Proceedings of the 4th International Conference on Global Politics and Socio-Humanities
DOI: 10.54254/2753-7048/2026.34326

Research on the Localization Development Path of Science Philanthropy: Based on the Analysis of Typical Cases of Science Philanthropy at Home and Abroad

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Abstract. Science Philanthropy is an important form for social forces to support basic research and make up for insufficient public funding. This study examines four representative cases — Westlake University, the Shaw Prize, the Gates Foundation, and the Nobel Prize — through comparative analysis across four dimensions: funding sources and long-term sustainability, governance structure and project autonomy, field focus and strategic positioning, and early-stage investment versus post-achievement incentives. Research findings show that Science Philanthropy at home and abroad have developed differentiated operation models. Westlake University relies on government and non-governmental funding to form a Foundation University (adopted from Westlake University's official translation) model oriented towards national strategies. The Gates Foundation achieves large-scale foundation operation driven by global missions through professional investment. The Shaw Prize and the Nobel Prize have respectively established a closed trust type and a legal charter type of sustainable science award system. Based on this, this paper proposes three specific paths: establishing an investment mechanism for Science Philanthropy funds that combines competitiveness and stability, preserving academic autonomy within the compliance framework while strengthening professional decision-making and supervision constraints, and scientifically controlling the flow of Science Philanthropy funds to balance risks and efficiency.

Keywords: Science Philanthropy, Westlake University, Shaw Prize, Gates Foundation, The Nobel Prize

1. Introduction

Scientific innovation capacity is a core dimension of national competitiveness. Scientific and technological innovation is characterized by the need for long-term and stable financial support. Relying solely on government public funding is difficult to comprehensively cover the entire chain of scientific research and support high-risk, frontier basic research [1]. Against this backdrop, a model has rapidly emerged where multiple entities such as foundations, enterprises, and social organizations support scientific and technological innovation through foundation operations, the

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DOI: 10.54254/2753-7048/2026.34326

establishment of science and technology awards, and talent funding. This model is known as Science Philanthropy [2].

Globally, the Science Philanthropy sector in developed countries started earlier and has developed more maturely. The United States is a benchmark country for the development of Science Philanthropy worldwide. Its charitable funds have become a core supplementary force for the continuous and stable growth in the field of basic research. From 2006 to 2021, the growth of non-profit funding (72%) was significantly higher than that of federal government investment (1%) [3]. In 2015, China's investment in basic research reached 20.6 billion US dollars, making it the second largest country in the world in terms of basic research investment. However, the financial support in the scientific research field is still dominated by government finances (96.9% in 2016) [4], and all sectors of society have not yet formed a core supplementary role. Compared with developed countries, the Science Philanthropy model still has a lot of room for development. In conclusion, this paper selects four high-impact benchmark cases at home and abroad, namely Westlake University, the Shaw Prize, the Gates Foundation and the Nobel Prize. Through comparative analysis of their success logic and differentiated conditions, it explores the localization path of Science Philanthropy that suits China's national conditions.

2. Literature review

Research on Science Philanthropy abroad can be summarized into the following aspects: (1) Current development status and resource allocation characteristics; (2) Core values and functional positioning; (3) Implementation paths and optimization strategies. Overall, Shekhtman et al.'s analysis shows that private charities in the United States have already provided considerable funding for science, but the allocation of resources has a strong local preference and is in the form of long-term funding [5]. From the perspective of the positive effects of Science Philanthropy, Conn et al.'s research further indicates that charitable donations have significantly enhanced the creativity and competitiveness of the US scientific research system by promoting interdisciplinary research, investing in human capital, and driving institutional innovation. Moreover, charity and government funds have a stronger synergy effect [6]. Falk further clarified that although the scale of charitable funds is much smaller than that of the federal government, its flexibility enables it to fund high-risk exploratory research and early-career researchers, playing an irreplaceable strategic supplementary role [7]. Yin et al. further pointed out that the fields supported by public funds have a higher social impact, while private funds can provide more targeted support for frontline researchers [8]. The editorial department of Nature Methods emphasizes that in the context of fierce competition for federal funding, private foundations are an important force in supporting high-risk exploratory research [9]. In terms of the path to realization, Giles suggests that research crowdfunding provides scientists with a new channel to raise funds directly from the public, especially for early-stage research that has not yet reached the threshold of traditional funding [10]. Collins et al. believe that for scientists, foundations should systematically support their career growth and help them address non-research challenges in their academic careers through professional skills training [11].

