

Entrepreneurial management equity allocation and financing structure optimization of technology-based entrepreneurial firm

Equity allocation

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Abstract

Purpose – To satisfy the demand of initial investor for above-average capital return and the expectation of entrepreneurial management to establish their own business, this paper aims to explore a dynamic equity allocation model in which the shareholding ratio of the technology-based entrepreneurial firm changes with its growth and profit. Based on the dynamic equity allocation model, the authors design a financing structure which not only ensures timely and adequately obtaining the fund but also avoids equity dilution and safeguards the integrity of equity.

Design/methodology/approach – The paper selects high-tech companies listed in China as the sample for empirical research to identify the role of stock incentive and uses model deduction to find the equitable quantized benchmark for entrepreneurial management equity allocation. The study uses capital exclusivity as an entry point to perform theoretical analysis and demonstrates how the equity allocation of a technology-based entrepreneurial firm changes dynamically as the presentation speed of entrepreneurial management's human capital exclusivity accelerates. The paper then constructs a conceptual model to design the financing structure of the technology-based entrepreneurial firm.

Findings – The study finds that stock incentive upwardly regulates debt financing and downwardly regulates equity financing. Based on characteristics of technology-based entrepreneurial firms, the paper suggests that the immediate surplus capital increment can signify the increasing presentation speed of human capital exclusivity, and it is proposed as an equitable quantized benchmark for equity allocation to entrepreneurial management. Based on the dynamic equity allocation model, the paper designs an internal equity and external debt financing structure.

Originality/Value – The conclusions enrich the theoretical foundation for entrepreneurial management to participate in residual claim and provide practical guidance for equity allocation and financing structure design in the context of mass entrepreneurship and innovation. The paper also sets up a conceptual framework for solving two major issues of the technology-based entrepreneurial firm: timely acquisition of external funding and lasting maintenance of entrepreneurial management stability.

Keywords Capital exclusivity, Financing structure, Immediate surplus capital increment, Time-changing equity allocation

Paper type Research paper

1. Introduction

Different from an ordinary enterprise which develops new products according to the enterprise development plan by full-time high-tech professionals or acquires complicated technology by means of technology shares, a technology-based entrepreneurial firm



incubates differential products by its entrepreneurial management's innovative technology with a small amount of startup capital from the initial investor, and the entrepreneurial management has the desire of creating their own business. The initial investor and entrepreneurial management consent to a time-changing inevitability that the latter agrees to reward the former a return above market average level for the high capital risk during the transformation from technology to products, and that the former recognizes the remaining of total profits minus the above-market-average capital gain being the initiative contribution of the latter. The equity allocate shall keep changing till the entrepreneurial management realizes their ultimate goal of establishing their own business. After the startup stage of product development and trial marketing, the technology-based entrepreneurial firm comes to a new stage of rapid growth, which should be supported by huge financing capital. A review of China's high-tech enterprises profoundly reveals a reality that timely obtaining development funds enables enterprises for rapid expansion, while enterprises miss the development opportunities because the capital is not in place.

The scale and timing of internal financing is limited by the accumulation. In contrast, external financing can timely provide full funds based on current differentiation of products, subjective illustration of market potential and prospective operational performance. Therefore, external financing is the only approach for technology-based entrepreneurial firms to acquire development funds. In addition, the financing success largely depends on the competency and motivation of the entrepreneurial management. On the other side, whether the entrepreneurial management is willing to exercise its proactive motive power to design a financing structure for maximum fund with minimum equity costs or compile a convincing business plan to the capital market is fully dependent on the equity allocation model agreed between the initial investor and entrepreneurial management at beginning of the startup.

Initial investor bears the fund risk during the transformation process from technology to differential products, and entrepreneurial management is eager to complete the incubation and market recognition. Though entrepreneurial management holds originality technologies, they usually accept the customary 30:70 per cent ratio of technical capital to fund capital when the firm is registered. After differential products have evolved from the incubation process, if the earlier equity share remains unadjusted or only limited stock incentive is in place to stimulate entrepreneurial management, because its failure to recognize the increasing importance of competency and motivation of the entrepreneurial management, and may induce an undesirable concern of unbalanced interest distribution. In the worst case, the disappointment for being not able to establish their own business may prompt the entrepreneurial management to leave. Finally, technology-based entrepreneurial firms have to disintegrate. Therefore, the equity allocation mechanism established by the initial investor and entrepreneurial management should take into account not only the contribution of the entrepreneurial management in terms of wisdom, diligence and operation management but also the aspiration for establishing their own business.

Thus, the paper selects samples of China's listed high-tech companies to analyze the role of equity incentive in optimizing the financing structure by empirical research. With reference to the empirical conclusions that stock incentives can regulate financing structure and also avoid defects of stock incentive mechanism that more reflect the economic interests but lack to give decision-making power, the paper establishes an equitable quantized benchmark for equity allocation. The benchmark named immediate surplus capital increment which is the calculation result that immediate total capital minus the total financing capital, startup capital and the startup capital appreciation (the startup capital appreciation is calculated at market cost of ordinary debt financing). Taking the above benchmark as a basis, the paper proposes a financing structure which guarantees the

venturing capital appreciation for the initial investor and the stability of entrepreneurial management team at the same time.

2. Literature review

Schumpeter (1912) proposed that innovation is the reorganization of production factors, and technology innovation as one of the most important components is an effective approach for an organization to acquire or transform resources and shape resource differences (Teece *et al.*, 1997). Porter (1991) took recombining of production factors as basis to draw a new production function for extra profit. Solow (1956) incorporated technology into an economic growth model, and Rome (1990) established an endogenous growth model related to technical advancement. Since then, technology became a key component for production, and scholars in China and over the world have been attracted to conduct many discussions about the action of technology on enterprise development. Branch (1974) identified the effect of technical R&D on profitability enhancement. Xin *et al.* (2008) and Li *et al.* (2010) presented direct positive action of technology innovation on enterprise performance. Dehning *et al.* (2005) proposed a positive correlation of information technology with enterprise value. Roger (2007) concluded that technology plays a substantial role in sustaining core competencies of an enterprise. Greenwood and Jovanovic (1999) suggested that technology innovation can proactively increase the market value of stocks. Wu and Xiao (2016) concluded that technology innovation, whether application- or exploration-oriented, helps to improve the operational performance of an enterprise. Evidently, technology innovation constitutes the basis for higher performance, is a source of extra profit and is key to competitive advantages (Teece *et al.*, 1997; Salomo *et al.*, 2007).

