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Research on Multi-Actors' Interaction and Value Co-Creation Driven by Corporate Venture Capital from the Perspective of Symbiosis Theory

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ABSTRACT

Corporate venture capital is a window for incumbents to acquire new technologies, and it is also a key force to promote the growth of new ventures, the birth of unicorns and industrial innovation. Combined with the research status and development trend of CVC at home and abroad, the symbiotic unit, symbiotic relationship and symbiotic environment of symbiosis theory are embedded into the practice of corporate venture capital, aiming to build a multi-actors interaction mode driven by corporate venture capital. On this basis, the CVC driven multi-actors value co-creation integration system is built from the perspective of value creation, and the path selection of multi-actors value co-creation is proposed from the macro-level to create the "sensor + adapter" between the enterprise and the environment, the meso level to build the "channel" for the exchange of resources between enterprises, and the micro-level to improve the cognitive ability and creativity of individuals/teams. All these are to improve the ecological construction of equity investment market and promote the harmonious development of large and medium-sized enterprises.

KEYWORDS

Symbiosis theory; Corporate venture capital; Multi-actors' interaction; Value co-creation

1. INTRODUCTION

In an increasingly uncertain global environment, mature incumbent firms facing rapidly evolving technologies and increasingly open market environments must accelerate their pace of external entrepreneurship to enhance overall R&D efficiency, integrating into the entrepreneurial ecosystem through cross-boundary collaboration and cooperation. Corporate Venture Capital represents small-scale equity investment in new ventures under uncertain conditions, serving as a powerful tool for enterprises to acquire external innovative knowledge across organizational boundaries [1]. Compared to traditional Independent Venture Capital (hereinafter referred to as IVC), CVC primarily focuses on strategic objectives, utilizing parent company funds for strategic investments. CVC led by leading enterprises not only satisfies their own strategic needs but also plays a significant role in promoting the growth of new ventures, technological advancement, and industry development. For instance, in June 2020, Alibaba Cloud, the data intelligence business unit of Alibaba Group, announced a 2 billion RMB investment to empower globally innovative and creative partners, accelerating post-pandemic innovation and jointly creating more value for the global cloud industry. In Baidu's investment portfolio, autonomous driving is most likely to transform public perception of the company, with NIO—jointly invested by Baidu alongside Sequoia Capital, Lenovo Group, and dozens of other renowned investment institutions—becoming a disruptor in the new energy and autonomous driving vehicle industry. Numerous practices demonstrate that under uncertain conditions, incumbent firms can access and acquire emerging technologies and new business models through CVC. Meanwhile,

new ventures obtaining CVC funding can not only supplement their financial capital needs but also acquire other strategic resources from incumbent firms, such as supplier resources, customer resources, and social network resources, to accelerate innovation achievement transformation [2]. In recent years, with the gradual maturation of the venture capital market, an increasing number of venture capital institutions have adopted "syndicated investment" approaches to reduce investment risks and achieve complementary advantages, forming highly effective strategic synergies [3]. Statistics on global venture capital in 2018 revealed that CVC participated in nearly one-fifth of venture-backed transactions. Among Chinese unicorn enterprises in 2019, approximately half had connections with Baidu, Alibaba, Tencent, or JD.com, while 100% of the top ten enterprises by valuation had received investment from large enterprises. This highlights both the importance of CVC in strategy, finance, and entrepreneurship management, and its significance in connecting uncertain environments, new ventures, IVC institutions, and other actors to jointly advance the construction of entrepreneurial ecosystems. However, existing CVC research has primarily explored CVC's influencing factors, mechanisms, and outcomes from a "point and line" perspective, neglecting the construction of "surface and volume" among CVC-driven multi-actors and the value co-creation paths they present. This paper examines the multi-actor interaction model and integrated system driven by CVC from the perspective of symbiosis theory, aiming to deconstruct and analyze complex synergistic relationships among multiple symbiotic units and value creation paths at different levels, with the goal of improving the ecological construction of the equity investment market and promoting the harmonious development of large, medium, and small enterprises.

