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Research Article

The Practices of Sci-tech Finance Policy: Value-Orientation, Stimulation, and Value Creation

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Abstract:

The integration of science, technology, and finance is critical to the innovation and value creation of technology companies. In China, sci-tech finance policies have been formulated to support and help technology companies. Policy stimulus is becoming the key driver in different phases of value creation by providing complementary resources or reducing risk to technology companies. We propose a value-oriented, multidimensional framework to address the complex realities of the interplay between policy, technology companies, and value creation. The framework explains the impact of policy incentive and compensation mechanisms on the value creation of technology companies. An electrical manufacturing company was selected as an evidence-based example to validate the framework and display the expected results and unexpected consequences.

1. Introduction

The convergence of science, technology, and finance has opened up numerous opportunities for innovation among technology companies, enabling them to create more excellent value [1]. Supportive policies can enhance technological innovation by easing financing constraints and providing complementary resources. To transform ideas into reality, policymakers need to dynamically adjust policies through appropriate methods in response to the changing environments and business needs [2].

Unlike social or cultural public policies, sci-tech finance policies operate in an environment characterized by rapid technological change and highly volatile financial markets. Consequently, the effectiveness of sci-tech finance policies is subject to higher uncertainty. Effective policies facilitate coordination among stakeholders, thus making it crucial to allocate resources rationally and manage stakeholder relationships appropriately [3].

Governments worldwide have implemented policies to foster innovation and growth among technology companies, such as Germany's Sustainable Finance Strategy (2021) and High-Tech Strategy (2025). The Small Business Innovation Research (SBIR) program in the US is a highly competitive federal program that funds research and development (R&D) proposed by small businesses. By providing direct funding to small businesses, SBIR enables them to explore their technological potential and develop high-potential products and services.

Value creation of technology companies is not merely about managing limited resources and technological uncertainty [4]; governments must also consider policy inefficiencies resulting from policies that fail to meet the needs of technology companies. Without understanding the process of value creation and technology companies' requirements, policies may conflict or even undermine each other. This is significant because misguided and incoherent policy frameworks send mixed and contradictory messages [5] to companies.

Sci-tech finance is a unique concept in China, and policies have been enacted to assist and support technology companies [6]. Beyond fiscal policy

support, the policies have guided industry innovation and facilitated the development of multi-channel capital markets. Policy focus has shifted from increasing the quantity of technology companies to improving the quality of their development, and from increasing financial profitability to creating value.

This study focuses on sci-tech finance policies and discusses the impacts in the various phases of value creation of technology companies. From the perspective of technology companies, we examine how incentive and compensation mechanisms influence the realization of the value of technology companies. Within a broader transformative framework, we focus on the framework of policy interventions. Based on value-orientation, we propose a multi-dimensional framework to address the complex reality of the interplay between policies, technology companies, and innovation. An electrical company was selected to validate this model, demonstrating policy stimulation's direct and derivative effects. The findings can help policymakers choose effective stimulation methods and enhance policy coherence [7].

2. Literature Review

2.1 Value Creation

The concept of value creation has been explored from various perspectives in the literature. Traditional theories suggest that value originates from producer labor [8], and that the entry point for value creation is technology or market needs [9]. Value creation typically encompasses activities that lead to increased revenue, reduced costs, improved efficiency, and competitive differentiation. However, this concept has been underestimated as it adopts a static scope of research [10]. From a dynamic perspective, the focus of value creation lies in activities. This expanded concept has contributed to a new understanding of the boundaries of value creation among researchers.

The literature on value creation is now highly diversified. Divergences in value creation perspectives often stem from the context and focus of the literature. With the advancement of IT (information technology), the centre of value creation has shifted from individual companies to supply chains and financing systems [11, 12].

A recent approach links the value creation to utilitarian welfare functions [13, 14]. These methods believe that there is an optimal combination of policies to achieve mutual maximization of qualitative and relational wealth through value creation [15]. Value is primarily created when firms meet social needs by efficiently producing goods and services while avoiding unnecessary negative externalities.