Adequate and timely external financing (Rouvinen, 2002; Hall, 2002; Beck *et al.*, 2005; Wu *et al.*, 2014) and stable and enthusiastic technical team (Ren, 2001; Lu *et al.*, 2013) are crucial to technology innovation and technology-based entrepreneurship. Technology R&D, for its higher risk and longer duration, faces stronger financing constraints when compared with other projects (Hellmann and Stiglitz, 2000; Chen, 2015). Zhou *et al.* (2014) discovered that internal financing itself hardly supports technology innovation, while external financing with its large quantity plays a significant role in promoting the technology to product transformation at a listed company. Bettignies and Brander (2003) by building a bilateral moral model analyzed and concluded that bank debt can well motivate technical professionals to devote to technology R&D. Nevertheless, Myers (1977) and Rossi (2005) discovered that as technology innovation is a positive indicator of high growth potential, which also avoids the pressure of debt service, and a listed company would usually prefer to acquiring the R&D fund from the stock market. Besides stock market, another key approach to funding technology innovation and product transformation is angel fund or venture capital fund. Lu *et al.* (2013) indicated that equity share of venture capital fund increases as the scale of investment and level of technology innovation grow. Mei and You (2012) discovered that as the venture capital strengthens the investor's supervision right of enterprise's management decision-making, it easily leads to the partial loss of enterprise control. In fact, it improves the financing costs.

As many scholars indicate, offering rational incentives to technical professionals is a key approach to stabilizing and motivating the technical team (Ryan and Wiggins, 2002; Cheng, 2004; Larraze-Kintana *et al.*, 2007; Ma *et al.*, 2013; Pepper and Gore, 2015). Amabile *et al.* (1986); Green (2004); Merriman and Deckop (2007) and Gu and Wang (2014) discovered that performance salary has positive effects on application innovation, which is created by explicit knowledge. Robert Lucas (1988); Yang and Zhou (1997); Luo (2014) and Xu and Jin (2015) suggested that team members holding technologies shall be given the rights to receive distribution of surplus profit so that they are duly motivated to perform technology R&D,

which in turn sustains the firm's core competencies. Xu (2004a, 2004b) and Zeng *et al.* (2004) indicated that technology for equity or equity appreciation arrangement provides technology holders the rights to surplus profit distribution, and they are effective approaches to motivate technical professionals and ensure continuity of technology R&D. Hu *et al.* (2015) and Wright *et al.* (2007) concurred that equity allocation to technology holders can strike their enthusiasm for technology R&D. Then, fair allocation of equity rights to surplus profit for technology holders is crucial to maximize the role of technology capital in creation (Guo and Zhang). Qin (2004) calculated the share of equity with the sum of cash expenditures for technical R&D and the opportunity costs in prior periods. Gao and Zhao (2010) suggests to determine the share of equity of technology holders by calculating the ratio of technology value to net assets value of the firm at the time of cooperation. Dai *et al.* (2010) established 12 indicators around personal qualifications, capabilities and risks to calculate the equity share of technology holders. Xu (2004a, 2004b), in the principle of risk-return tradeoff, put forth the method of equity shares by "the sum of total value of technical achievement and capital for empowering such technology at period n divided by total value of technical achievement at period n ". Yu and Gao (2009) suggested to determine the equity share by calculating the ratio of net profit from projects under the charge of technical professionals to the firm's total net profit of the year.

All the above studies, from different perspectives, acknowledge the positive role of technology in enhancing a firm's core competencies and market value and indicate that firms mostly prefer to acquire fund for technology transformation by means of equity financing and suggest that technical professionals should take part in surplus profit allocation by equity shares. These studies have contributed to the selection of financing models and attracted attention to the positive roles of technical professionals. However, the equity financing by stock offerings for listed companies is not applicable to technology-based entrepreneurial firms at the startup stage. Capital raising by "equity for fund" dilutes the firm's shares and causes loss of control rights, which is opposite to the entrepreneurial management's expectation of establishing their own business. More importantly, these general reviews do not match the contribution of entrepreneurial management who take charge of technical R&D and business administration at the same time. Therefore, it is of significance to design a financing structure which can ensure timely acquisition of fund in adequacy, avoid dilution of equity and safeguard integrity of equity. It is also important to explore a dynamic equity allocation model which can satisfy the demand of initial investor for above-average capital return and increase the equity share of the entrepreneurial management along with the firm's profit till the expectation of establishing own business is realized.

3. Empirical analysis of stock incentive optimizing financing structure

3.1 Theoretical analysis of stock incentives to management optimizing financing structure

A financing structure comprises equity financing and debt financing, which are mixed at different ratios (Li *et al.*, 2013). The management who designs the financing structure and operates the acquired fund tends to design the financing structure in accordance with the incentives. If the incentive agreed between the shareholder and management is a certain percentage of profit, the management will turn to a financing model promising maximum profit. As accounting standards specify, the earnings for dividend distribution are the results of profit after interest and tax plus undistributed profit at the beginning of the year minus staff payrolls, welfare and provident fund. This means that the dividend distribution to shareholders does not affect total incentives to the management, and the only adjustable variable to determine the management's incentive is financing interest. Most startups in growth cannot provide pledges or mortgages to borrow fund from banks or non-bank financial institutions such as investment companies whose interest rate is higher than bank levels, and these may

sometimes consume a substantial portion of earnings before interest and tax. Therefore, it is a natural choice of management to seek interest-free equity financing.

If the agreed incentive to the management is a certain percentage of equity, the dividend distribution will more significant to. In turn, the management will seek a financing structure in maximizing their dividend income for a certain equity ratio. Equity financing brings increase in the total capital, meaning decrease in per-share dividend and dilution of the management's equity ratio agreed between the shareholders and the management. This reduces the management's equity earnings significantly. Though the debt interest from debt financing reduces the net profit for dividend distribution, such cost is evenly allocated to each share of equity. If the management holds limited shares of equity, they share insignificant amount of the debt interest cost. Compared with equity financing, which directly dilutes the management's equity share, debt financing impacts the management's equity earnings in a very limited degree. Thus, the management would naturally choose debt financing not to dilute their equity earnings.

In conclusion, financing structure design preference of the management is subject to the way of incentives agreed with shareholders. Stock incentives encourage the management to seek debt financing while abandon certain interest-free equity financing and to seek the debt financing of the lowest costs. Therefore, stock incentives to the management can lead to higher proportion of debt financing that optimizes the financing structure.

3.2 Empirical analysis of stock incentives optimizing financing structure

3.2.1 Sample selection and variables design. Technology-based entrepreneurial firm is a new organization motivated by "mass entrepreneurship and innovation". Existing studies lack the regular reference about the effects of dynamic equity allocation to entrepreneurial management on financing structure. Nevertheless, the entrepreneurial management of technology-based firms and the management of high-tech enterprises have similar influence on financing structure decisions. Particularly, they both seek to avoid significant dilution of equity share. Therefore, samples are taken from high-tech enterprises that provide stock incentives to management. Sample companies are selected from high-tech listed companies with management stock incentives at China's main board from 2006 to 2014. Those involving special treatment, particular transfer or incomplete data and those with stock incentive not extended to the management are excluded. To insure the time matching the management's influence on financing structure, companies involving forced departure of general managers are excluded (Ko *et al.*, 2007). Finally, 102 specimen companies are selected.