2. CVC RESEARCH FROM A MULTI-ACTOR PERSPECTIVE

Corporate Venture Capital originated in the mid-1960s in the United States, where it was favored by major corporations as a means to acquire external innovative knowledge and emerging technologies. In China, CVC started relatively late, but with the accumulation of practical experience, numerous scholars have begun to pay attention to and summarize the underlying patterns behind various phenomena. Based on a multi-actor perspective, this section reviews relevant international CVC research from the standpoints of incumbent firms (including CVC units) and new ventures respectively, laying the foundation for constructing a CVC-driven multi-actor interaction model.

2.1. Incumbent Firms as the Subject

In research with incumbent firms as the subject, scholars have primarily explored the "interdependent relationship" between incumbent firms and CVC units, as well as the "exploratory learning relationship" with new ventures. Based on these relationships, scholars have examined the antecedent influencing factors and effects of CVC activities by incumbent firms.

Regarding antecedent influencing factors of CVC, research has mainly unfolded from three dimensions: industry, enterprise, and individual, as well as their interactions. CVC as a strategic motivation for incumbent firms to acquire external technologies has been widely accepted [4]. Beyond this, enterprises in industries characterized by rapid technological change, weak intellectual property protection, high R&D investment levels, and high competitive intensity are more likely to engage in CVC [5]. Apart from industry factors, incumbent firms' larger cash flows, absorptive capacity, strong technological resources, marketing resources, and complementary resources developed through various entrepreneurial activities can all promote greater CVC participation [6]. At the enterprise level, beyond resource factors, scholars adopting a social network perspective have found that information about CVC practices obtained from interlocking directorate networks can predict corporate CVC behavior. At the individual level, corporate venture capitalists, as the operators behind CVC, possess different career experiences representing specific knowledge and mental models that influence CVC goal orientation and operational strategy changes [7], while performance-based reward measures significantly affect the quantity of their CVC activities [8]. However, when

corporate venture capitalists face two external innovation methods—CVC and acquisition—increased exogenous environmental uncertainty raises the likelihood of enterprises choosing CVC, while technological irreversibility and industry competition levels enhance the impact of uncertainty [9].

In research on CVC effects, scholars have primarily examined CVC's impact on incumbent firms' innovation performance, financial performance, and acquisition and alliance formation. Some studies have shown an inverted U-shaped relationship between CVC quantity and the level of knowledge transferred from new ventures [10]. Subsequently, scholars exploring the relationship between CVC portfolio diversity and incumbent enterprise innovation performance also found an inverted U-shaped relationship [11]. As CVC portfolios continue to expand, research has demonstrated that CVC geographic diversity positively affects enterprise technological performance [12]. These results indicate that incumbent firms should make rational arrangements regarding investment quantity, portfolio diversity, and geographic diversity to enhance innovation levels through efficient portfolio configurations. The impact of CVC on incumbent firms' financial performance is closely related to the specific organizational structures and operating environments adopted by enterprises, reflecting the structural and environmental embeddedness of CVC activities [13]. The effect of CVC on acquisition performance is primarily influenced by incumbent firms' absorptive capacity and CVC unit professionalism; companies with more stable CVC programs achieve higher returns when acquiring technology startups compared to those with more sporadic investment programs [14]. Additionally, the number of prior entrepreneurial investments by companies, technological similarity, and investment stage affect strategic alliance formation between incumbent firms and new ventures, enriching the understanding of CVC effects through the exploration of CVC-strategic alliance relationships [15].

2.2. New Ventures as the Subject

In research with new ventures as the subject, scholars have primarily explored the "dancing with sharks" relationship between new ventures and parent companies. Based on this relationship, scholars have examined the "Who + How + What" questions faced by new ventures seeking CVC.

"Who" primarily refers to the question of which financing option new ventures should choose when facing multiple funding alternatives. Based on institutional theory, although both CVC and Governmental Guidance Funds (GGF) possess valuable social relationship networks and technological and commercial resources, their institutional logics limit the efficiency with which young companies can acquire resources. In contrast, IVC institutions maintain close advisory relationships with new ventures, better understanding their commercialization processes and more effectively facilitating resource acquisition [16].