The path to value creation may originate from complex innovations that are difficult to transfer, such as knowledge and technology, or from cooperative processes like resource association and mergers [16]. From a value chain perspective, consumer demand is driven by external forces [17]. The cooperation between companies and partners, coupled with the linkage mechanism of the government, can significantly improve performance and maximize the value creation of companies [18]. From stakeholders' perspective, value is created by leveraging complementary resources, mutually beneficial relationships [19], and a combination of trust and specific assets [20].

2.2 Policy Stimulation

When value creation occurs, the boundaries between tech companies and stakeholders are dynamic. In other words, stakeholders change over time [10] because they have different regional and institutional backgrounds, phases of development, business models, and motivations [21]. For the actors involved in the value creation of tech companies, this process provides opportunities for collaboration. They integrate complementary resources by providing services in exchange for additional resources [22]. In this virtuous cycle, actors not only have the ability to create their share of value, but also to capture more value by synergizing with other actors in the value network [23].

These demands shape the different directions of government stimulus. Some technology finance policies adopt an incentive mechanism, providing companies with opportunities to increase competitive resources and innovative advantages [24], such as policy-based innovation projects, government subsidies, and government venture capital. Other stimulus policies use compensation mechanisms to compensate technology companies for potentially risky losses in their value-creating activities, thereby reducing uncertainty. Such policies usually require market institutions to act as intermediaries to achieve government objectives. For example, some policies use emerging tactics to compensate banks for risk losses and push them to extend credit to technology companies. In this multi-link stimulus process, the direct target of the policy's risk loss compensation is financial institutions. However, it is technology companies that ultimately benefit. They can borrow from banks more efficiently, even if they are light-asset and high-risk [25]. Policy guarantees have smoothed out the possible risk losses of financial

institutions [26]. Industrial bases and incubators have been established to help technology companies reduce production costs and risks in recent years.

A good availability regime is a prerequisite for ensuring actors play their roles [27]. For market intermediaries, policy compensation needs to ensure that the resource providers of these technology companies are interested in stimulus policies. [28]. Government intervention frequently involves new industrial paradigms to address societal demands [29].

However, government intervention is far from "neutral" [30], as the selective allocation of resources may be detrimental to some industries and technology companies. Due to the policy distortions and financial frictions caused by numerous sci-tech finance policies [31], it may lead to misallocation of resources. This leads to arbitrage opportunities, encourages rent-seeking behavior, and reduces innovation and value creation of technology companies [32].In reality, irrational policies can lead to mutually exclusive effects or undesirable consequences in technology companies, such as crowding-out effects or policy dependency.

2.3 Sci-tech finance policy

Most research on sci-tech finance policy focuses on its impact on the macro-environment. Some studies have examined the effects of science and sci-tech finance policies on industry structure [33], regional economy [34], resource allocation [35], and innovation talents [36]. A few studies delve into the nature of sci-tech finance and the formulation of sci-tech finance policies [37, 38].

There are few theoretical studies on how sci-tech finance policies affect the financing outcomes of technology companies through financial markets [39]. Due to the lack of a solid methodological basis, the findings remain fragmented [40].

Value creation of technology companies is not merely about managing limited resources and technological uncertainty [4]; governments must also consider policy inefficiencies resulting from policies that fail to meet the needs of technology companies. If we do not consider the mutual influence of macro and micro environments, it is impossible to correctly understand the factual background and operational logic of sci-tech finance policies [41].

Therefore, this study aims to investigate how sci-tech finance policies stimulate technology companies to engage in value creation, from a perspective that integrates both macro and micro viewpoints. This approach will enable an in-depth understanding of the factual context and operational logic of sci-tech finance policies.

3. Method

In the implementation process of sci-tech finance policy, factors may be ignored by quantitative data or are challenging to quantify. For example, the needs of financiers, conflicts between different organizations, the complexity of the market environment, and the distribution of interests may potentially impact the effectiveness of the policy's implementation. Therefore, this study uses a case study to investigate the practice of sci-tech finance policy and adopts an exploratory philosophy [42] to define problems, construct validation within-case analysis, and replicate logic.

The single case study is primarily in-depth research on phenomena to provide a new interpretation of a construct or theory in a specific context. The theory elaboration can be used for an extreme case or an opportunity for unusual research [43]. Therefore, the evaluation criteria of a single case study mainly include the degree of contextualization, abstraction, and description thickness [44]. It is hoped that a theoretical framework with high logical coherence [45] can be obtained based on convincing evidence.