Domestic academic research on Science Philanthropy can be summarized into the following aspects: (1) Drawing on the experience of the United States and comparative studies between China and the United States; (2) Local practice forms and theoretical foundations. Tan Yi, Sun Guiping and others, based on the case study of the United States, found that Science Philanthropy is the core supporting force for the rise and development of research universities in the United States, profoundly shaping their basic form and management mechanism. The relevant experience has important reference significance for China [12-14]. At the macro comparison level between China

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and the United States, Fu Kefei systematically sorted out the development history, current characteristics, operation mechanism, supporting policies and social impact of Science Philanthropy in the United States, and explored its reference significance for China [15]. Ling Han found that, in contrast to the government model, contemporary major charitable foundations in the United States invest heavily in basic scientific research [16]; Wu Yang found through comparison that there are significant differences in the current development status, supporting policies and operation models of social donations for basic research between China and the United States. In response, he proposed policies and measures for social donations for basic research that are suitable for China's national conditions [17]. In terms of practical forms and typical cases, Dong Junlin concluded that the core practices of Science Philanthropy can be classified into three categories: support for scientific talents, support for research institutions, and the establishment of science and technology awards [2]. Wang Ming, through typical cases, verified the important supporting role of charity in scientific development [18]. The above-mentioned research systematically clarified the operational logic and core values of Science Philanthropy, laying a solid foundation for the case selection, dimension design and comparative analysis of this article.

3. Comparison of typical cases at home and abroad

This article selects four typical cases, namely Westlake University, the Gates Foundation, the Shaw Prize, and the Nobel Prize, based on social recognition. It conducts systematic benchmarking analysis from four dimensions: source of funds and long-term guarantee, governance structure and project autonomy, field layout and strategic positioning, and early-stage investment and post-achievement incentives, divided into two groups according to the entity category and the reward category. It sorts out the characteristics of Science Philanthropy practices at home and abroad and distills a localized development path that suits China's national conditions.

3.1. Funding sources and long-term guarantees

In terms of the source of funds, Westlake University, as China's first new-type research university, is a typical benchmark of "Foundation University" in the country. Its establishment and operation rely on the Westlake Education Foundation. In the early days of its establishment, the university received financial support from the Zhejiang provincial and Hangzhou municipal governments, which provided a basic guarantee for campus construction and the launch of disciplines [19]. The Gates Foundation, on the other hand, has formed a highly centralized and sustainable financial operation system, with funds mainly coming from the continuous capital injection of the founding family and a small amount of compliant personal donations. The foundation has clear regulations on donors, forms and uses of funds, and as a whole, it has formed a financial structure mainly based on large and continuous contributions from founders and supplemented by small donations from individuals [20]. In cases of reward-based Science Philanthropy, the Shaw Prize has established a closed and earmarked, purpose-restricted funds operation model. The Shaw charitable trusts provide all the funds. The initial principal was a personal donation made by Mr. Run Run Shaw when he established the award in 2002. Subsequently, the estate of Mr. Run Run Shaw and his wife, Ms. Fong Yat Wah, was injected to continuously strengthen the scale of the funds. The original principal of the Nobel Prize is the personal inheritance left by Nobel, amounting to 31 million Swedish kronor [21].

From the perspective of long-term financial guarantee, the long-term guarantee funds of Westlake University mainly rely on diversified donations from social forces such as individuals and

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enterprises. After entering the stable operation stage, the donation forms have expanded to equity donations of enterprises, achieving sustainable funding by tying support to corporate growth returns. Relying on the tax-exempt investment authority granted by Section 501 (c) (3) of the Internal Revenue Code of the United States, the Gates Foundation has established a professional and market-oriented long-term asset management mechanism. Through diversified asset allocation such as stocks and financial derivatives, it achieves cross-cycle asset preservation and appreciation, and can continuously generate stable cash flow, providing core support for its large-scale global funding over the past few decades. The Shaw charitable trusts achieve long-term stable appreciation through holding properties, financial assets and other means. They form a stable cash flow with rent, dividends, and investment income to ensure the long-term stability of their capital operation. After the Swedish government lifted investment restrictions and implemented tax exemption policy in 1953, the Nobel Foundation diversified its investment in stocks, real estate and other fields. Its assets continued to recover. With the return to repay the principal and professional compound interest growth, the Nobel Prize achieved a steady increase in the scale of the prize money and sustainable operation for a hundred years [21].