"How" reflects how new ventures can avoid "technology theft" and being "eaten by sharks" in cooperation with CVC units. New ventures seeking corporate venture capital often face trade-off dilemmas. On one hand, CVC can provide new ventures with complementary assets to promote the commercialization of new risky technologies. However, close ties with specific corporate investors may limit new ventures' ability to acquire innovation from other sources in open markets [17]. On the other hand, in interactions with incumbent firms, new ventures face risks of "technology theft" or even acquisition [18]. How should new ventures balance this tension? Scholars have offered several recommendations: (1) increasing the mobility of incumbent enterprise inventors to promote new ventures' utilization of incumbent firms' knowledge resources [19]; (2) increasing social interaction with incumbent firms and achieving balance between development and self-protection through relationship safeguards such as limiting CVC control over stock ownership, restricting board seat allocation to corporate venture capitalists, or accepting CVC only in later investment stages [20].

"What" refers to what effects CVC/IVC have on new ventures. Regarding their relationship with new venture innovation, research shows that new enterprises receiving corporate financing demonstrate

greater post-financing innovation rates compared to those funded solely by IVC institutions [21]. A survey of 545 biotechnology enterprises founded between 1990 and 2003 in the United States found that CVC-backed investment targets exhibited higher innovation output rates compared to independently venture capital-backed peers, with this relationship influenced by new ventures' ability to utilize CVC complementary assets [22]. Additionally, surveys based on same-industry samples found that this relationship is also affected by new ventures' financing stage and whether they possessed patents before financing [23]. Beyond CVC amount affecting enterprise innovation, CVC shareholding proportion and founder identity also influence new ventures' R&D investment strategies [24]. CVC affects not only new venture innovation but also their IPO underpricing. In venture capital-backed IPOs, private venture capital ownership is positively correlated with IPO underpricing, while corporate venture capital ownership is negatively correlated with IPO underpricing [25].

Domestic scholars' research on CVC clearly lags behind international research, with some studies merely re-validating international research conclusions based on the Chinese context [26]. CVC research based on Chinese samples has primarily focused on how CVC affects innovation performance/value creation of incumbent firms/new ventures, with boundary conditions including absorptive capacity, involvement intensity, governance structure, and organizational slack [27, 28]. Additionally, when examining CVC's impact on IPO underpricing of domestically listed enterprises on the Growth Enterprise Market, results have generally remained consistent with international research findings, with this relationship influenced by the business relevance between investors and investees [29].

In summary, this paper reviews CVC-related research with incumbent firms and new ventures as subjects. It can be observed that when scholars examine corporate venture capital activities both domestically and internationally, they present a "diverse perspectives, diverse results" point-line dispersion pattern, preventing an integrated perspective on the strategic ultimate goals of various research subjects. Although the consensus that CVC can create value for multiple actors has been widely recognized, research on how to analyze and construct an integrated framework for CVC-driven multi-actor value creation from different levels remains scarce. Particularly in constantly changing environments, the question of why an increasing number of incumbent firms choose to conduct strategic layout through CVC has become a matter requiring continuous reflection by scholars and practitioners.

3. CVC-DRIVEN MULTI-ACTOR INTERACTION MODEL

As an antenna extending across organizational boundaries toward external innovation for incumbent firms, CVC not only brings new growth points to itself and new development opportunities to new ventures but also promotes technological advancement and integrated development across industries, creating an interconnected, co-evolving, and dynamically flexible symbiotic system for enterprises and consumers. Based on the domestic and international literature review, this section analyzes and constructs a CVC-driven multi-actor interaction model from the perspective of symbiosis theory, examining the three elements of symbiotic units, symbiotic relationships, and symbiotic environment.