Equity financing ratio and debt financing ratio are selected to measure financing structure (Zhong and Hu, 2014). Net equity financed amount quoted in financing announcement of each respective specimen company is used as basis for calculating equity financing ratio (Zhang and Yao, 2014). The sum of short-term loan, tradable financial liabilities, long-term loan, securities payable and long-term payables is deemed as debt financed amount (Li *et al.*, 2015; Li and Xie, 2014). Return on capital (ROC) is used to represent the results of capital operation by the management (Sheng *et al.*, 2016). Stock incentive, being an independent variable, is used as a virtual variable to identify whether stock incentive is implemented and still valid to study its influence on financing structure and results of capital operation. With reference to prior studies, controlled variables, e.g. company size, are determined (Han *et al.*, 2008; Xiao, 2010; Chen and Yang, 2015). Virtual variables of the year and the industry are used for control the macro factors (Yang *et al.*, 2016). Selection and definition of variables are given in Table I.

3.2.2 Study design. Three study periods are established for benchmarking before and after implementing stock incentive. Period t , a three-year period before implementing stock

Table I.
Variables selection
and definition

	Variables	Definition
Dependent variable	Equity financing ratio (FS _E) Debt financing ratio (FS _D)	Net equity financed amount/total assets (Short-term loan + tradable financial liabilities + long-term loan + securities payable + long-term payables)/total assets
Independent variables	ROC Stock incentives (SI) (Virtual variable)	Net profit/average capital 0 for the first three years of SI; 1 for at stock incentive valid period; 2 for three years after expiry of stock incentive valid period
Controlled variables	Company size (SIZE) Non-debt tax shield (NDTS) Assets composition (AC) Profitability (PRO) Growth opportunities (GROW) Year (YEAR) (Virtual variable) Industry (IND) (Virtual variable)	Natural logarithm of total assets Yearly depreciation/total assets Net fixed assets/total assets Return on net assets Assets market value/book value Control influence of economic environment of different years As classification of China's Securities Regulatory Commission (2012) Control influence of industries

incentive, is the base period to indicate the financing structure and capital operation results when the management do not hold stocks. Period $t + 1$ is the stock incentive validity period, which in comparison with Period t demonstrates any changes occurring to financing structure and capital operation results after the management has been awarded shares, correlating to the financing structure of technology-based entrepreneurial firms when the entrepreneurial management holds stocks. Period $t + 2$ is a three-year period after stock incentive period ends up, which in comparison with Period $t + 1$ demonstrates the long-term effects of management equity on financing structure and capital operation results, correlating to the financing structure when the shares held by the entrepreneurial management remain unchanged while the firm grows. Three regression models are established to study the effects of stock incentive on FS_E, FS_D and ROC:

$$FS_E/FS_D/ROC = \alpha_0 + \sum \alpha_j SI_{j,t} + \beta_1 SIZE_{i,t} + \beta_2 NDTS_{i,t} + \beta_3 AC_{i,t} + \beta_4 PRO_{i,t} + \beta_5 GROW_{i,t} + \beta_6 \sum YEAR_{i,t} + \beta_7 \sum IND_{i,t} + \varepsilon_{i,t}$$

Here, $SI_{j,t}$, as an independent variable, is a virtual variable representing stock incentive, where $j = 1$ stands for Period $t + 1$, the stock injective valid period; and $J = 2$ stands for Period $t + 2$, a three-year period after the stock incentive period ends up. Period t is the base period for reference.

3.2.3 Analysis of empirical results. To test correlation of main variables, Spearman testing is adopted in consideration that dependent variable stock incentive is not continuous. [Table II](#) below lists the testing results.

Stock incentive is significantly negatively correlated to equity financing ratio (FS_E) and significantly positively corrected to debt financing ratio (FS_D) and ROC. To a certain extent, that explains the empirical study's feasibility of this study. Significant correlation is observed at a few independent variables and the controllable variable. However, the regression analysis demonstrates VIF < 2 (VIF: variance inflation factor) for all variables.

Therefore, no significant multicollinearity occurs. Table III lists results of the regression analysis.

Regression of virtual variables for stock incentive demonstrates that SI_1 and SI_2 are significantly negatively correlated with equity financing ratio (FS_E), implying that contrasted with Period t , the reference group, Periods $t + 1$ and $t + 2$ have stronger negative influence on FS_E . The FS_E descends significantly after implementing stock incentive. In addition, the absolute values of the coefficients before SI_1 are higher than SI_2 , indicating the maximum FS_E descend occurs in Period $t + 1$, which is the valid period of stock incentive. Similarly, SI_1 and SI_2 are in significant positive correction with debt financing ratio (FS_D) and ROC at 0.01, 0.05 and 0.1 levels, implying that in contrast with Period t , Periods $t + 1$ and $t + 2$ have stronger positive influence on FS_D and ROC. In other words, the FS_D and ROC ascend significantly after stock incentives are implemented. In addition, the absolute values of the coefficients before SI_1 are higher than SI_2 , indicating the maximum FS_D ascend and best capital operation results occur at Period $t + 1$, which is the valid period of stock incentive.

In summary, stock incentive motivates the management to optimize the financing structure and achieve the best capital operation results. This demonstrates the value of stock incentives in motivating the management to tap their wisdom and competency to optimize financing

	FS_E	FS_D	ROC	SI	SIZE	NDTS	AC	PRO	GROW
FS_E	1.000								
FS_D	0.136	1.000							
ROC	0.174	-0.033	1.000						
SI	-0.721**	0.629**	0.635**	1.000					
SIZE	-0.038	0.127	0.058	0.113	1.000				
NDTS	0.307	-0.262	0.014	0.084	0.245	1.000			
AC	0.033	-0.202	-0.242	0.071	0.537**	0.019	1.000		
PRO	0.417	0.071	0.311**	0.000	0.057	-0.303	0.321	1.000	
GROW	-0.059	-0.077	0.108*	-0.047	-0.061	-0.009	0.113	0.231**	1.000

Table II.
Spearman correlation testing of main variables

Note: *, ** and *** stand for significance at 0.1, 0.05 and 0.01 levels, respectively

	FSE	FSD	ROC	VIF
Constant	4.581*** (3.121)	3.729*** (2.980)	4.332*** (3.004)	-
SI_1	-1.283*** (-1.221)	1.369* (1.336)	1.775** (1.913)	1.021
SI_2	-1.002** (-0.966)	0.921** (0.915)	1.357*** (1.237)	1.130
SIZE	0.032 (0.315)	0.224 (0.422)	0.128 (0.379)	1.068
NDTS	0.317 (0.219)	-0.296 (-0.233)	0.185 (0.112)	1.091
AC	0.475 (0.421)	-0.427 (-0.447)	-0.216 (-0.542)	1.084
PRO	0.872* (0.997)	1.212* (1.311)	1.114* (1.275)	1.029
GROW	0.971* (0.774)	0.998* (0.822)	1.272* (0.917)	1.029
YEAR	Control	Control	Control	-
IND	Control	Control	Control	-
F	21.703***	13.532**	22.251***	-
R^2	0.439	0.329	0.433	-
Adjusted R^2	0.427	0.208	0.413	-

Notes: *, ** and *** stand for significance at 0.1, 0.05 and 0.01 levels, respectively. The figures in brackets are t values

Table III.
Regression results

structure of the enterprise. However, the current stock incentive mechanism plays a less positive role at listed high-tech corporations after the stock incentive valid period. That is because the limited and fixed amount of incentive shares are not enough to play the role of "Golden Handcuffs." Management shareholding regulates debt financing upwards and equity financing downwards, which concur with the financing orientation to minimize equity dilution and maximize financed amount of technology-based entrepreneurial firms. This sets a theoretical foundation for technology-based entrepreneurial firms to establish equity allocation and optimize the financing structure based on immediate surplus capital increment. Enhancement of capital operation results provides empirical evidence that stock incentive can motivate the entrepreneurial management to better capital operation. Therefore, rational equity allocation not only increases the entrepreneurial management' motive power but also constitutes a necessary pre-condition to set up favorable financing structure for technology-based entrepreneurial firms.