3.2. Governance structure and project autonomy

From the perspective of governance structure, Westlake University implements a president responsibility system under the leadership of the board of directors, and has established institutions such as the Board of Supervisors and the Academic Committee, with clear rights and responsibilities. The Board of Directors is the highest decision-making body. It has a Finance Committee under it to manage funds, and the Board of Supervisors is responsible for financial supervision to ensure the compliant use of donated funds [22]. For the Gates Foundation, the Council serves as the highest decision-making body, responsible for fund allocation and strategic direction. It has a Management Committee under it, which is in charge of daily management and operation [20]. The funds of the Shaw Prize are fully managed by the Shaw charitable trusts in accordance with their charter, and the prizes are distributed based on the projects. The operation and evaluation rules of the Nobel Prize are clearly stipulated in the Statutes of the Nobel Foundation. The Nobel Foundation is the core institution designated in the will for the operation of the awards, and it has a Board of Directors responsible for the management of the fund assets and the foundation's property [21].

From the perspective of project autonomy, the decision-making and review of academic affairs at Westlake University are fully handled by the Academic Committee. The Communist Party of China (CPC) Committee of Westlake University only ensures the correct political orientation of running the university and does not participate in academic assessment and decision-making, ensuring academic autonomy [22]. The Gates Foundation's project funding is implemented by six project teams including Global Health and Global Development, and the project review is independently conducted by external professional institutions and experts, with a high degree of professionalism and autonomy in decision-making [20]. The direct expenses for the review, operation and popular science of the Shaw Prize are reviewed in full confidentiality by an independent selection committee, fully ensuring academic autonomy. The Nobel Prize has established an independent review mechanism centered on scientists: five dedicated committees are responsible for the core review work of each award, and the Nobel Society implements full-process supervision, completely eliminating the interference of non-academic factors and achieving the autonomy of scientists in academic affairs [21].

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The four cases all follow the principle of "leaving professional matters to professionals". The difference lies in that foreign cases operate independently by the private sector, while Westlake University needs to uphold the correct political orientation while maintaining academic autonomy.

3.3. Field layout and strategic positioning

From the perspective of field layout, Westlake University, as a new-type research university, mainly focuses its research progress on seven major fields: life and health, medical innovation, energy and sustainable environment, materials science, advanced manufacturing, artificial intelligence (AI) + interdisciplinary research and application, and the frontiers of science. The Gates Foundation, as the funder, focuses its funding areas closely on deep concern for the survival of underprivileged people around the world, and its investment is focused on six areas: gender equality, global development, global growth and opportunity, global health, global policy and advocacy, and the American Program [20]. The Shaw Prize is awarded annually to scholars who have made outstanding contributions in the fields of astronomy, computer science, life sciences and medicine, and mathematical sciences. The Nobel Prize was established strictly in accordance with the will of Mr. Nobel and covers six major categories: physics, chemistry, physiology or medicine, literature, peace and economics.

From the perspective of strategic positioning, the disciplinary layout of Westlake University is not an accidental disciplinary interest, but is based on clear strategic considerations. President Shi Yigong's speech at the 2025 undergraduate admission ceremony hit the nail on the head: Westlake University takes the reform of higher education as its mission and aims to explore a new path for building a world-class university based on Chinese soil. It can be seen from this that the discipline selection of Westlake University not only focuses on the basic needs of the country but also delves deeply into the frontier areas that are rarely explored. Since its establishment, the Gates Foundation has set three donation goals: global maternal and child health security, prevention and elimination of major infectious diseases, and global poverty governance and sustainable development. Fund allocation adheres to the foundation's founding mission and addresses the real global needs. The core purpose of the Shaw Prize is to "benefit humanity", and the fields it selects all emphasize the public nature of basic science and the universal needs of human development. The core intention of the Nobel Prize is to guide the world to value scientific discoveries and theoretical creation, and thereby advance social well-being and serve the public good through the power of knowledge [23]. For a century, the fields covered by the Nobel Prize have remained unchanged, demonstrating its commitment to fundamental values and long-term goals.