3.1. Symbiotic Units

Symbiotic units refer to the basic energy production and exchange units that constitute symbiotic bodies or symbiotic relationships, serving as the fundamental material conditions for forming symbiotic bodies [30]. In the CVC context, symbiotic units refer to the participating actors in the construction of incumbent firms' CVC portfolios, primarily including incumbent firms, CVC units, new ventures, IVC, and other institutions. incumbent firms generally refer to mature large-scale enterprises, while CVC units are typically specialized departments or subsidiaries established by incumbent firms for external investment. CVC units serve as intermediaries in CVC practice, connecting joint ventures with relevant business departments to facilitate joint ventures' utilization of

internal organizational resources and generate synergies in further cooperation with incumbent firms [31]. New ventures primarily refer to non-listed enterprises established for less than 10 years, generally concentrated in technology-intensive sectors [32]. IVC refers to equity investment in new ventures by independent financial investors seeking financial returns, including both independent individual investors and professional financial investment institutions.

3.2. Symbiotic Patterns

Symbiotic patterns, also called symbiotic relationships, refer to the ways in which symbiotic units interact or the forms in which they combine. They reflect both the modes and intensity of interaction between symbiotic units, as well as the material information exchange relationships and energy exchange relationships between them [29]. In the CVC practice context, various symbiotic units possess different communication methods, information exchange methods, and the communication efficiency and operational efficiency behind these methods.

Due to CVC units being affiliated units of incumbent firms, incumbent firms and CVC units often exhibit an "interdependent relationship," with incumbent firms providing CVC units with complementary assets available for new ventures to choose from, including technological resources, industry knowledge, social capital, and customer networks. CVC units, in turn, serve as windows for incumbent firms to discover and acquire emerging technologies and new business models. Both parties share the same strategic objectives and depend on each other for survival [33]. However, behind this relationship, issues of connection tightness and operational efficiency also exist; CVC units sometimes cannot fully utilize resources from various business departments of incumbent firms, and frequently encounter failures when acquiring technology, making the symbiotic relationship between them worthy of exploration.

Incumbent enterprise CVC units and new ventures maintain complex relationships, with the degree of technological overlap and asset complementarity between them affecting enterprise growth, often manifesting in practice as a "dancing with sharks" relationship that metaphorically captures the subtle knowledge acquisition paradox between them [1]. In cooperation with incumbent firms, new ventures frequently face situations of "knowledge misappropriation," leading them to adopt certain safeguard measures, which in turn may cause trust damage and knowledge acquisition limitations for incumbent firms. The interaction between CVC units as intermediaries and new ventures directly affects incumbent firms' technology acquisition and value enhancement. How CVC units should balance the strategic and interest demands of both incumbent firms and new ventures in cooperation with new ventures to achieve efficient synergy is worthy of exploration.

CVC units and IVC institutions often exist in a "syndicated investment" relationship. In highly uncertain environments, syndication between CVC units and IVC institutions reduces investment uncertainty, expands investment portfolios in emerging fields, and promotes the commercialization of new technologies through skill complementarity and risk sharing [34]. In recent years, research on syndicated investment networks has been increasing, reflecting the symbiotic concept of "mutual subjectivity and overall mutual benefit" in the venture capital field.

IVC institutions and new ventures also maintain investment-investee relationships, but unlike CVC, IVC institutions primarily conduct equity investment in new ventures based on financial objectives to obtain financial returns as quickly as possible, with the relationship between them being more purely "commercial interconnection."

3.3. Symbiotic Environment

The symbiotic environment refers to the exogenous conditions for the existence and development of symbiotic relationships, i.e., symbiotic patterns [35]. In CVC-related research, the external environment of CVC mainly includes institutions, technology, economy, and society, with the most

prominent characteristics of the external environment manifested in rapid technological iteration, continuously opening markets, and high uncertainty. It is precisely changes in these situational factors that stimulate enterprises to constantly seek more efficient external innovation methods to avoid elimination in evolution [6]. Beyond these external environments, there also exists the "internal environment" in which enterprises themselves are situated, including their financial and human capital foundations and their entrepreneurial and innovative atmospheres. The internal and external environments of enterprises jointly affect CVC activities through "interaction and adaptation" with symbiotic units.

In summary, from a symbiotic perspective, each relationship connects not single subjects but direct, indirect, or cross-cutting connections among multiple subjects, ultimately forming the CVC-driven multi-actor interaction "surface," which lays the foundation for further exploring value creation paths among symbiotic units at different levels [36].