4. Entrepreneurial management equity allocation and financing structure optimization

The entrepreneurial management who takes charge of technology transformation is also responsible for business administration of the firm. How they play their competency and motivation determine the firm's development. As the entrepreneurial management is oriented to create own business, whether it will make proactive efforts to perform technology R&D or design the optimal financing structure is closely related to the agreed equity allocation model.

4.1 Theoretical analysis

The fairness preference theory (John Stacey Adams, 1965) indicates that the working motivation is significantly influenced by whether they receive fair or equal proceedings (Quan and Wu, 2010; Qian *et al.*, 2014). People pay high regard to the results of allocation and the fairness of the allocation process and require that risks of work and level of efforts can be fairly reflected. Maslow's hierarchy of needs and organismic integration theory from different points of view conclude that it is essential to satisfy the needs of working value acknowledgement to motivate human creativity (Maslow and Green, 1943; Amabile, 1993; Ryan and Deci, 2000). The model of allocation satisfying the first needs demonstrates the maximum incentive utility. Technology R&D personnel more strongly pursue the sense of job accomplishment (Thomas *et al.*, 1998; Wen and Wu, 2003; Liao Zhongju *et al.*, 2014). Therefore, the equity allocation to entrepreneurial management should not only fairly reflect their contributions to the firm's technology development and business operation but also accommodate their needs of creating their own business. Yang and Zhou (1997) and Hu (2011), on the basis of incomplete contract theory, suggest that it is more efficient and fair to base the equity allocation on the presentation speed of capital exclusivity. The capital of exclusivity means that leaving the enterprise will cause corporate team productivity to decline, reduce organizational rent and disintegrate the entire organization. Exclusive capital is the foundation of enterprise establishment, existence and development. Relied on by other companies make it hold the negotiating initiative. Exclusive capital is the key to acquire corporate control. Figure 1 depicts the exclusivity presentation curves of different capitals, X_m line for material capital and X_h line for human capital.

The change in exclusivity presentation speed of material capital and human capital (non-material capital) imposes significant influences on the equity allocation of an entity. As the human capital's potential which can create huge profits like unique innovative idea or proprietary technologies, have to be tested on the market. Human capital cannot

demonstrate its value like material capital at the beginning of the enterprise, and at that time, the holder of human capital is at non-dominating position. As shown in Figure 1, material capital demonstrates higher presentation speed than human capital in Phase I. That means that the former predominates and controls the entity. In Phase II, the two are largely present at the same speed and jointly control the entity. In Phase III, human capital significantly speeds up its exclusivity presentation while material capital slows down. Naturally, the former takes over the control of entity.

Similarly, at a technology-based entrepreneurial firm in which human capital ultimately predominates, the firm establishment needs two varieties of capital, i.e. human capital embodied in proprietary technologies and business administration capabilities, and material capital represented by the initial capital from the initial investor. At different phases of development, the two varieties of capital demonstrate different speeds of exclusivity presentation, which determine the changes in equity allocation between entrepreneurial management and initial investor. The initial capital is relied on to support daily operation when the technology-based entrepreneurial firm focuses on transforming proprietary original technologies into differentiated products. At this incubation phase (Phase I), the initial capital faces significant incidental risks and demonstrates strong exclusivity because of its rareness and indispensability. Naturally, the initial investor, who identifies the potentials of the original technologies and decides to provide financial support, becomes the holder of such exclusivity capital and possesses control shares of the firm. When the firm succeeds in transferring the original technologies into products of differentiation, and the products are acknowledged and accepted on the market, it steps into the phase of development. In this phase, the products provide increasing support to the firm's potentials of development and the entrepreneurial management needs to leverage its capabilities and motivation to raise appropriate amount of fund to support the firm's market expansion. The presentation speed of human capital exclusivity increases gradually to a level equal to that of the initial capital. Signifying the Phase II, the entrepreneurial management holds equal shares with the initial investor. When the differential products are accepted on the market and the firm's business prospect is widely recognized, the risks of invested funds are reduced significantly and the firm enters into a phase of rapid growth. The technology-based entrepreneurial firm faces much less constraints of financing and lower threshold of capital injection. The exclusivity presentation speed of the initial investment sharply declines. The human capital, which supports the product differentiation, has evolved into the core competency to support the technology-based entrepreneurial firm to excel in the sector. Timely and adequately raise development funds that is increasingly important to support rapid development of the firm. Both the availability of financing and the design of financing structure are highly subject to the competency and motivation of the

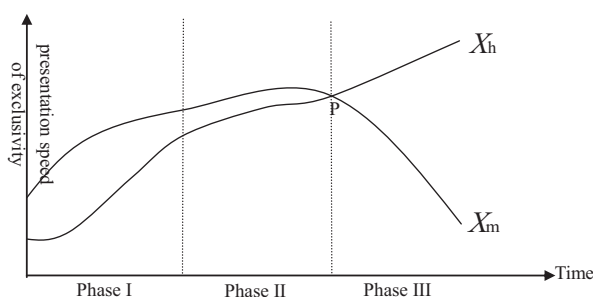


Figure 1.
Exclusivity presentation speed of material capital and human capital

entrepreneurial management. Therefore, the presentation of human capital exclusivity accelerates to a speed over the presentation of initial capital exclusivity (Phase III). The entrepreneurial management assumes absolute control shares at Point P.

4.2 Incentive equity allocation based on immediate surplus capital increment

4.2.1 Mechanism analysis of incentive equity allocation. A technology-based entrepreneurial firm, which has stepped out of incubation stage, achieved acceptance of product differentiation and attained profitability above-average of the industry and entered into a fast growth stage in which capital is crucial for quick pickup of market shares. CSRC's *Listed Companies Stock Incentive Management Rules* allows for only a small share of stock incentive to the management, which cannot motivate the entrepreneurial management to acquire adequate external financing at minimum equity costs. The entrepreneurial management does not have decision-making power while it believes that the incremental assets are fully attributable to their core technologies and performance of the management. That makes them feel unfairly treated and even break up with the initial investor in the worst case. Such undesirable situation may make the firm lost opportunities at a critical stage for quick growth, which is due to inadequacy of capital or instability of the entrepreneurial management. Therefore, it is necessary to study a new equity allocation model to suit technology-based entrepreneurial firms, which will emerge in huge amounts under the "mass innovation".