Whether it is Westlake University as the recipient of the funding or the Gates Foundation, the Shaw Prize and the Nobel Prize as the funders, their field choices are not driven by personal preferences, but rather based on the responses of their organizational tenets to the demands of the times and the trends of scientific development.

3.4. Early-stage investment and post-achievement incentives

There are two completely different core models of Science Philanthropy funds: one is invested in exploratory research that has not yet been carried out, and the other is invested in completed work that has achieved remarkable results. The two have different risk characteristics and incentive effects.

From the perspective of early-stage investment, funding entities represented by the Gates Foundation, as well as Westlake University, which serves as the carrier for funded research, have all

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allocated funds to scientific research that has a clear direction but has not yet been initiated or is still ongoing. As a new-type research university, Westlake University itself serves as an incubation platform for scientific research. With continuous and stable financial support, scientific research projects are gradually advanced, completing the entire process from basic research to the transformation of research results. For instance, Jiang Hanqing's laboratory at Westlake University has incubated the world's first flexible variable-stiffness robotic arm, the Mawarm, and the HEART series robots [24]. The Gates Foundation follows a similar logic. Professional review teams evaluate projects that closely align with the foundation's mission but have not yet been undertaken, directing funding toward research still in its early stages. The goal is to catalyze breakthroughs through targeted financial support. However, scientific exploration is full of uncertainties. Early-stage investment is essentially a high-risk behavior, testing the ability to accurately grasp trends and tolerance for long-term failure.

From the perspective of post-achievement incentives, the charitable forms of science and technology awards represented by the Shaw Prize and the Nobel Prize adopt this incentive model, and the funds are invested in scientists who have achieved outstanding results and completed research achievements. Such grants are distributed in the form of bonuses, with extremely high efficiency in the use of funds, low operational risks, and relatively less pressure on fund management. But from the perspective of the entire research cycle, late-stage rewards cannot promptly alleviate the resource predicament of scientists before they achieve breakthroughs and may restrict the pace of advancing frontier research.

A comparative analysis of the two types of practices reveals that the essential difference lies in the timing of funding intervention. One is located at the front end of the research chain and is a pre-investment; the other is located after the results are produced and is a later-stage incentive. They are not opposed to each other or have a superiority or inferiority. Each has its own strengths and weaknesses, and together they form a complete support chain.

3.5. Summary of the case models

Through a systematic analysis of the four typical domestic and international Science Philanthropy cases mentioned above, their operation models can be summarized as follows: (1) Westlake University takes the leadership of the Board of Directors, the guidance of the Party committee, and academic autonomy as the core. Through government matching and social donations (including equity) to guarantee funds, it focuses on the advance investment in scientific research at the forefront of national strategies, forming a national strategy-embedded foundation university model. (2) The Gates Foundation, based on the decisions of the board of directors and independent expert review, focuses on early-stage investment in cutting-edge projects to meet global public needs through founder's capital injection and professional investment appreciation, thus forming a global mission-driven large-scale foundation model. (3) The Shaw Prize is based on the closed-loop operation of charitable trusts and independent review by experts. Through the founder's estate and stable trusteeship to guarantee funds, it focuses on basic disciplines and rewards scholars with achievements, forming a public value-oriented scientific award model. (4) The Nobel Prize is centered on being bound by legal regulations and independently reviewed by global academic institutions. It maintains funds through the inheritance principal and compound interest over a hundred years, focuses on basic science, and implements subsequent rewards, forming a century-long stable and sustainable scientific award model.

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4. The localization development path of Science Philanthropy

Through the multi-dimensional comparative analysis of the above four typical cases of Science Philanthropy at home and abroad, it can be found that the development of Science Philanthropy in China must be based on the local institutional environment, scientific research system and social donation culture. While drawing on international experience, it is necessary to forge a development path that suits the national conditions. Specifically, efforts should be made from three aspects: the mechanism of fund sources, the academic governance structure, and the strategy of fund investment, to form a localized development path for Science Philanthropy with Chinese characteristics.