We selected a data-rich technology company to conduct an empirical analysis of the framework for the practice of sci-tech finance policy. The company SF was established in 1994. It is a power equipment company focusing on the innovation and manufacturing of power generation, transmission, and distribution equipment. The company has over 3,000 employees and total assets exceeding $1.1 billion.

This case contains a wealth of information related to the stimulus of sci-tech finance policies and can provide a rich perspective and comprehensive interpretation for the research. By delving deeply into the research topic, this study can better understand the practical effects of the value-orientation and stimulation mechanisms of sci-tech finance policies.

4. The Evolution of Sci-tech Finance Policies in China

Sci-tech finance is a unique term in China. Early research was relatively superficial, focusing on the instrumental nature of the relationship between science, technology, and finance [46]. Later researchers elaborated on the meaning of sci-tech finance from four perspectives: innovative activities, the technology-economy paradigm, the

capitalization process, and the composition of financial capital [47]. Other scholars have expanded this concept from the perspectives of financing activities [48], institutional arrangements [49], and financial business models [50]. Although there is no consistent definition, it is generally agreed that sci-tech finance is a system composed of financial instruments, policies, and services [51] that increases innovation opportunities for technology companies and broadens their access to funding.

China began experimenting with integrating science and technology into finance as early as the 1980s. After three decades of development, sci-tech finance has become a key component of China's macroeconomic landscape. In 1985, the People's Bank of China and the State Council jointly issued the "Notice on Actively Developing Science and Technology Credit," marking the beginning of China's sci-tech finance policies. In 2006, the State Council issued the "Outline of the National Medium and Long-Term Program for the Development of Science and Technology (2006-2020)," proposing the establishment of sci-tech finance cooperation platforms. Table 1 shows the five stages of the evolution of China's sci-tech finance policies.

Table 1. *Stages in the development of sci-tech finance policies in China*

Stage	Marking event	Stage characteristics
1985—1992	"Joint Notice on Actively Developing Science and Technology Credit" policy	The emergence of sci-tech finance Loans in the capital markets
1993—1998	First appearance of the term "Sci-tech Finance"	The emergence of venture capital in the capital markets
1999—2005	The setting up of the Small and Mid-cap Stock Plate on the Shenzhen Stock Exchange	Focus on venture capital investment in small and medium-sized enterprises (SMEs)
2006—2012	"Outline of the National Development Plan of Medium and Long Term on Science and Technology"	The emergence of a series of financial instruments such as sci-tech insurance, sci-tech guarantees, and intellectual property pledges
2013 ongoing	The establishment of the National Equities Exchange and Quotations	Broadening the equity financing channels for technology companies, with a focus on the multi-level capital market

As the environment changed, the policy focus shifted to combining government strategy and market forces. As a result, many technological finance policies that integrate innovation and resources into the financial market mechanism have emerged, reflecting policymakers' thinking on the rationality of policies [52]. These policies promote the enthusiasm of market institutions to participate in the innovation of technology companies and have become an essential driving force for value creation in technology companies [37].

5. Framework of Sci-tech Finance Policy Stimulating Value Creation

5.1 Value-Orientation of the Sci-tech Finance Policy

Some policies are mission-oriented, which were initially conceived as big science for solving big problems [29]. Mission-oriented policies are often associated with radical technological breakthroughs [53]. Additionally, the focus on the "challenge-oriented" [54] of innovation policy is gaining traction. The focus is on improving equity and overall outcomes for general public policies, such as those related to population or poverty.

This study posits that sci-tech finance policies are unique, as they are neither mission-oriented nor challenge-oriented. The efficiency of sci-tech finance policies is evaluated based on a utilitarian understanding, comparing inputs and outputs. The activity is considered effective if the output is satisfactory relative to the input. This differs from Pareto efficiency, which requires that an activity improves someone's welfare without making anyone else worse off. Standard fiscal policies are often small-scale, marginal interventions, emphasizing short-term risk compensation[55]. But sci-tech finance policies are far more ambitious. They address market failures such as information asymmetry, transaction costs, and frictions in competitive markets [56]. Policies aim to stimulate technology companies to generate more value

through innovation, and thus require a longitudinal, comprehensive value orientation.