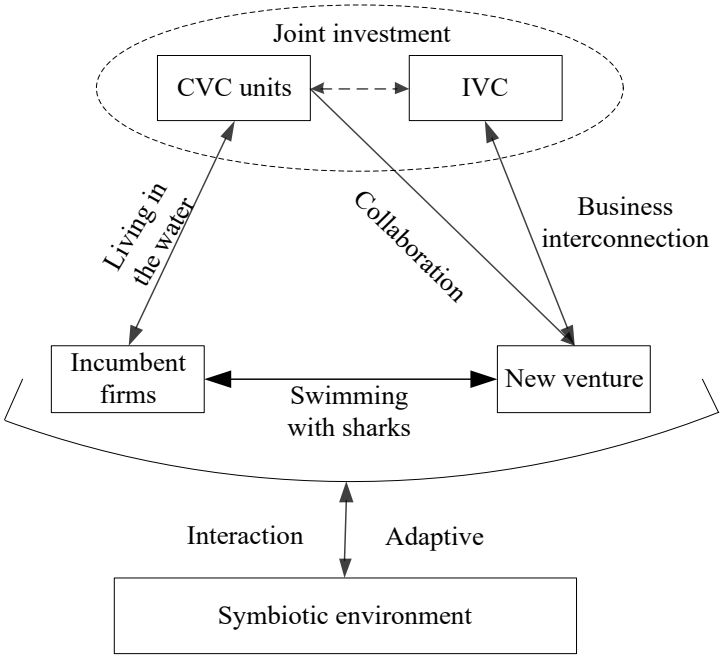

Figure 1. Multi-actor interaction model driven by CVC

4. CVC-DRIVEN MULTI-ACTOR VALUE CO-CREATION INTEGRATED SYSTEM

In the digital economy era, an increasing number of incumbent firms actively conduct strategic layout through entrepreneurial mechanisms, on one hand to avoid falling into the innovator's dilemma, and on the other hand to establish long-term competitive advantages by actively seeking innovation opportunities. As an important means of external entrepreneurship for companies, CVC increases corporate financial and strategic performance by acquiring external innovation and complementary assets for incumbent firms [10, 16]. Meanwhile, as important support for new ventures to obtain funding, markets, and legitimacy, CVC promotes the transformation of scientific and technological achievements and IPO listings for new enterprises [24, 28]. CVC units are "intermediaries" supported by parent companies yet detached from parent company organizational contexts, creating value for themselves, parent companies, and new ventures through optimizing investment portfolios, inter-organizational learning, and balancing the interest demands of parent companies and new ventures [37]. IVC investment institutions combine their professional investment advantages with incumbent firms or CVC units through strong alliances, creating value for multiple actors through the flow of personnel, resources, and knowledge between them [38]. In a symbiotic environment, CVC investment-driven multi-actors interact and co-evolve, jointly constituting the CVC-driven multi-

actor value co-creation integrated system, as shown in Figure 2. The outermost layer primarily examines external stimuli brought by the symbiotic environment and their interaction with subjects from a macro perspective; the middle layer primarily examines factor flows and interactions among symbiotic units from a meso perspective; the inner layer primarily examines cognition and decision-making logic among individuals/teams driven by CVC from a micro perspective, as specifically shown in Figures 3, 4, and 5.