Different from ordinary enterprises, technology-based entrepreneurial firms are unique in two aspects. First, entrepreneurial management as the holder of core technologies plays a key role in the financing process. Meanwhile, members of the entrepreneurial team are keen on establishing their own business. Second, at a new stage of fast growth after technical incubation and trial marketing of products, the broad development potential results from product differentiation, and entrepreneurial management's competency and motivation are preconditions for raising capital to fund further development. So, the presentation speed of human capital exclusivity is higher than that of material capital (Phase III). At a technology-based entrepreneurial firm, the equity allocation shall change dynamically, and ultimately, entrepreneurial management takes the control equity. The above theoretical analysis concludes that it is more efficient and equitable to change the firm's equity allocation dynamically along with the changes in capital exclusivity. Accordingly, the equity allocation shall accommodate the need of the initial investor for appreciation of the startup capital and satisfy the expectation of the entrepreneurial management for establishing their own business. In this context, the paper suggests using the immediate surplus capital increment as the basis for equity allocation to the entrepreneurial management. The immediate surplus capital increment is calculated as an immediate total capital as a performance result of the total acquired fund of the firm minus the total financed capital minus the startup capital and the startup capital appreciation at level of debt financing costs. [Figure 2](#) demonstrates a conceptual model of incentive equity allocation to the entrepreneurial management.

Total immediate capital comprises startup capital, total financed capital, startup capital appreciation and immediate surplus capital increment. Surplus capital increment is the remainder after deducting startup capital appreciation. At an earlier stage, the firm relies on initial investment to maintain on-going operation, while the startup capital faces significant contingent risks. The initial investor holds a great majority of the equity shares for its initial investment while the entrepreneurial management holds only a small portion of the shares. Along with the firm stepping into fast growth, timely acquisition of adequate financing becomes a key to support the fast development. Success of financing and rational financing

structure design depend on the management's high extent competence and motivation. A technology-based entrepreneurial firm relies more on core technologies to sustain product differentiation. To best leverage the management's capabilities and initiative for adequate external financing and sustained passion for technology R&D, the entrepreneurial management must be awarded such shares of equity that match with their wisdom, competencies and even life-time devotion. The immediate surplus capital increment is an embodiment of such wisdom and devotion at a certain period of operation. Appreciation of immediate surplus capital represents the presentation speed of technical capital exclusivity. The initial capital contributed by the initial investor is materialized in the firm and bears capital risks and is therefore entitled to surplus profits. As the immediate surplus capital increment accumulates, the management's share of equity may exceed that of the initial investor to reflect that the firm relies more on core technologies and business administration capabilities than the initial investment. Table IV depicts the principle of capital and equity changes under the equity allocation based on immediate surplus capital increment.

4.2.2 Critical point of equity reversal. When the equity reversal, the entrepreneurial management to achieve the original intention that create their own business. Following the above principles of equity allocation, the paper calculates the critical point of immediate capital for equity reversal. Below are the assumptions:

- A1. The immediate surplus capital increment ΔC is total immediate capital C minus startup capital C_0 , startup capital appreciation αC_0 and total financed capital C_1 .
- A2. Startup capital C_0 comprises initial investment γC_0 from the initial investor and technical capital $(1 - \gamma)C_0$ of the entrepreneurial management.

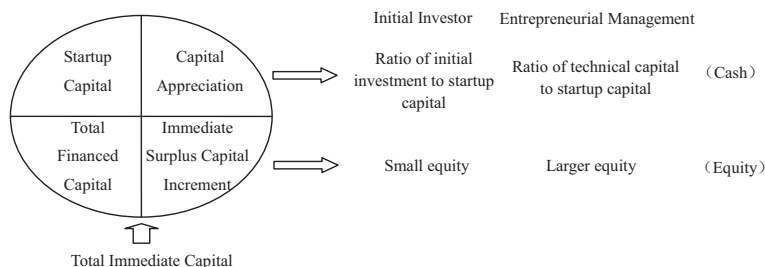


Figure 2. Conceptual model of incentive equity allocation to entrepreneurial management

Stage	Equity change	Equity allocation
Fast growth	Capital in continuous appreciation Immediate surplus capital increment increased	Initial investor receives appreciation of initial investment and distribution from immediate surplus capital increment Entrepreneurial management receive appreciation of technical capital and distribution from immediate surplus capital increment, with shares of equity growing
Fission growth	Capital in continuous appreciation Immediate surplus capital increment in huge amount	Initial investor receives appreciation of initial investment and distribution from immediate surplus capital increment Entrepreneurial management receive appreciation of technical capital and distribution from immediate surplus capital increment, with shares of equity growing, even to over the shares of initial investor

Table IV. Principle of capital and equity changes with immediate surplus capital increment

A3. Both the initial investor and entrepreneurial management receive distribution of immediate surplus capital increment, at proportion of β for the initial investor and $1 - \beta$ for the entrepreneurial management. β is as agreed between initial investor and entrepreneurial management at the range of $0 < \beta < 1/2$, which allows the entrepreneurial management to hold more equity shares than the initial investor.

From AI , $\Delta C = C - (1 + \alpha)C_0 - C_1$. If the technology-based entrepreneurial firm steps into the stage of fast growth, i.e. $\Delta C > 0$, the entrepreneurial management receives distribution of immediate surplus capital increment at proportion of $1 - \beta$. The total amount of immediate capital of entrepreneurial management is $(1 - \beta)[C - (1 + \alpha)C_0 - C_1] + (1 + \alpha)(1 - \gamma)C_0$, while that of initial investor is $\beta[C - (1 + \alpha)C_0 - C_1] + (1 + \alpha)\gamma C_0$. When and only when the entrepreneurial management receives more distribution of "immediate surplus capital increment" than the initial investor, the former holds more shares of equity than the latter. The equation is:

$$Y = (1 - \beta)[C - (1 + \alpha)C_0 - C_1] + (1 + \alpha)(1 - \gamma)C_0 \\ - \beta[C - (1 + \alpha)C_0 - C_1] + (1 + \alpha)\gamma C_0 > 0$$

Evolved to:

$$C > (1 + \alpha)C_0 + \frac{(2\gamma - 1)(1 + \alpha)}{1 - 2\beta}C_0 + C_1$$

As known from above, the entrepreneurial management will hold more shares of equity than the initial investor when they realize the earnings of $\frac{(2\gamma - 1)(1 + \alpha)}{1 - 2\beta}C_0$ after satisfying the demand of startup capital appreciation and acquiring the intended external financing.

Evidently, immediate surplus capital increment constitutes the theoretical foundation for fair quantized equity allocation of entrepreneurial management. It satisfies the demand of initial investor for the initial investment appreciation and also allows the entrepreneurial management to realize the expectation of establishing their own business by increasing the immediate surplus capital increment. Furthermore, the total immediate capital C is relative to the initial investor's share β to the immediate surplus capital increment and the expected appreciation rate α of startup capital. α is relatively objective as it is calculated by the financing costs of ordinary debt. Therefore, the total immediate capital C is more closely related to β .