4.1. Establish an investment mechanism for Science Philanthropy funds that combines competitiveness and stability

Science Philanthropy needs to establish a funding mechanism that combines competitiveness and stability to solve the problem of sustainability. Under the framework of China's laws and regulations, high-risk tools from abroad cannot be simply copied. The central government's requirement of combining competition with stable support should be implemented, attract large donations to form a stable funding pool, and provide long-term and stable support to high-quality basic research projects and young talents that have been reviewed. Establish a publicity and liaison department to proactively connect with donors and reduce information asymmetry; at the same time, purchase asset management products from licensed institutions in accordance with the law, carry out equity investment related to the purpose, and encourage equity donations, charitable trusts, etc., to promote the self-sustaining development of the funding pool and ensure its long-term survival.

4.2. Adhere to academic autonomy under the compliance framework and strengthen professional decision-making and supervision constraints

The localization of Science Philanthropy should adhere to academic autonomy under the premise of compliance, allowing those who best understand scientific research to decide the direction of funds. A high-level and independent academic review team should be established, authoritative experts should be recruited, and an open and standardized process should be formulated to select projects and talents. Implement the "contract responsibility system" orientation of the 15th Five-Year Plan, and grant scientists greater decision-making power over technical routes and fund allocation. At the same time, integrity and risk prevention and control should be improved, and a governance structure that integrates governmental oversight, internal self-regulation, and external accountability should be established, and establish a dedicated supervision body for full-process supervision. Ultimately, a sound operation model featuring professional decision-making, academic autonomy and effective supervision will be formed.

4.3. Scientifically control the flow of Science Philanthropy funds to balance risks and efficiency

Science Philanthropy should scientifically control the flow of funds and balance risks and efficiency in terms of fields and stages. The funding fields should be in line with national strategies and global frontiers. While ensuring stable investment in basic research, it should boldly support original and disruptive frontier technologies as a supplementary force to government investment, not determined by personal preferences. During the funding stage, it is necessary to balance "rewarding existing achievements" and "early-stage investment in developing projects". Under certain circumstances,

DOI: 10.54254/2753-7048/2026.34326

the two can complement each other to form a complete support loop. Although early-stage investment carries relatively high risks, Science Philanthropy does not pursue economic returns. It is necessary to maintain enthusiasm for funding, prevent potential explorations from being interrupted due to a lack of funds, and effectively promote scientific progress.

5. Research outlook

This article, through a comparative analysis of four typical domestic and international cases, summarizes three localized development paths for Science Philanthropy, supplements the research on the practical paths of Science Philanthropy, and also provides corresponding references for individuals and organizations that are interested in participating in Science Philanthropy. But there are still some limitations in this paper. Although the four selected cases are typical benchmarks both at home and abroad, they do not include emerging foundations that have emerged in China in recent years, such as the New Cornerstone Science Foundation, Meituan Qingshan Science and Technology Fund, and Xiaomi Foundation. Furthermore, although this article explores the localization development path of Science Philanthropy within the current national policy and legal framework, it does not involve specific suggestions at the policy design level. For instance, Lei Jun's proposal at the National Two Sessions pointed out that a more complete institutional environment should be created for public welfare foundations to support scientific and technological innovation, promoting the full integration of public welfare foundations into the national innovation ecosystem, and incorporating the behavior of enterprises and individuals in funding scientific and technological public welfare into the innovation evaluation framework. These contents regarding policy suggestions are not covered in this article.

The development of Science Philanthropy still has a long way to go. The Impact Institute pointed out in its comparative report on Science Philanthropy between China and the United States that a mature Science Philanthropy industry should possess three capabilities: taking on high risks, cross-cycle stable operation, and data accumulation and self-reflection. Future research on Science Philanthropy can focus on the following aspects: risk-tolerance policy design for charitable funding in the frontier exploration field, and sharing scientific research risks together; incorporating Science Philanthropy donations into innovation evaluations, improving the supporting regulations for equity donations and charitable trusts, and broadening the sources of long-term funds; establishing unified information reporting and disclosure standards for Science Philanthropy, building a comprehensive longitudinal database, promoting regular reflection and continuous improvement in the industry, and ultimately helping Science Philanthropy gradually grow into a stable social force supporting the country's innovative development.

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