

A Study on the Role of Female Investors' Perspective in Promoting the Innovation and Development of Rare Diseases

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Abstract: Rare diseases, affecting over 300 million patients globally, pose a significant public health challenge. These diseases have long faced challenges in terms of insufficient innovation resource allocation and inadequate investment support. Traditional investment models, characterized by their focus on short-term gains and risk aversion, struggle to meet the unique demands of the rare disease sector, which is marked by high risk, long cycles, and low commercial returns. Female investors, with their unique value concepts and investment behaviors, are becoming a crucial force in driving the innovative development of rare diseases. This study analyzes the behavioral patterns, value creation mechanisms, and practical approaches of female investors in rare disease investments, systematically explaining how they can inject new vitality into the rare disease innovation ecosystem through their socially responsible investment motives, long-term value-oriented strategies, and humanistic care influenced by emotional factors. The research finds that female investors exhibit unique methods of financial support, outstanding resource integration capabilities, and comprehensive value-added services, effectively addressing the shortcomings of traditional investment models in patient needs, social value creation, and sustainable development. However, female investors still face market-level issues such as funding scale limitations, insufficient decision-making influence, and professional skepticism, as well as policy environment constraints like inadequate regulatory policies and missing tax incentives, and social cognitive limitations. This study proposes systematic strategic recommendations for enhancing market capabilities, optimizing the policy environment, and improving social cognition, providing theoretical guidance and practical references to help female investors better play a promoting role.

Keywords: Female Investors; Rare Diseases; Innovation and Development

1. Introduction

Rare diseases pose a significant challenge to modern medicine, causing immense suffering for patients and their families, and posing a severe test to the allocation of medical resources and innovation capabilities in society. Among the approximately 7,000 known rare diseases, fewer than 5% have effective treatment options, highlighting the urgent need for innovation in this field. The traditional pharmaceutical investment system is notably ill-suited to the unique demands of rare diseases, as its focus on short-term financial gains conflicts with the long-term patience required for rare disease research and development. In this context, female investors, with their unique investment philosophies and behaviors, are becoming an indispensable force in driving the innovative development of rare diseases.

Women investors demonstrate a strong sense of social responsibility, a focus on long-term value, and a commitment to risk management in their investment decisions, which aligns closely with the intrinsic needs of investing in rare diseases. They are particularly concerned with the social impact and patient value of investment projects, and are willing to provide sustained financial support for innovative projects with significant clinical implications. This investment philosophy offers new perspectives and approaches to addressing the funding gaps in the rare disease sector. A deeper exploration of women investors' role in driving innovation in rare diseases not only enhances the theoretical framework of rare disease investment but also has significant practical and guiding value for optimizing resource allocation and promoting the healthy development of the industry.

2. The role of female investors in innovation and development in the field of rare diseases

2.1 Social responsibility drive

(1) Care for vulnerable groups

Female investors show a natural inclination towards caring for vulnerable groups in the investment of rare diseases. This care is not only reflected in their value judgments but also deeply influences their investment practices. Rare disease patients, who are often marginalized in the medical field, face multiple challenges such as difficulty in diagnosis, limited treatment options, and high medical costs. Driven by their innate empathy and social concern, female investors tend to focus their investment perspectives on the actual needs of this special group ^[1]. In practice, they often delve into the living conditions and treatment difficulties of rare disease patients, gathering firsthand information through field research and patient interviews to ensure that investment projects genuinely address the patients' real issues. This patient-centered investment philosophy leads female investors to support innovative projects with clear clinical value that can significantly improve patients' quality of life, rather than just focusing on maximizing financial returns. The care shown by female investors is also evident in their emphasis on the corporate social responsibility (CSR) of the invested companies. They place greater importance on the companies' performance in areas such as drug accessibility, patient assistance programs, and public welfare activities, promoting the establishment of a more comprehensive CSR system ^[2]. Through the influence of their investment decisions, female investors effectively promote the construction and dissemination of a culture of social responsibility in the rare disease sector.

(2) The concept of health equity

Health equity, a core value in modern healthcare systems, holds a significant place in the investment philosophies of female investors. Due to the rarity and complexity of rare diseases, patients often face challenges in accessing medical resources, making health equity issues particularly prominent. Female investors, driven by a deep understanding and strong belief in health equity, actively invest in innovative projects that promote medical equity for rare diseases. In their investment choices, they focus on technologies that can reduce treatment costs and improve drug accessibility. For example, they prioritize investments in new drug delivery technologies, low-cost diagnostic methods, and telemedicine solutions, which can effectively lower the barriers to treating rare diseases and benefit more patients. Female investors also actively promote the establishment of diversified payment models and protection mechanisms. They support the development of innovative payment schemes, such as pay-for-performance models, patient assistance funds, and commercial insurance coverage, aiming to build a more equitable and reasonable medical payment system. Through these innovative payment models, they help alleviate the economic burden on patients with rare diseases and improve treatment accessibility. Female investors also pay attention to global health equity issues, actively participating in international cooperation projects to promote the application of rare disease treatment technologies in different regions. They support differentiated pricing strategies for regions with varying levels of economic development, ensuring that patients with rare diseases worldwide can access necessary medical services.