4.2.3 Suggestions on proportion of immediate surplus capital increment. At the beginning, the technology held by the entrepreneurial management is yet to evolve to differential products. The underlying market share or competitiveness is uncertain, which imposes the significant risks of capital on the initial investor. In accordance with directives of technology for share of the PRC Ministry of Science and Technology, the entrepreneurial management contribute technologies to the firm and hold a share of equity around 30 per cent and the initial investor holds around 70 per cent shares of equity for capital contribution. When the firm at the phase of quick development, substantial capital is needed to support fast growth and the management's capabilities of financing and R&D become the key to sustainable development. The paper, with reference to 30 vs 70 per cent equity allocation under the above directives of technology for share of the PRC Ministry of Science and Technology suggests that the immediate surplus capital increment can be distributed at $\beta = 30$ per cent, i.e. the entrepreneurial management receiving 70 per cent and the initial

investor 30 per cent. This ratio of distribution awards the initial investor the rights to benefit from the immediate surplus capital appreciation besides appreciation of the initial investment. Meanwhile, it allocates 70 per cent of the immediate surplus capital increment to the entrepreneurial management, making it possible that the management may hold more shares of equity than the initial investor to realize the expectation of establishing their own business.

Equity allocation based on the immediate surplus capital increment has the following advantages:

- It recognizes the capabilities and motivation of the entrepreneurial management, who in turn are willing to make the best efforts as owner of the firm to maximize the firm's earnings to get the highest possible share of equity.
- It sustains dynamic equity allocation and stabilizes the entrepreneurial management tend to pick up ownership of the firm.

4.3 Financing structure design under the equity allocation principle of immediate surplus capital increment

Empirical analysis shows that management shareholding regulates debt financing upwards and equity financing downwards, which concurs with the technology-based entrepreneurial firm's financing orientation to minimize equity dilution and maximize financed amount. Enhancement of capital operation results provides empirical evidence that equity sharing can motivate the entrepreneurial management to better capital operation. This sets a theoretical foundation for technology-based entrepreneurial firms to adopt equity allocation to optimize financing structure. As the equity allocation principle of immediate surplus capital increment, the entrepreneurial management and initial investor are significantly apt for debt financing as they both prefer not to dilute the shares that they currently hold.

Both the entrepreneurial management and initial investor tend to avoid equity financing and prefer debt financing, as the former wish to avoid dilution of the firm's equity for purpose of establishing their own business and the latter wishes to maintain the firm's equity integrity to sustain dividend earnings. The immediate surplus capital increment approach to equity allocation can motivate the entrepreneurial management to prepare business plans, convincing the financial market with the firm's potentials and prospects and laying sound foundation for debt financing. Meanwhile, the sustainable high immediate surplus capital increment promised by the firm's prospect drives the initial investor to pledge for the firm's debt financing with their financial strength and prestige on the market so that their shares will not be diluted. Evidently, the equity allocation based on immediate surplus capital increment leads both the entrepreneurial management and the initial investor to prefer debt financing, thus making it easier for the firm to adopt debt financing. Thus, the paper puts a financing structure depicted in [Figure 3](#), which ensures expected interests of the initial investor and facilitates stability of the entrepreneurial management.

Product differentiation and promising future of the firm give the initial investor reasons to expect huge capital appreciation. So, the initial investor is willing to acquire additional equity, and the firm can thereby receive additional fund by increasing equity. Different from the initial investor, the entrepreneurial management needs to raise bank debt to acquire the firm's equity. The initial investor will leverage their financial strength and market credit to provide pledge to the entrepreneurial management for bank loan, thus transferring the debt service pressure to the management. As the borrower is the entrepreneurial management, the firm is not directly liable for the debt service. Under the above financing structure, the initial investor acquires additional equity of the firm with its own fund and the

entrepreneurial management purchases additional equity by raising bank debt, both contributing cash to the firm. For technology-based entrepreneurial firms, the equity does not flow to outside and is maintained in integrity through internal equity financing. The bank, through the entrepreneurial management and under pledge from the initial investor, supplies fund to support the firm's development. As the bank does not hold any equity of the firm, the cash flows in as external debt financing. The above financing structure avoids "equity for fund" and maintains equity integrity for the initial investor and entrepreneurial management.

5. Conclusions and contribution

For a technology-based entrepreneurial firm, external financing is the only approach to acquiring capital needed for growth from a small firm to a large corporation. Acquiring external financing in a timely manner and at reasonable terms and establishing an optimal financing structure depend on the entrepreneurial management's competency and motivation, while the performance is determined by the pattern of equity allocation agreed between the initial investor and entrepreneurial management. The paper studies China's listed high-tech enterprises, where the stock-based incentive mechanism upwardly regulates debt financing and downwardly regulates equity financing, gives consideration to characteristics of technology-based entrepreneurial firms, explores the principles of equity allocation to the entrepreneurial management and further designs a financing structure involving equity allocation. The conclusions are as follows.

First, with reference of fairness preference theory and Maslow's hierarchy of needs and incomplete contract theory, the paper introduces the concept of capital exclusivity and suggests that capital exclusivity is the major factor that influences the equity allocation. Then, the paper analyzes the theoretical mechanism of human capital-led equity allocation and adapts it to technology-based entrepreneurial firms. Finally, the paper puts forth the equity allocation principle that the equity shares of the entrepreneurial management changes along with the presentation speed of capital exclusivity.

Second, the immediate surplus capital increment precisely reflects the wisdom and efforts of the entrepreneurial management and represents the presentation speed of technical capital exclusivity. It is the basis of equitable quantized benchmark for equity allocation. By model deduction, the paper suggests:

- that the entrepreneurial management will be able to hold majority shares of equity if they create the capital equal to $\frac{(2\gamma-1)(1+\alpha)}{1-2\beta} C0$; and
- allocating the immediate surplus capital increment by the proportion of $\beta = 30$ per cent, which gives balanced consideration to the importance of the entrepreneurial management's competencies and the initial investor's capital risks.

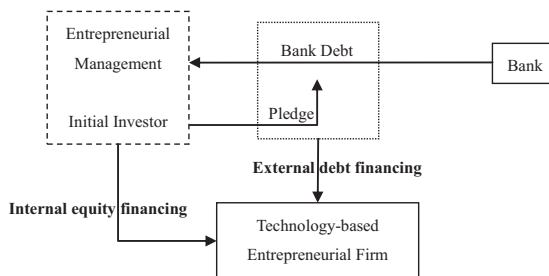


Figure 3.
Financing structure design

Finally, the paper puts forth a financing structure that the initial investor pays additional capital and provides pledge for the entrepreneurial management to raise loan to purchase additional shares. The proposed financing structure satisfies the demand of capital of a technology-based entrepreneurial firm and guarantees the integrity of its equity.

The paper, using capital exclusivity as an entry point, demonstrates the mechanism of dynamic equity allocation of the technology-based entrepreneurial firm, laying the theoretical foundation for studies on human capital-led equity allocation. An equity allocation model based on the concept of immediate surplus capital increment and a financing structure featuring internal equity and external debt guarantees the initial investor's expectation for interests, helps ensure stability of the entrepreneurial management team and enhances the motivation of core technical team. This paper can provide a theoretical basis to solve the problems in China that technology-based entrepreneurial firm is difficult to achieve sustainable development because of the difficulty to obtain sufficient funds, then lost the development opportunities, or the entrepreneurial management leave due to unfair distribution.