The "value-orientation" is about constructing a series of stimuli to provide direction and resources to raise technology companies' expectations for value growth, catalyzing activities that would otherwise not occur. The value-orientation approach breaks through the policy dichotomy. With value creation as the core, it constructs a multidimensional framework from goals, methods, and regulations. In making sci-tech finance policy, the role of government is not to run companies but to inspire innovation and capture value. By meeting the diverse needs of technology companies in the process of value creation, the government borrows new tools and technologies to stimulate innovation in an environment of uncertainty.

5.2 Two Stimulation Mechanisms of the Sci-tech Finance Policy

Therefore, sci-tech finance policies need to consider how to stimulate both the supply and demand sides of innovation value.

Incentive is the positive stimulation, which utilizes incentive mechanisms to directly or indirectly provide complementary resources to technology companies, such as providing funding to technology companies through government venture capital (GVC) or constructing policy-driven innovation projects. The primary purpose of the incentive system is to increase the confidence of technology companies to innovate, which opportunity costs cannot constrain. Under this policy incentive, the technology companies will obtain supplementary resources above the opportunity cost if they innovate successfully.

The other is a defensive [55] stimulation, which utilizes compensation mechanisms to reduce risks for technology companies through cooperation with market institutions, for example, by using government guarantee funds to lower the threshold for banks to lend to technology companies. Compensation mechanisms are a conservative strategy for minimizing the risk of failure in technology companies' innovations. Table 2 shows a comparison of two stimulation mechanisms.

Table 2. *Comparison of two stimulation mechanisms.*

	Incentive	**Compensation**
Type	Positive	Defensive
Government Role	Resource Provider	Risk Sharer
Executing Agency	Government Agency	Government Agency + Market Institution
Risk Attitude	Accept and encourage failure as a learning tool	High risk aversion; Assume optimistic bias

5.3 Key Drivers in Policy Stimulation Mechanism

It should be noted, however, that sci-tech finance policy stimulation should not only focus on improving the conditions for company investment but also stimulate the desire for innovation and guide the direction of future growth for enterprises [55]. If technology companies are confident about the future, they will invest and seek innovation. However, they are less likely to do so if they see limited market opportunities [57].

Consequently, the key driving factors in the sci-tech finance policy stimulation come from both policy and technology companies.

Governments possess vast social and public resources that are crucial for technology companies to create value [1]. Cooperation among stakeholders is essential in resource allocation. Value creation is not static, as regional environments, institutional backgrounds, business models, and motivations constantly change. For technology companies, key stakeholders include institutions involved in policy incentives or subsidy programs, such as banks, insurance companies, human resource training institutions, and incubators.

The different motivations of stakeholders can lead to complex and dynamic interactions within the policy path (Moktar, 2018), so a strong enforcement mechanism is necessary to maintain actors' participation. As the embodiment of strategy, these value-oriented rules identify actors and construct guiding principles for stimulation.

Incentive policies provide technology companies with scarce resources such as capital, talent, knowledge, and innovation opportunities. Their existence and interaction are key resources for successful value creation. The compensation mechanism requires stakeholders to act as intermediaries, and the related policies usually focus on the coordination of financial institutions and the construction of value transformation platforms. Technology companies can reduce operational uncertainty by moving into incubators or technology conversion bases. In the financial market, policy-based compensation institutions

provide a safety net for the risk control of financial institutions through financial means such as government guarantee/reguarantee [26]. The indirect consequence of the compensation mechanism passed on to technology companies is that they can obtain loans more efficiently or reduce production costs.

Similar to non-technology companies, the drivers for technology companies include resource acquisition, risk control, and cost reduction [58, 59]. These factors contribute to more significant opportunities for technology utilization, reduced losses, and increased profits. Unlike non-technology companies, however, technology companies are characterized by innovation. Therefore, the drivers inevitably include knowledge acquisition and continuous learning, which help technology companies maintain their innovation capabilities and competitive advantages. However, knowledge itself does not directly create wealth. To transform advanced knowledge innovations into value, technology companies primarily engage in technology transfer, production, and commercialization. In this way, technology companies capture commercial value and achieve technological spillovers and an increase in social wealth. Therefore, the final driver is the establishment of a comprehensive value-capturing process.

