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Research of the Effectiveness of the Growth of Smes under Intellectual Capital Driven-based on the Empirical Analysis of Smes in China Listed Companies

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Abstract: Intellectual capital is the sum of all the wisdom and experience can be used to create wealth. It is including human capital, structural capital and relational capital. Because of intellectual capital is the heterogeneity resources, thus it become the main driving force for the growth of SMEs. The study selects the panel data of 2008-2011, 198 SMEs in China listed companies and use factor analysis extracted growth factor, use intellectual value added coefficient model to measure intellectual capital, take the use of quantile regression method to test the validity of the intellectual capital-driven growth of SMEs. It was found that the intellectual capital do not have a significant impact to the company that growth slow and the impact of the rapid growth of the company significantly and therefore proposed that SMEs should vigorously develop operational intellectual capital proposals.

Key words: Intellectual capital, SMEs, growth, empirical analysis

INTRODUCTION

Intellectual capital is a kind of enterprise resource build on the knowledge base, prominent features that can creative intelligence, enables enterprises to obtain sustainable competitive advantage, mainly for the knowledge, technology, skills and experience. Edvinsson and Malone (1997) divided intellectual capital into human capital and structural capital, structural capital, including customer capital and organizational capital; organizational capital is divided into innovation capital and process capital. Innovative capital mainly including intellectual property rights, the processes capital mainly including workflow and trade secrets.

Bontis (1998) study the relationship between the intellectual capital and enterprise growth of the Malaysian services sector and non-service industry, pointed out that the human capital in the non-service sector have a greater impact on business growth than in the service sector, structural capital and business growth also exists a positive effect.

Riahi-Belkaoui (2003) based on the resource-based theory and stakeholder theory, Sample empirical analysis for the 81 "largest transnational" manufacturing and services company, found that the intellectual capital have the positive significant effect on the growth of multinationals of U.S. Zhu (2003) analysis of the role of human capital on growth indicators, believe that human capital is a key factor in determining corporate growth. Chen *et al.* (2004) used evaluate intellectual capital

qualitative index system designed by himself to research, found that the various elements of the intellectual capital and business growth have a significant positive effect. Li and Li (2004) used the VACI model to study the relationship between intellectual capital and business growth of the computer industry in China. He believes that human capital has a positive effect on business growth but the impact was not significant, structural capital and business growth is negative correlation, physical capital has a significant positive effect on business growth.

The scholars based on different perspectives empirical test of the influence of intellectual capital to the growth ability and basically come to a unanimous conclusion: intellectual capital is an important factor in driving business growth. But different growth levels of the small and medium enterprises, it's driving growth role whether the same, the need for further empirical analysis. The study selects the panel data of 2008-2011, 198 SMEs in China listed companies and use factor analysis extracted growth factor, use intellectual value added coefficient model to measure intellectual capital, take the use of quantile regression method to test the validity of the intellectual capital-driven growth of SMEs.

THEORETICAL ANALYSIS AND RESEARCH HYPOTHESIS

According to the resource-based theory, heterogeneous interlibrary resources are a source of

power for driving business growth. Therefore, heterogeneous interlibrary resources obtained a competitive advantage, to obtain a sustainable development capability. Enterprise's intellectual capital has all the characteristics of the heterogeneity of resources: valuable, scarce and difficult to imitate, difficult to substitute. (1) Intellectual capital valuable to be able to create value. The value of intellectual capital is the present value of the cash flows created by intellectual capital; intellectual capital is the main manufacturer of the company's cash flow. (2) Intellectual capital is scarcity because it is difficult to obtain. Intellectual capital is intangible resources exist in the minds of men and embedded in organizational skills, corporate culture and behavior, there is no trading market, cannot be obtained through the market, which is scarce. (3) Intellectual capital is difficult to imitate because form a unique and complex path. Performance of intellectual capital for the knowledge, experience and ability, is after numerous the size of the decision-making enterprises in the long-term growth process gradually cultivate and accumulated, its carrier and organizations, with the formation of path dependence, plus the competitors time, cost and capacity constraints, this long-term nurturing and accumulated intellectual capital, cannot be competitors easily imitate. (4) Intellectual capital is hard to replace because recessive and unique. Knowledge, experience and ability are recessive that is relatively independent and indivisible, is difficult to replace each other. In addition, the particularity of generation environment of intellectual capital leads to the heterogeneity of the intellectual capital.

Intellectual capital is a kind of heterogeneous interlibrary resources. Heterogeneous interlibrary resources are the root of the differences in corporate growth. Different levels of business growth, intellectual capital affect the ability of the business growth. The greater contributions of intellectual capital for business growth while the faster business growth. Therefore, according to the heterogeneity resource properties of the intellectual capital, we propose the following hypothesis:

- H1:** Intellectual capital is able to improve the growth
- H2:** Greater contributions of intellectual capital for business growth while the faster business growth.