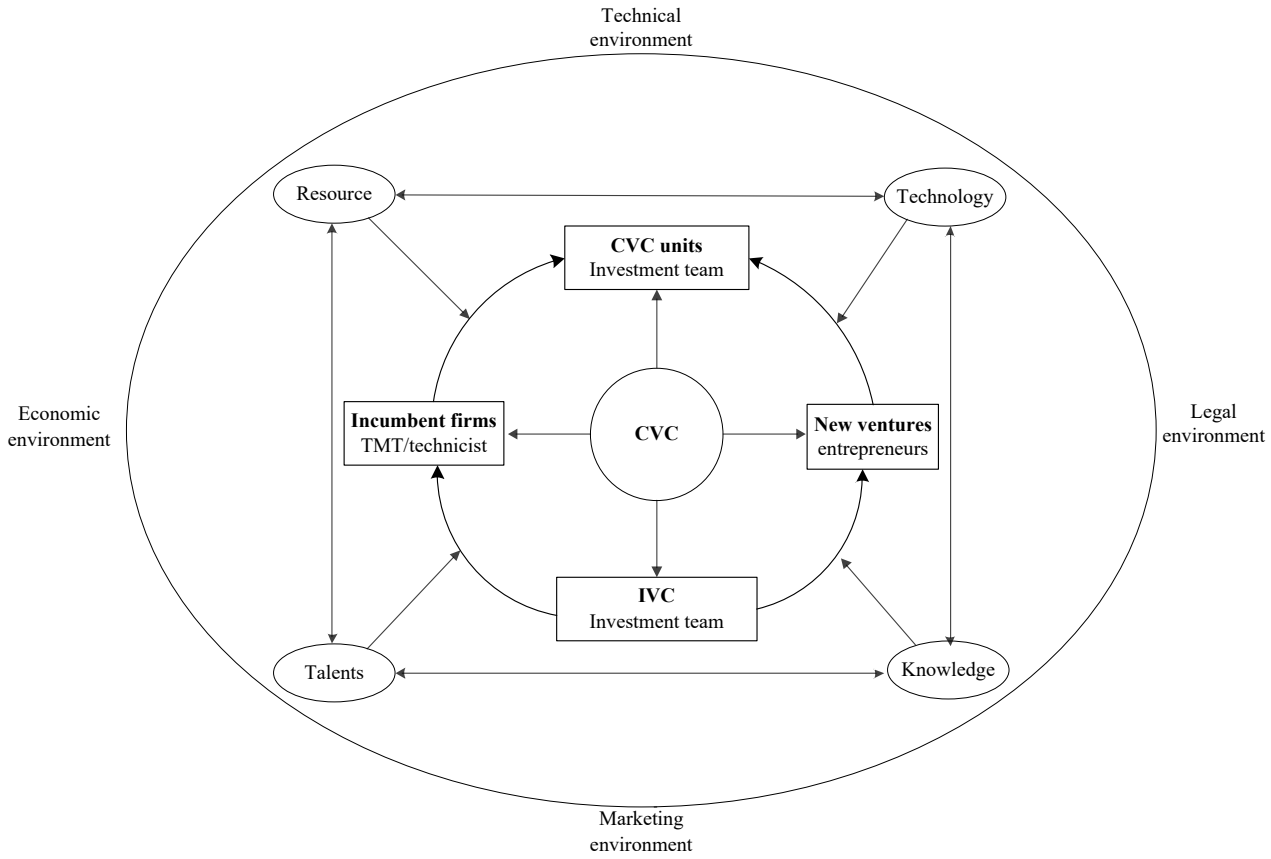

Figure 2. Integrated system of multi-Actor value co-creation driven by CVC

4.1. Macro Level: Creating "Sensors + Adapters" Between Enterprises and Environment

The symbiotic environment in which CVC operates often contains numerous changes and uncertainties, manifested in external industry technological dynamics, competitive intensity, and growth. When facing these changes, first, symbiotic units should maintain keen insight, with lead institutions in CVC, to a certain extent, determining the direction of industry value chains. Second, in the broader environment, different types of enterprises should establish "alarms" between enterprises and the environment, rapidly adapting to changing environments through "self-adaptation and other-coordination." In this response chain, CVC units and IVC institutions as "sensing ends"—active participants in the venture capital market—based on their perception and foresight of the environment and future, promote the integration of various industries, the emergence of technologies, and the generation of innovation through investment. New ventures, as main members active on the innovation front line, excel at seizing opportunities, rapid trial and error, and iteration; through front-end sensing, they promote the integrated development of incumbent firms and new ventures. In the "adaptation end," various symbiotic units adapt to environmental changes by combining their own organizational states with coordination with other enterprises, forming a platform for collaborative promotion and continuous evolution [36]. On this platform, symbiotic units form rapid response and agile coping mechanisms through sufficient information sharing, thereby reducing the impact of

environmental uncertainty on enterprise growth. The macro-level response mechanism of CVC practice from a symbiotic perspective is shown in Figure 3.