In the five drivers, value maximization and risk minimization are the core incentives [60]. Technology companies weigh the benefits against the costs, and stakeholders stimulated by sci-tech finance policies usually compensate for the gap. Adequate resources and reasonable policy compensation are crucial for reducing negative emotions.

Based on the above analysis, Table 3 summarizes the key drivers in the policy incentive mechanism.

Table 3. *Key drivers in the policy stimulation mechanism*

	key drivers	**Description**
Policy	Policy implementation rules	Created by the policy module, identifying stakeholders, and integrating various solutions
	Incentive	Replenishing scarce resources; Providing opportunities for innovation
	Compensation	Reducing risk; Compensating for losses
Technology companies	Obtaining complementary resources	Taking advantage of opportunities; Maximization of financial value
	Risk sharing	Reducing uncertainty and possible damage
	Reducing transaction costs	Increased profits; Sustainable development
	Acquires knowledge and continuous learning	Competitive advantage: Continuous ability to innovate
	establishing a comprehensive value-capturing process	More consistent technology transformation; Commercialization of value

5.4 The Model

Sci-tech finance policies are typically supported by significant, non-refundable public funds [61], and policy implementation rules usually play a key role. The knowledge innovation of technology companies cannot be separated from the industry trend. There is usually a strong core[62] that defines the direction of industry innovation, breaks down tasks, and allocates resources. Policymakers use the kingpin's technology strategy as the stimulus direction. Compared with government subsidies, technology companies in the industry emphasize replenishing key resources and increasing intangible assets [63]. Therefore, they are willing to expand their innovative capacity by participating in important research projects provided by the sci-tech finance policy. However, for some SME technology companies, the inability to participate in these complex studies has become a bottleneck for innovation.

Policies that address value transformation cover the entire production process, aiming to facilitate the transition from knowledge innovation to product realization. These policies could include: 1) guarantee/reguarantee to reduce the risk of bank loans, 2) tax cuts to reduce costs for technology companies, 3) technology transfer bases and service platforms, and 4) emerging financing strategies, such as supply chain finance and intellectual property pledge. In these policies, the government plays the ultimate risk-sharing role. Through policy compensation, technology companies use low-risk and low-cost external resources to transform intangible knowledge innovation into tangible products. A well-functioning market is crucial for technology companies. Some sci-tech finance

policies that optimize the business environment will make companies' commercialization more efficient. These policies help technology companies attract talent, secure collaboration opportunities, and nurture partner relationships. Monopoly poses a significant challenge in this phase, as it can make policy stimulation vulnerable [64]. Therefore, decentralization is essential for equality in the business environment. Through policy guidance and market operation, technology companies can successfully acquire commercial and social value, which is also part of the policy promotion goal [65].

Due to multiple goals, conflict and disharmony often exist between technology companies and their resource providers. And policy plays a key coordinating role in minimising divergent interests and managing conflicting values [66]. Compensation and incentive policies promote the flow of innovation resources. Figure 1 depicts how technology finance policies stimulate technology companies to create value and thus capture value. In this framework, the alignment of policy objectives with the needs of technology companies is a key feature.

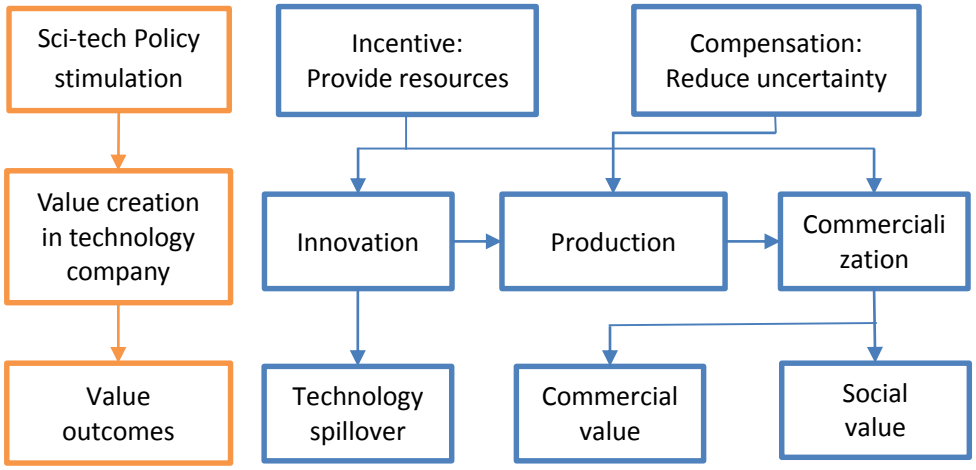

Figure 1. *The model of stimulating progress on value creation by sci-tech finance policy*