Conclusions of the paper have considerable practical significance. To a technology-based entrepreneurial firm emerging in "mass entrepreneurship and mass innovation" scheme, competitiveness is determined by product differentiation evolved from original technology, and speed of growth is determined by timely acquisition of capital. The entrepreneurial management takes charge of both technology R&D and business administration. Their competency and motivation are keys to the development of differential products and timely acquisition of external capital. Conclusions of the paper induce the entrepreneurial management to focus on developing differential products and establishing rational financing structure so that the firm grows smoothly on the market with differential products and sufficient capital, and ultimately satisfies the initial investor's expectation for capital appreciation and realizes the entrepreneurial management's dream of establishing their own business.

References

- Amabile, T.M. (1993), "Motivational synergy: toward new conceptualizations of intrinsic and extrinsic motivation in the workplace", *Human Resource Management Review*, Vol. 3 No. 3, pp. 185-201.
- Amabile, T.M., Hennessey, B.A. and Grossman, B.S. (1986), "Social influence on creativity: the effects of contracted-for reward", *Journal of Personality and Social Psychology*, Vol. 50 No. 1, pp. 14-23.
- Beck, T., Demircuc-Kunt, A. and Maksimovic, V. (2005), "Financial and legal constraints to firm growth: does firm size matter?", *The Journal of Finance*, Vol. 60 No. 1, pp. 137-177.
- Bettignies, J.E. and Brander, J. (2003), "Financing and advising: optimal financial contracts with startup capitalists", *The Journal of Finance*, Vol. 58 No. 5, pp. 258-285.
- Branch, B. (1974), "Research and development activity and profitability: a distributed lag analysis", *Journal of Political Economy*, Vol. 82 No. 5, pp. 999-1011.
- Chen, K.Y. (2015), "Listed companies technical innovation, financing and growth", *Science Research Management*, Vol. 3, pp. 64-70.
- Chen, Z.Q. and Yang, L.Y. (2015), "Financing structure, R&D expenditures and growth profile of medium & small-sized enterprises", *Research on Financial and Economic Issues*, Vol. 9, pp. 44-51.
- Cheng, S. (2004), "R&D expenditures and CEO compensation", *Accounting Review*, Vol. 79, pp. 305-328.
- Dai, J., Yin, N.A. and Feng, G.F. (2010), "Research on high-value technical professionals equity shares assessment", *Statistics and Information Forum*, Vol. 12, pp. 82-85.
- Dehning, B., Richardson, V.J. and Richardson, T. (2005), "Information technology investments and firm value", *Information & Management*, Vol. 42 No. 7, pp. 989-1008.

- Gao, G.P. and Zhao, T. (2010), "Human capital valuation model under 'risk – return' equivalence theories", *Soft Science*, Vol. 8, pp. 91-94.
- Green, F. (2004), "Why has work effort become more intense?", *Industrial Relations: A Journal of Economy and Society*, Vol. 43 No. 4, pp. 709-741.
- Greenwood, J. and Jovanovic, B. (1999), "The information technology revolution and the stock market", *American Economic Review*, Vol. 89 No. 2, pp. 116-122.
- Gu, J.P. and Wang, X.Y. (2014), "Study on performance-based remuneration, sense of self-efficacy for creativity and innovation behavior – based on empirical analysis of R&D team of high-tech enterprise in Jiangsu province", *Science and Technology Management Research*, Vol. 16, pp. 168-173.
- Hall, B.H. (2002), "The financing of research and development", *Oxford Review of Economic Policy*, Vol. 18 No. 1, pp. 35-51.
- Han, L.L., Li, K. and Xu, Y.K. (2008), "Pyramid structure, financing replacement and capital structure – empirical evidences from China's private listed companies", *Nankai Business Review*, Vol. 6, pp. 74-78.
- Hellmann, T. and Stiglitz, J. (2000), "Credit and equity rationing in markets with adverse selection", *European Economic Review*, Vol. 44 No. 2, pp. 281-304.
- Hu, J. (2011), *Research on the Theory of Enterprise 's Control*, Jilin University, Changchun.
- Hu, Z.H., Xiong, Y. and Shen, T. (2015), "Empirical study on influence of enterprise behaviors and management incentives on R&D expenditures – based on examples of listed companies in manufacturing sector", *Systems Engineering*, Vol. 7, pp. 1-11.
- Ko, J.L., Zhang, B.W. and Sun, J.M. (2007), "General manager replacing, senior management restructuring and enterprise performance improving", *Nankai Business Review*, Vol. 4, pp. 104-112.
- Larraze-Kintana, M., Wiseman, R.M., Gomez-Mejia, L.R. and Welbourne, T.M. (2007), "Disentangling compensation and employment risk using the behavioral agency model", *Strategic Management Journal*, Vol. 28 No. 10, pp. 1001-1019.
- Li, J., He, X.G. and Mao, J. (2010), "Genetic relationship, innovation capability and enterprise performance", *Nankai Business Review International*, Vol. 1 No. 3, pp. 117-124.
- Liao Zhongju, C.H., et al. (2014), "The influence factors and performance of firms' incentive measures of technology innovation", *Science Research Management*, Vol. 7, pp. 60-66.
- Li, H.D., Tang, Y.J. and Zuo, J.J. (2013), "Innovation with own or other's money – based on a study on financing structure and corporate innovation of China's listed companies", *Journal of Financial Research*, Vol. 2, pp. 170-183.
- Li, S. and Xie, X.Y. (2014), "Social responsibilities, political and debt financing of private enterprises – empirical evidences from China's capital market", *Nankai Business Review*, Vol. 6, pp. 30-40, 95.
- Li, W.A., Wang, P.C. and Xu, Y.K. (2015), "Charity donation, political connection and debt financing – resources interchange between private enterprises and government agencies", *Nankai Business Review*, Vol. 1, pp. 4-14.
- Lu, X., Zheng, Y.F. and Li, J.M. (2013), "Research into influences of financing constraints on enterprise R&D expenditures – empirical evidences from China's listed high-tech companies", *Accounting Research*, Vol. 5, pp. 51-58, 96.
- Lucas, R.E. Jr (1988), "On the mechanics of economic development", *Journal of Monetary Economics*, Vol. 22 No. 1, pp. 3-42.
- Luo, F.K. (2014), "On technical capital: the 4th capital of social economy", *Journal of Shandong University (Philosophy and Social Sciences)*, Vol. 1, pp. 63-73.
- Ma, W.C., Hou, Y. and Zhu, G.L. (2013), "Influence mechanism of R&D expenditures and staff incentives on innovation performance – based on comparative study on emerging industries and conventional industries", *Science of Science and Management of S&T*, Vol. 3, pp. 58-68.
- Maslow, A.H. and Green, C.D. (1943), "A theory of human motivation", *Psychological Review*, Vol. 50 No. 4, pp. 370-396.