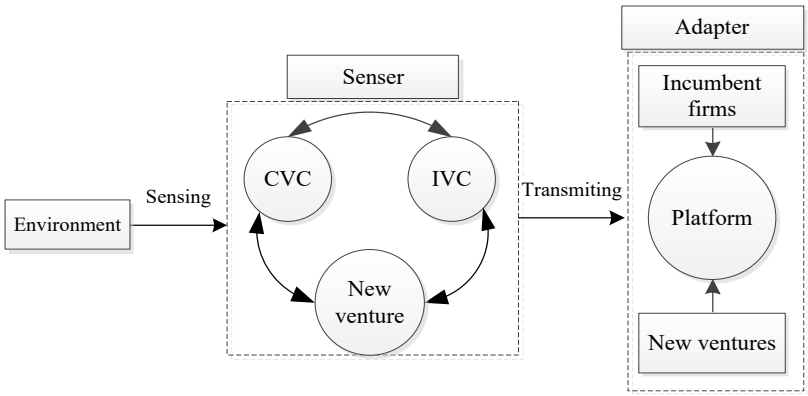

Figure 3. Macro-level response mechanism of CVC practice from symbiosis perspective

4.2. Meso Level: Building "Pipelines" for Resource Exchange Among Enterprises

In the CVC practice context, cooperation among different symbiotic units often involves the flow of people, finances, knowledge, and resources. Therefore, it is necessary to establish well-connected "pipelines" for resource flow among various subjects. For example, incumbent firms transmit complementary assets to new ventures and equip them with professional technical personnel, thereby reducing new ventures' technology transformation costs and promoting new venture survival rates. In return, new ventures utilize their technological innovation advantages to provide incumbent firms with new ideas and technologies, enriching or extending incumbent firms' value chains and promoting their transformation, upgrading, and long-term sustainability. IVC institutions, due to their strong professionalism and clear objectives, primarily transmit funds to new ventures, supplemented by a certain degree of growth consulting to help new ventures acquire key resources and overcome difficulties [15]. New ventures, in turn, create financial returns for IVC institutions through IPO listings [7]. CVC units and IVC institutions often form syndicated investment networks through cooperative relationships, creating value for each other through skill complementarity. Additionally, the flow of professional talent from IVC institutions to CVC units promotes the optimization of CVC unit talent allocation, benefiting CVC units' identification and screening of new projects [5]. In the connection between incumbent firms and CVC units, incumbent firms provide CVC units with funding and other complementary resources to promote CVC units' capture of new technologies. CVC units, in turn, return profits and new technologies and business models to incumbent firms through the capture of new ventures and subsequent venture exit methods. In summary, the resource exchange pipeline at the meso level of CVC from a symbiotic perspective can be summarized, as shown in Figure 4.

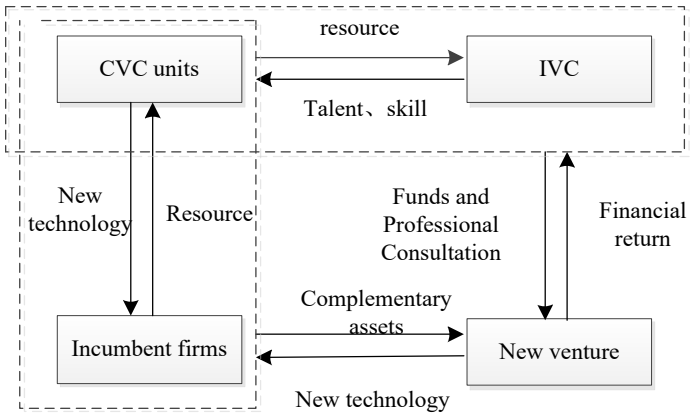

Figure 4. Meso-level resource interaction mechanism of CVC from symbiosis perspective

4.3. Micro Level: Enhancing Individual/Team Cognitive Abilities and Creativity

Individuals' or teams' perception of the environment within organizations is a key factor influencing corporate behavior. Therefore, in the highly uncertain CVC environment, enhancing the cognition of key individuals or teams regarding the external environment is particularly important. Executive teams of incumbent firms, investment managers of CVC units, investors of IVC institutions, and entrepreneurs of new ventures are key figures in the CVC context. How to create value for enterprises from the perspectives of individual/team cognition and creativity has become a question that must be answered in micro-level CVC research from a symbiotic perspective.