STUDY DESIGN

Sample selection and data sources: SMEs in China listed companies as the research object, select 198 listed before 2008 (excluding incomplete data company) panel data for the study sample, the data from CSMAR database. We use EXCEL, SPSS19 and Eviews6.0 software for data processing.

Variable definitions: This study selects four indicators of Total Asset Growth (TAG), Net Profit Growth (NPG), Sales Revenue Growth Rate (SRG) and the Owner's Equity Growth Rate (OEG) for factor analysis and extract the common factor represents corporate growth as explanatory variables.

We use the Value-added Intellectual Coefficient (VAIC) model put forward in Pulic (2000) to measure intellectual capital, VAIC consist in three parts of Physical Capital Efficient (PCE), Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE),

The calculation formula is:

$$VAIC_i = CEE_i + HCE_i + SCE_i$$

Study selected PCE_i, HCE_i, SCE_i represent physical capital, human capital, structural capital as an explanatory variable.

In which CE_i representatives the book values of the net assets of the I-th enterprise, the HC_i representatives the i-th enterprise total wages and salaries investment. The VA_i representatives the value added of the i-th enterprise. Calculated as follows:

$$\text{Value-added (VA)} = \text{Profit before tax} + \text{salary costs} + \text{interest expense}$$

Select the balance rate as the control variable. All variables are as defined in Table 1 below.

Empirical methods: In this study, we use the quantile regression method to test the validity of the intellectual capital-driven growth of SMEs. Quantile regression is a more generalized estimate method; its estimated value is robust.

Table 1: Variable definition table

Variable type	Variable name	Variable symbol	Variable definitions
Explained variable	Enterprise growth	GROWTH	TAG, NPG, SRG, OEG Factor analysis of the synthetic indicators
Explanatory variables	Value-added rate of physical capital	CEE _i	CEE _i = VA _i /CE _i
	Value-added rate of human capital	HCE _i	HCE _i = VA _i /HC _i
	Value-added rate of structural capital	SCE _i	SCE _i = (VA _i - HC _i)/VA _i
Control variables	Asset-liability ratio	LEV _i	LEV _i = Total liabilities/Total assets

Table 2: KMO and Bartlett's test

Kaiser-Meyer-Olkin measure of sampling sufficient degree	
Bartlett's sphericity test	0.661
Approximate chi-square	1913.226
df	4
Sig	0.000

Table 3: Total variance explained

Composition	Initial eigen values			Extraction of square and loaded		
	Total	Variance (%)	Accumulation (%)	Total	Variance (%)	Accumulation (%)
1	1.899	65.232	65.232	1.899	65.232	65.232
2	0.977	30.534	95.766			
3	0.864	2.345	98.111			
4	0.765	1.889	100.000			

Table 4: Descriptive statistical results

	Growth	CEE	HCE	SCE	LEV
Mean	0.30768	0.270137	2.928891	0.544109	0.410825
Median	-0.03391	0.247	2.277828	0.564646	0.409272
Std. Dev.	8.83073	0.140523	2.563596	0.353967	0.18688
Observations	791	791	791	791	791

Econometric model of this study can be constructed as follows:

$$\text{Growth} = \beta_0 + \beta_1 \text{CEE} + \beta_2 \text{HCE} + \beta_3 \text{SCE} + \beta_4 \text{LEV} + \mu$$

EMPIRICAL ANALYSIS

Extract growth factor: We select Total Asset Growth (TAG), Net Profit Growth (NPG), Sales Revenue Growth Rate (SRG) and the Owner's Equity Growth rate (OEG) four indicators to factor analysis and extract the common factor to represent the growth of enterprises.

KMO test and Bartlett spherical test results are listed in Table 2, illustrate suitable for factor analysis. According to Table 3 factor extraction for result after factor analysis to growth factors, the company's growth indicators can be expressed as:

$$\text{Growth} = 0.32\text{TAG} + 0.41\text{NPG} + 0.33\text{SRG} + 0.21\text{OEG}$$

Descriptive statistics: Table 4 reports the results of each variable descriptive statistics. The mean value growth was 30.768%, a standard deviation of 883%, illustrate that the differences between companies are too large; the level of development is extremely uneven. The average of the physical capital appreciation rate of 27%, a standard deviation of 14%, illustrate each company's physical capital utilization efficiency is not much difference. The average of the Human capital appreciation rate of 2.93, a standard deviation of 2.56, illustrate the company's human capital use efficiency has a big difference. Structure capital appreciation rate averaged 0.54, median 0.56, standard deviation 0.35; differences among the companies are not big; the asset-liability ratio mean and median are

41%, indicating a low level of corporate liabilities. Among them, the companies with the lowest of the asset-liability ratio of only 1.8% of the company's growth needs financial support and a lower proportion of debt funds, may be one of the important reasons for the slow growth.

Regression results analysis: In this study, examine the level of business growth and intellectual capital in different quantiles by quantile regression. The results are shown in Table 5.

Influence of physical capital to enterprises growth: Table 5 quantile regression results show that quantile between 5 and 50% exist a significant positive effect on physical capital for business growth, quantile between 55 and 95% also have a positive effect but not significant. This shows that the main driver of our normal business growth at this stage is still physical capital.