Value-oriented policy mainly focuses on incentive and compensation mechanisms. Incentives are rewards given to technology companies for their participation in innovation, while compensation mitigates potential losses that actors may suffer. Together, these mechanisms facilitate the operation of value creation.

The incentive policies provide technology companies with resources such as intelligence, patents, and an environment for innovation. The actors of knowledge innovation form an internal dependence structure according to the development trend of the industry, and may form technology spillover. With the support of compensation policies, the production system transforms knowledge innovations into products linearly at lower risk and cost. Decentralized policies encourage commercial markets to remain open, generating both commercial and social value. Positive feedback from the market promotes the continuous operation of value creation, forming a virtuous cycle. The spillover effect of the last round of innovation has brought about technology and resource updates, followed by the development of the entire industry. As social values increase, the goals of policymakers are achieved.

6. Case Study

6.1 Case Selection

To evaluate the impact of sci-tech finance policies on value creation in technology companies, we conducted a case study, selecting a data-rich entity for practical analysis. The selection criteria were: 1) a highly innovative technology company, 2) a manufacturing enterprise, and 3) established for over ten years and benefiting from multiple sci-tech finance policies. Beijing SF Automation Co., Ltd. (SF) was selected. Its customers include many power generation technology companies and large-scale industrial users of smart grid, thermal, hydro, nuclear, and new energy power. SF operates five subsidiaries, including one in Beijing, one in Nanjing, and three in Hebei Province (near Beijing). Therefore, this study examines the overall impact of tech finance policies and compares the differences between Beijing and neighboring regions.

6.2 The phases of the company's growth and policy stimulus

The development of SF is divided into three phases, according to the environment and strategic changes.

First phase: From establishment to pre-listing (1994-2010)

In the past 16 years, SF had progressed from the startup phase to rapid growth. SF received limited policy support until the National Development Plan Outline was released in 2006. Sci-tech policies' support helped SF implement many technological upgrades and build new information service systems. Support was relatively concentrated on innovation support and commercial markets. Policies provided various resources, including talent, finance, innovation projects, and commercialization assistance. For example, SF developed a new doubly fed induction generator through participating in an innovation project. At the end of this phase, SF's revenue reached $213 million, and R&D expenses reached $21 million. With over 100 patents and software copyrights, SF has become a leader in China's substation protection, integrated automation, and new energy control.

Second phase: Post-listing (2011-2013)

SF successfully became a public company in 2011. At this time, China was developing rapidly. Falling coal prices and increasing electricity consumption have led to rapid growth in the electrical industry. Within three years of listing, its total assets quickly increased from $556 million to $744 million, and its net profit increased from $34 million to $88 million. In the three years, SF participated in five policy innovation projects, including renewable energy and new generation equipment. However, its R&D spending declined in these three years, from 10.7% in 2011 to 9.8% in 2013, the lowest level in a decade. This shows a clear policy crowding-out effect.

During this phase, except for policy innovation projects, the policies in which SF participated declined sharply. The main reasons are as follows:

1) The sci-tech finance policy has gradually become more systematic and comprehensive, leading SF to interrupt/change the earlier projects;

2) At that time, the sci-tech finance policy focused more on SMEs, so that SF can use fewer preferential policies after listing.

Third phase: maturity (2014 ongoing)

In 2014, the electrical industry underwent significant changes driven by new technologies, new energy, and green development. Key technologies such as energy storage, microgrids, grid security, and green energy are rapidly accelerating the development of the industry. The sci-tech finance policy change to focus on the industry innovation of high-voltage and distribution networks, with a particular emphasis on integrating distribution networks with smart grids. SF has massively integrated its products and research programs to adapt to the policy. The new strategy on innovation increased its R&D spending from 10.1% to 12.1%. After years of steady development, SF's assets reached $13.2 trillion in 2023. The company has a total of 782 authorized patents and software copyright 617.