In CVC research, key figures' career experience, scientific capabilities, and investor-collaborator technological distance all affect corporate interest outcomes [28]. The mechanism behind this influence lies in key individuals'/teams' mental models, cognitive frameworks, and knowledge structures regarding the value perception, value transmission, and value realization of environments and resources. This process is closely connected and jointly operates with macro-level interactions between enterprises and the environment, reflecting the mutual linkage and co-evolution of environment, enterprises, and people from a symbiotic perspective. How to leverage people's "intelligence" role and how to lead enterprises to break boundaries, accept changes, and thereby create extraordinary value for enterprises will become important topics in CVC micro-level research.

In a symbiotic environment, people are more in cooperative relationships, sharing cognition and investment benefits through cooperation. The relationship backgrounds among incumbent enterprise executives, business unit managers, and venture capital group members can promote the survival of CVC units, thereby creating continuous value for enterprises [33]. In summary, the cooperation network at the micro level of CVC from a symbiotic perspective can be summarized, as shown in Figure 5.

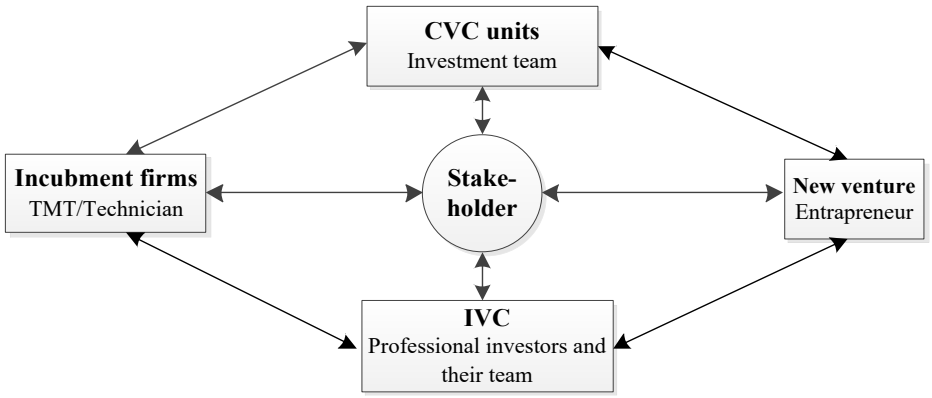

Figure 5. Micro-level cooperation mechanism of CVC from symbiosis perspective

5. MAIN RESEARCH CONCLUSIONS

With rapid technological iteration and continuously emerging new business models, incumbent firms must actively accelerate their pace to seek new opportunities and form long-term competitive advantages through entrepreneurial mechanisms. The 2019 Chinese Government Work Report also pointed out the need to strengthen enterprises' principal role in technological innovation, encourage large enterprises to open innovation resources, and promote the harmonious development of large, medium, and small enterprises. As a main pathway for incumbent firms to access external technologies and integrate into the innovation and entrepreneurship ecosystem, CVC makes important contributions to serving its own strategic objectives while also contributing to new venture growth, industry advancement, and industrial structure upgrading. Through reviewing domestic and international multi-actor perspectives on CVC, this paper identifies the lack of construction regarding "surface and volume" in CVC-driven multi-actor interactions in existing research. Based on

symbiosis theory, this study examines complex interactive relationships among symbiotic units and constructs a CVC-driven multi-actor interaction model, i.e., the CVC-driven multi-actor interaction "surface." Based on this, combining macro, meso, and micro perspectives, this paper constructs a CVC-driven multi-actor value co-creation integrated system, proposing to create "sensors + adapters" between enterprises and the environment at the macro level, build "pipelines" for resource exchange among enterprises at the meso level, and enhance individual/team cognitive abilities and creativity at the micro level, with the aim of improving the ecological construction of the equity investment market and promoting the harmonious development of large, medium, and small enterprises.

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