Influence of human capital to enterprises growth: As can be seen from Table 5, quantile between 10 and 30%, human capital and business growth were negatively correlated but not significantly. Quantile for between 60 to 95% and the relationship between human capital and business growth is significantly positive, indicating that human capital cannot play its role in the slow development of the enterprises. But in the faster-growing enterprises, human capital is a major factor in driving business growth.

Influence of structural capital to enterprises growth: Quantile more than 10%, structural capital and enterprise growth was positively correlated and the effect is more significant. This shows the structural capital is an

Table 5: Quantile regression results

	C	CEE	HCE	SCE	LEV
0.05	-2.0768*** (0.0042)	2.8032***(0.0000)	0.0146(0.6127)	1.14716(0.1732)	-2.2702***(0.0043)
0.10	-1.7136***(-0.0172)	2.2771***(0.0000)	-0.0172(0.2225)	1.4205***(0.0000)	-1.3937***(0.0023)
0.15	-1.3479***(0.0002)	1.7071***(0.0000)	-0.0147**(0.4044)	-1583**(0.0303)	-0.8696***(0.0000)
0.20	-1.0607***(0.0000)	1.3947***(0.0000)	-0.0105(0.3240)	0.8795***(0.0024)	-0.7303***(0.0001)
0.25	-0.9232***(0.0000)	1.2390***(0.0000)	-0.0100(0.3886)	0.8240***(0.0029)	-0.6269***(0.0009)
0.30	-0.6973***(0.0000)	0.9585***(0.0000)	-0.0041(0.6967)	0.5884***(0.0074)	-0.4405***(0.0089)
0.35	-0.6366***(0.0000)	0.9011***(0.0000)	0.0031(0.8462)	0.5479**(0.0169)	-0.4332***(0.0092)
0.40	-0.5415***(0.002)	0.7578***(0.0007)	0.0041(0.7959)	0.4656**(0.0407)	-0.3141*(0.0520)
0.45	-0.5043***(0.0007)	0.6881***(0.0033)	0.0152(0.4664)	0.4252*(0.0753)	-0.2212(0.2019)
0.50	-0.4689***(0.0025)	0.6231***(0.0146)	0.0193*(0.3170)	0.355(0.1507)	-0.0291(0.8743)
0.55	-0.3789***(0.0168)	0.5093***(0.0593)	0.0263(0.1269)	0.2706(0.2821)	0.1167(0.5510)
0.60	-0.3002****(0.0060)	0.4009***(0.0332)	0.0323***(0.0274)	0.1824***(0.0297)	0.2223(0.1692)
0.65	-0.1964***(0.0301)	0.1612***(0.3725)	0.0321(0.1143)	0.2220***(0.0215)	0.2696*(0.0844)
0.70	-0.1157(0.4417)	0.1782(0.4008)	0.0398(0.1348)	0.0957(0.6665)	0.3498***(0.0164)
0.75	0.0857 (0.4152)	-0.0034(0.9841)	0.0538*(0.0792)	0.0286(0.4893)	0.2536(0.1183)
0.80	0.0466(0.8307)	-0.1490(0.3568)	0.1093****(0.0026)	0.0154(0.6168)	0.3775*(0.0549)
0.85	-0.0534(0.6970)	-0.209(0.2894)	-0.1876****(0.0000)	0.0296(0.2883)	0.6285****(0.0075)
0.90	-0.1473(0.5921)	-0.4030(0.1958)	0.3106***(0.0280)	0.0469****(0.0036)	0.8911****(0.0061)
0.95	0.1312(0.8507)	-0.2412(0.9030)	0.4632****(0.0000)	0.0333(0.9616)	1.0036(0.4432)

***, ** and * indicate the significant level of 1, 5 and 10%

important factor in driving business growth that the innovation capital, such as trademark rights, copyright, patent, the flow of capital, such as technological process, trade secrets, system convention and so on. So, assumption 1 and assumption 2 was confirmed.

CONCLUSIONS AND RECOMMENDATIONS

This study regards SMEs in China listed companies as the research object, through empirical analysis; explore the validity of the intellectual capital drive the growth of small and medium enterprise. The conclusion is: SMEs intellectual capital has a significant positive effect on the growth of the enterprise. That SMEs the development, accumulation and expansion of the intellectual capital can effectively promote the rapid growth of enterprises. However, the different impact of intellectual capital to the different levels of business development, enterprises who development a strong ability, growth faster, intellectual capital plays a powerful role in driving and in the enterprises who growth slower, intellectual capital-driven growth capacity still not been fully exploited. Therefore, it is recommended that the SMEs in developing, especially slow-growing enterprises, should be vigorously developed and operational intellectual capital, the play value of intellectual capital to create and drive business growth, promote SME healthy and sustainable development. Play the function of intellectual capital that value creation and drive business growth, promote SME healthy and sustainable development.

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