- Mei, D.Q. and You, Y. (2012), "Study on correlation between entrepreneurship, innovation type and financing approach of high-tech enterprises", *Management Review*, Vol. 1, pp. 67-74.
- Merriman, K.K. and Deckop, J.R. (2007), "Loss aversion and variable pay: a motivational perspective", *The International Journal of Human Resource Management*, Vol. 18 No. 6, pp. 1026-1041.
- Myers, S.C. (1977), "Determinants of corporate borrowing", *Journal of Financial Economics*, Vol. 5 No. 2, pp. 147-175.
- Pepper, A. and Gore, J. (2015), "Behavioral agency theory new foundations for theorizing about executive compensation", *Journal of Management*, Vol. 41 No. 4, pp. 1045-1068.
- Porter, M.E. (1991), "America's green strategy", *Scientific American*.
- Qian, A., Yu, Z. and Bu, D. (2014), "Process fairness or result fairness? An empirical analysis of compensation incentives impact on labor turnover", *Research on Economics and Management*, Vol. 9, pp. 101-109.
- Qin, J.P. (2004), "On technical talents participating in distribution of enterprise earnings", *Economics and Management Research*, Vol. 2, pp. 63-67.
- Quan, X. and Wu, S. (2010), "Wen fang. Managerial power, private income and compensation rigging", *Economic Research Journal*, Vol. 11, pp. 73-87.
- Ren, X. (2001), "Influence of main inputs to technical innovation on innovative results", *Quantitative and Technical Economics*, Vol. 11, pp. 19-22.
- Roger, S. (2007), "Understand and acquiring technology assets for global completion", *The Novation*, Vol. 27, pp. 643-649.
- Rome, P.M. (1990), "Endogenous technological change", *Journal of Political Economy*, Vol. 98, pp. 71-102.
- Rossi, S. (2005), "Capital structure and the demand for corporate securities", Working paper.
- Rouvinen, P. (2002), "R&D productivity dynamics: causality, lags, and 'dry holes'", *Journal of Applied Economics*, Vol. 5, pp. 123-156.
- Ryan, H.E. and Wiggins, R.A. (2002), "The interactions between R&D investment decision and compensation policy", *Financial Management*, Vol. 31, pp. 5-29.
- Ryan, R.M. and Deci, E.L. (2000), "Self-determination theory and the facilitation of intrinsic motivation, social development and wellbeing", *American Psychologist*, Vol. 55 No. 1, pp. 68-78.
- Salomo, S., Gemunden, H.G. and Leifer, R. (2007), "Research of corporate radical innovation systems – a dynamic capabilities perspective: an introduction", *Journal of Engineering and Technology Management*, Vol. 24 Nos 1/2, pp. 1-10.
- Schumpeter, J.A. (1912), *The Theory of Economic Development*, Transaction Publishers, Piscataway, NJ.
- Sheng, M.Q., Zhang, C.Q. and Wang, Y. (2016), "Senior management stock incentive and capital structure dynamic adjustment", *Accounting Research*, Vol. 2, pp. 44-50, 95.
- Solow, R.M. (1956), "A contribution to the theory of economic growth", *Quarterly Journal of Economics*, Vol. 70 No. 1, pp. 65-94.
- Teece, D., Pisano, G. and Shuen, A. (1997), "Dynamic capabilities and strategic management", *Strategic Management Journal*, Vol. 18 No. 7, pp. 509-533.
- Thomas, H.D., David, W.D.L. and Michael, C.B. (1998), "Successful knowledge management projects", *Sloan Management Review*, Vol. 39, pp. 43-57.
- Wen, K. and Wu, D. (2003), "The abnormal encouragement of heterogeneous talents – an investigation report on the talent incentive mechanism of high – tech enterprises in Beijing", *Management World*, Vol. 10, pp. 110-114.
- Wright, P., Kroll, M., Krug, J.A. and Pettus, M. (2007), "Influence of top management team incentives on firm risk taking", *Strategic Management Journal*, Vol. 28 No. 1, pp. 81-89.
- Wu, J.Z. and Xiao, S.F. (2016), "Diversion of innovation attention, hops in R&D investment and enterprise performance – empirical evidences from China's A-listed companies", *Nankai Business Review*, Vol. 2, pp. 182-192.

- Wu, P., Kang, J.J., Qin, J.L. and Liu, C.J. (2014), "Options of high-tech firms financing – study based on different levels of technical innovation", *Science and Technology Management Research*, Vol. 24, pp. 96-100.
- Xiao, Z.P. (2010), "Ownership and control segregation degree, governmental interference and capital structure selection – empirical evidences from China's listed companies", *Nankai Business Review*, Vol. 5, pp. 144-152.
- Xin, C., Shi, C.S. and Wu, Z.G. (2008), "Structure-oriented organizational innovation, technical innovation and driving effect of organizational performance", *Research & Development Management*, Vol. 1, pp. 45-51.
- Xu, P. (2004a), "Technical R&D achievement for equity study series 2 – a way to determine the carried interest of technology provider", *Science and Technology Management Research*, Vol. 5, pp. 75-77.
- Xu, W.Q. (2004b), "A preliminary exploration of human capital participating earnings allocation", *Journal of South-Central University for Nationalities (Humanities and Social Sciences)*, Vol. 1, pp. 20-22.
- Xu, X.M. and Jin, Z.J. (2015), "Review on development of western technical capital theories", *Science and Technology Management Research*, Vol. 15, pp. 185-189.
- Yang, R.L. and Zhou, Y.A. (1997), A normative analysis framework for enterprise ownership arrangement and its implications – also a review of some viewpoints of Zhang Weiyang, Zhou Qiren.
- Yang, X., Tian, G.L., Si, Y. and Fonseka, M.M. (2016), "Ownership nature, enterprise political connection and private placement – based on empirical analysis of China's listed companies", *Nankai Business Review*, Vol. 1, pp. 134-141, 154.
- Yu, D.Y. and Gao, W.D. (2009), "Study on human capital for equity systems design for high-tech firms study", *Science & Technology Progress and Policy*, Vol. 24, pp. 125-129.
- Zeng, A.Q., Li, S.C. and Liu, Z.Y. (2004), "Research on associated reforms of China's high-tech enterprises ownership allocation system", *China Industrial Economics*, Vol. 5, pp. 105-112.
- Zhang, H.L. and Yao, B.S. (2014), "Study on asymmetrical influence of managers' management defense on capital structure adjustment – empirical evidence from China's listed companies in manufacturing sector", *Management Review*, Vol. 26, pp. 149-160.
- Zhong, T.L. and Hu, Y.B. (2014), "Influence of human capital characteristics on financing structure at high-tech entrepreneurial firms", *Science of Science and Management of S. & T*, Vol. 3, pp. 164-174.
- Zhou, F.Z., Fu, J.H. and Zhong, S. (2014), "External financing, enterprise scale and list companies technical innovation", *Science Research Management*, Vol. 3, pp. 116-122.

Further reading

- Guo, Y.Y. and Zhang, S. (2015), "Study on incentive mechanism for technical team to enjoy technical achievement transformation earnings distribution", *Science of Science and Management of S. & T*, Vol. 7, pp. 146-154.

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