets started relatively late in China, the coverage of joint investment is small, and there is a great potential for investment exchanges and cooperation among business angels.

The cliques of the syndication network are large in number, small-sized and highly overlapped. This shows that most well-known business angels don't like to invest in the same project with too many angels. Members in the same clique generally share a similar investment philosophy and criteria. Furthermore, the cliques are not mutually isolated but contacted with each other because of the existence of overlapping clique members who act as bridges to effectively promote the flow of resources and information between cliques.

A small percentage of angels have a high percentage of relationships in the network. There is a large difference in the capacity to access and control resources in the syndication network. Angels with high centrality have more opportunities to cooperate with other angels, while the members on the periphery of the network are easily ignored. Cooperation among key members is emerging to reduce investment risk. Peripheral members of the syndication network should actively pursue every opportunity to cooperate with key members in order to enhance their reputation and access more high quality investment.

The results also show that business angels who bridge structural holes in the network gain significant advantages to initiate the business angel group. Structural holes are channels for promoting the flow of information, and bringing together business angels from opposite sides of the hole to make investments. Angels who occupy structural holes are likely to increase the diversity of the ego network, so the information and control advantages of structural holes should be a competitive advantage for angels.

VI. Implications and Limitations

Based on the above analysis and conclusion, we find that there is a huge potential for Chinese angels to build

cooperative relationship through BAN. The 83 well-known Chinese business angels have rich investment experience and high social reputation, thus they have greater opportunities to establish a business angel club or business angel network. We should ensure that these key members have the opportunity to play a major role in the establishment of BAN; as such, they can drive joint investment practices in China. Angels who lack experience should actively pursue every opportunity to cooperate with these key members in order to enhance their reputation and obtain high quality investment opportunities. At the same time, we should enhance communication between small angel groups to raise the standard of information sharing and broaden investment channels. For entrepreneurs, a better understanding of angel syndication network can help start-ups to target their fundraising goal. Entrepreneurs should approach angels selectively and try to tap into the network of angels to increases the chance of financing.

Since information collected in this paper is mainly from the Internet and relevant magazines, it might benefit from other types of data. Another limitation is that this paper does not distinguish leading investors from follower investors, which presents a consideration for future research.

VII. ACKNOWLEDGEMENTS

The authors thank the National Natural Science Foundation of China for the funding that made this study possible (Funded project: Research on financing from business angels: theory and application, No. 71072138; Personal and institutional drivers and the model of financing from business angel and VC of women owned entrepreneurial firm, No. 71272056).

REFERENCES

[1] Chinaventure (2014), "China Business Angels Annual Report", *A Report for Analyzing the Development of Business Angels in China*.

[2] CMBC (China Merchants Bank and Bain) (2013), "China Private Wealth Report in 2013", *A Report for Analyzing the Development of Private Wealth and Private Banking in China*.

[3] C.M. Mason & R.T. Harrison (1995), "Closing the Regional Equity Capital Gap: The Role of Informal Venture Capital", *Small Business Economics*, Vol. 7, Pp. 153–172.

[4] S.G. Morrissette (2007), "A Profile of Angel Investors", *Journal of Private Equity Summer*, Pp. 52–67.

[5] C.M. Mason & R.T. Harrison (2000), "The Size of the Informal Venture Capital Market in the UK", *Journal of Small Business Economics*, Vol. 15, Pp. 137–148.

[6] J.E. Sohl (2003), "The US Angel and Venture Capital Market: Recent Trends and Developments", *The Journal of Private Equity*, Vol. 6, No. 2, Pp. 7–17.

[7] P. Kelly & M. Hay (2000), "'Deal-Makers': Reputation Attracts Quality", *Venture Capital: An International Journal of Entrepreneurial Finance*, Vol. 2, No. 3, 183–202.

[8] P. Kelly & M. Hay (1997), "'Deal-makers': Reputation Attracts Quality", *Venture Capital: An International Journal of Entrepreneurial Finance*, Vol. 2, No. 3, Pp. 183–202.

[9] R. Aernoudt, A. San José & J. Roure (2007), "Executive Forum: Public Support for the Business Angel Market in Europe–A Critical Review", *Venture Capital: An International Journal of Entrepreneurial Finance*, Vol. 9, No. 1, Pp. 71–84.

[10] Z.J. Acs & F.A. Tarpley (1998), "The Angel Capital Electronic Network (ACE-Net)", *Journal of Banking and Finance* Vol. 22, No. 6, Pp. 793–797.

[11] W.H. Payne & M.J. Macarty (2002), "The Anatomy of an Angel Investing Network: Tech Coast Angels", *Venture Capital: An International Journal of Entrepreneurial Finance*, Vol. 4, No. 4, Pp. 331–336.

[12] C.M. Mason & R.T. Harrison (2002), "Barriers to Investment in the Informal Venture Capital Sector", *Journal of Entrepreneurship & Regional Development*, Vol. 14, Pp. 271–287.

[13] J. Lange, B. Leleux & B. Surlemont (2003), "Angel Networks for the 21st Century: An Examination of Practices of Leading Networks in Europe and the US", *The Journal of Private Equity*, Vol. 6, No. 2, Pp. 18–28.

[14] V. Collewaert, S. Manigart & R. Aernoudt (2010), "Assessment of Government Funding of Business Angel Networks in Flanders", *Journal of Regional Studies*, Vol. 44, No. 1, Pp. 119–130.

[15] D. Zu Knyphausen-Aufseß & R. Westphal (2008), "Do Business Angel Networks Deliver Value to Business Angels?", *Venture Capital: An International Journal of Entrepreneurial Finance*, Vol. 10, No. 2, Pp. 149–169.

[16] Jun Liu (2004), "An Introduction to Social Network Analysis", *Social Sciences Academic Press*.

[17] S.P. Borgatti, M.G. Everett & L.C. Freeman (2002), "Ucinet for Windows: Software for Social Network Analysis".

[18] A. Vilpponen, S. Winter & S. Sundqvist (2006), "Electronic Word-of-Mouth in Online Environments: Exploring Referral Networks Structure and Adoption Behavior", *Journal of Interactive Advertising*, Vol. 6, No. 2, Pp. 8–77.

[19] N. Tichy (1973), "An Analysis of Clique Formation and Structure in Organizations", *Journal of Administrative Science Quarterly*, Pp. 194–208.

[20] M.G. Everett & S.P. Borgatti (1998), "Analyzing Clique Overlap", *Journal of Connections*, Vol. 21, No. 1, Pp. 49–61.

[21] Wasserman, Stanley & Joseph Galaskiewicz (1994), "Advances in Social Network Analysis: Research in the Social and Behavioral Sciences", *Sage Publications*, Vol. 171,

[22] T. Opsahl, F. Agneessens & J. Skvoretz (2010), "Node Centrality in Weighted Networks: Generalizing Degree and Shortest Paths", *Journal of Social Networks*, Vol. 32, No. 3, Pp. 245–251.

[23] P. Chinowsky, J. Diekmann & V. Galotti (2008), "Social Network Model of Construction", *Journal of Construction Engineering and Management*, Vol. 134, No. 10, Pp. 804–812.

[24] R.S. Burt (2009), "Structural Holes: The Social Structure of Competition", *Harvard University Press*.