In 2015, the critical policy "Several Opinions on Deepening Institutional Reform and Accelerating the Implementation of Innovation-Driven Development Strategy" was released, highlighting the importance of technological innovation. Subsequent policies provide more detailed support. For example, Beijing issued the “Beijing Action Plan on Promoting the Commercialization of Scientific and Technological Achievements” policy. Since then, SF has successively participated in five key research projects, focusing on energy conservation and new energy. These projects include system control protection, charging devices, and distributed renewable energy, which align with industry trends. The proven technologies of these projects have been successfully commercialized and led to advances in the electrical industry. Another critical policy that SF benefited from was an industrial transformation base. However, the policies related to commercialization at this phase are close to zero.

6.3 Discussion and Conclusions

The Positive Impact of the Value Orientation of Sci-tech Finance Policies

The evolution of SF demonstrates that value-oriented sci-tech finance policies have positively impacted the value creation of technology companies.

During the three developmental phases, SF has reaped various benefits from sci-tech finance policies. The most significant and effective of these benefits has been participation in policy-driven innovation projects, which constitute the innovation phase in value creation. These kingpin projects involve key links in electrical manufacturing. Through these projects, SF quickly integrated into the industry chain, secured stable suppliers, and thus established its position within the industry chain. In the first phase, SF received substantial commercial support from policies, which helped the then-small company to capture value. Finding stable customers in a decentralized business market helped the company enter a period of rapid growth.

An interesting finding concerns the government's stimulus toolkit. In the third phase, as SF adopted an expansion strategy, sci-tech finance policies aimed at value transformation became highly attractive to the company. SF is headquartered in Beijing but has three subsidiaries in the geographically adjacent Hebei Province. In comparison, Hebei Province's economy lags behind Beijing's, with less funding available to support innovation policies.

Hebei Province's policy focuses on attracting technology companies from outside the region, aiming to stimulate the provincial economy through external investments. Therefore, based on its resource advantages, Hebei Province has formulated some compensatory policies to attract investments from large companies. A sci-tech finance policy provided a production park, encouraging technology companies like SF to join Hebei Province's smart grid equipment demonstration base. As a result, one of SF's subsidiaries successfully invested and produced in the base.

Facing the significant challenge of rapid technological iteration, a new toolkit based on rules and stimuli is needed to achieve value-oriented policies. For governments with substantial financial resources, the stimulus policies adopted depend on the needs of different parts of value creation. Policy stimulus methods for governments with limited fiscal resources should fully consider local resource endowments. Incentive policies require more government expenditure. As for those compensatory policies, they are related to the probability of risk loss. Therefore, stimulus policies have the potential to achieve more value with less government expenditure.

Living up to policy expectations, SF's development has been relatively smooth, with significant improvements in commercial value, technology spillover, and social value. SF has become a leading enterprise in China's electrical and industrial automation industry. SF possesses hundreds of patent technologies and software copyrights. Besides, the company has successfully operated over 1.23 million sets of relay protection equipment in more than 18,000 35kV substations.

This case demonstrates that sci-tech finance policies help promote the flow of innovative resources. Value-oriented sci-tech finance policies have successfully driven the value creation of technology companies by stimulating different phases of innovation, production, and commercialization. Positive feedback from companies has promoted the continuous operation of sci-tech finance policies, thus forming a virtuous cycle. The spillover effects of the previous round of innovation have brought updates in technology and resources, and subsequently, the entire industry has developed. As social value increases, the goals set by policymakers are achieved.

The Distinct Roles of Incentive and Compensation

This case also confirms more about the roles of the incentive and compensation mechanisms of sci-tech finance policies. The cross-impact from the drivers of policy and technology companies is very obvious.

When SF was a small company with limited innovation capabilities and facing various development challenges, the characteristics of the sci-tech finance policies that supported it were "small but far-reaching" [67]. These policies were mainly incentive-based, focusing on helping the company with innovation and commercialization. With the help of these policies, SF gained access to various innovative resources and opportunities, and expanded its sales market. As SF grew into a medium to large company with mature operational capabilities and a stable business market, the incentive-based sci-tech finance policies focused on knowledge innovation, such as policy-driven innovation projects. Thus, incentive policies essentially serve as a positive stimulus to enhance the innovation confidence of technology companies.

Value conversion is a necessary phase that involves significant investments and high costs. What technology companies need is to reduce costs and spread risks. Compensatory incentives can provide SF with additional stimulation to make production decisions. Innovation platforms (incubators, industrial bases, etc.) attract SF by reducing fixed asset investments. For some technology companies that are not on the innovation platform, compensatory policies focus on the financial market. Policy-based guarantee funds share risks with some banks to promote bank lending to high-tech companies like SF.

Crowding-out Effect

Effective policies can meet the needs of technology companies and ensure that resource providers are interested in incentives. However, “government failure [68] can occur, where well-intentioned decisions to improve welfare may exacerbate conditions beyond market failure. Whether policy crowding-in or crowding-out R&D expenditure, there are significant differences in theoretical derivation and empirical results. Researchers found the empirical results of R&D expenditure into three types: crowding-in [69], no effect[70], and crowding-out[71, 72]. The inconsistency of

empirical results may be caused by different research samples or by the coexistence of the crowding-in and crowding-out effects.

In the second development phase of SF, a significant crowding-out effect emerged. The reason is not the company substituted public funds for private investments it would have otherwise made [71]. The root cause is that the innovation talent and resources are limited, which does not match the growth rate of the technology. From 2011 to 2014, SF participated in five significant policy-driven innovation projects and allocated most of its innovative talent and resources to these initiatives. Reluctantly, SF had to abandon some of its research, leading to a significant decrease in innovation projects and R&D expenditure (from 10.7% to 9.8%). Consequently, when a company's innovative resources are limited and fully utilized, obtaining additional government innovation projects will passively reduce the company's innovation projects. From a financial perspective, this is reflected in the reduction of R&D expenditure, which is known as the crowding-out effect. After 2014, with the expansion of SF's scale and emphasis on innovation, the company's R&D expenditure increased again to over 10.5%.

7. Implications

We have proposed the value orientation of sci-tech finance policy at the theoretical level and constructed a multidimensional framework. This offers a novel perspective, emphasizing that policy design should focus on promoting the value creation of technology companies. By dividing policy incentives into two types (motivation and compensation), the article not only provides an understanding of how policies affect enterprises' behavior but also deeply explores how these policies interact with the value creation process of enterprises. This analysis helps to reveal how policy incentives promote/hinder innovation through different mechanisms and how to optimize these effects through policy design.

The practical significance of the article is equally significant. It emphasizes the importance of the judicious use of motivational and compensatory incentives in sci-tech finance policies and points out that these policy tools should reflect value orientation. This means that policymakers should consider how to encourage corporate innovation through motivational policies and reduce the risks and uncertainties enterprises face through compensatory policies when designing policies. This dual approach can help technology companies obtain the necessary support at different phases of development, thereby achieving value creation more effectively.

Besides, the article emphasizes the importance of truly understanding the status and needs of enterprises through empirical research on a technology company (SF). This indicates that policymakers need to deeply analyze enterprises' actual needs and market environment when formulating sci-tech finance policies to avoid excessive policy intervention. Excessive policy support may lead to the crowding-out effect, suppressing enterprises' self-innovation capabilities. Therefore, the policy evaluation and adjustment advocated can help ensure the adaptability and effectiveness of sci-tech policies, thereby better serving the value creation of enterprises.

8. Limitations and Improvements

This article provides theoretical and practical support for achieving effective alignment between policy and enterprise needs by emphasizing policy design with value orientation and a deep understanding of enterprises. While the article offers profound insights at both macro and micro levels, it also has certain limitations and potential areas for improvement. This article validates the proposed theoretical framework through a single case study (SF). Although this provides abundant data for in-depth analysis, the singularity of the case may limit the generalizability of the research findings. Additionally, we mentioned the unintended consequences of excessive policy intervention, such as crowding-out effects and policy dependency, but the analysis and solutions for these consequences are not sufficiently addressed. Future research could enhance the universality and robustness of the research conclusions by increasing the number and diversity of case studies to provide policymakers with more comprehensive and in-depth guidance.

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