2.2 Long-term value orientation

2.2.1 Sustainable development concept

Female investors demonstrate a strong commitment to sustainable development in investing in rare diseases. This commitment is evident not only in their focus on the long-term value of investment projects but also in their thoughtful consideration and practical application of the sustainability of the entire rare disease innovation ecosystem. The concept of sustainable development enables female investors to look beyond short-term financial gains, considering the broader impact on social value and investment value. In their decision-making process, they place greater emphasis on the long-term growth potential and sustainability of projects. They consider multiple factors, including the maturity of technology, market prospects, regulatory stability, and the continuity of social demand, to build a comprehensive value assessment system. This holistic approach helps identify truly valuable investment opportunities and avoids the negative impacts of short-term speculation on industry development. Female investors' commitment to sustainable development is also reflected in their attention to the governance structure and development model of the companies they invest in. They favor companies with strong governance structures, a focus on talent development, and a strong emphasis on R&D innovation, promoting the establishment of sustainable business models and

development strategies. By participating in corporate governance, female investors effectively support the standardized development and long-term competitiveness of rare disease companies. In terms of ecosystem development, female investors actively promote collaborative innovation among industry, academia, and medical sectors, supporting the establishment of long-term and stable cooperation mechanisms. They emphasize the integration of basic and applied research, supporting the entire innovation chain from basic scientific discoveries to clinical applications, laying a solid foundation for the sustainable development of the rare disease field.

2.2.2 Risk tolerance differences

Women investors exhibit significant differences from male investors in risk tolerance and risk management approaches, which add unique value to investments in rare diseases. Compared to high-risk, high-reward strategies, women investors tend to adopt a more conservative risk management approach, which is particularly advantageous in the unique environment of rare disease investments. Women investors typically conduct more thorough due diligence, spending significant time and effort to understand the technical details, market conditions, regulatory risks, and other aspects of the project. This meticulous due diligence helps identify and mitigate potential risks, enhancing the scientific rigor and accuracy of investment decisions. In the context of rare disease investments, where technology is complex, regulations are stringent, and market uncertainties are high, this cautious approach is especially crucial. When it comes to risk diversification, women investors focus on diversifying and balancing their portfolios. They strategically allocate investments across rare disease projects at various stages, using different technical approaches and targeting different indications to reduce overall risk. Additionally, they value collaboration with other investment institutions, sharing risks through joint investments to increase the likelihood of project success. Women investors also emphasize continuous monitoring and dynamic adjustments in their risk management. They establish robust post-investment management systems, regularly assess project progress and changes in risk, and promptly adjust investment strategies and support measures.

2.2.3 Specific ways in which female investors promote innovation in rare diseases

(1) Ways of financial support

Women investors exhibit a unique investment pattern in the field of rare disease innovation. This pattern is not only reflected in the scale and timing of their investments but also in the innovative arrangements for investment structure and risk sharing mechanisms. Compared to traditional investors, women are more likely to provide crucial financial support in the early stages of rare disease projects. This 'timely support' effectively fills the funding gap in the rare disease innovation chain. Understanding the high-risk and long-term nature of rare disease research, women show greater patience and resilience in their financial arrangements, willing to provide continuous funding for projects with significant clinical value.

When it comes to the use of investment tools, female investors exhibit a more flexible and diverse approach to capital allocation. Beyond traditional equity investments, they actively explore a variety of financing tools, such as debt investments, convertible bonds, and milestone payments. This diversified funding strategy better aligns with the varying capital needs of rare disease companies at different stages of development. Notably, female investors place greater emphasis on aligning their interests with those of entrepreneurs and sharing risks when designing investment terms. By establishing reasonable valuation adjustment mechanisms and performance incentive clauses, they protect investors' rights while also motivating the entrepreneurial team^[3].

(2) Resource integration capability

Female investors demonstrate exceptional resource integration capabilities in the innovation of rare diseases. This capability is evident in their ability to effectively identify, connect, and coordinate various innovative elements, thereby building a comprehensive resource network that supports the development of rare disease enterprises. Leveraging their natural communication and coordination skills and keen insights, female investors can deeply understand the specific needs of rare disease enterprises in areas such as technology research and development, market expansion, and regulatory affairs, and integrate relevant professional resources accordingly. In terms of technology resource integration, female investors, through their extensive professional networks, can introduce top-tier research institutes, medical institutions, and technical experts to the invested enterprises. They not only focus on the advancement of technology but also emphasize the feasibility of technology transfer and the practical value of clinical applications, showing a stronger practical orientation in the selection and matching of technology resources. By establishing a closely integrated collaboration mechanism among

industry, academia, research, and medicine, female investors effectively promote the rapid transformation of basic research results into clinical applications, thereby shortening the time from laboratory to patient for rare disease innovation. The integration of market resources also highlights the unique value of female investors. They can deeply understand the real needs and medical habits of patient groups and, through deep cooperation with patient organizations, doctors, hospital managers, and other stakeholders, build market channels that directly reach end users for rare disease enterprises. Female investors place a high value on integrating international market resources. By establishing cross-border cooperation networks, they help Chinese rare disease companies gain access to advanced technologies and mature markets overseas, while also facilitating the entry of high-quality foreign projects into the Chinese market. In terms of regulatory resource integration, female investors demonstrate a keen awareness and proactive adaptation to changes in the policy environment. They actively participate in activities related to industry associations and standard-setting organizations, maintaining good communication with regulatory authorities, and can promptly provide regulatory policy interpretations and compliance guidance to their invested companies. This forward-thinking approach to regulatory resource integration effectively reduces the policy risks faced by rare disease companies and increases the likelihood of product approval and market entry.

(3) Providing value-added services

Women investors offer value-added services in the investment of rare diseases that are highly personalized and cover the entire lifecycle. These services often extend beyond traditional investment relationships, demonstrating a stronger partnership and a focus on long-term value creation. In optimizing corporate governance, women investors leverage their natural advantages in organizational management and interpersonal relations to help rare disease companies establish more standardized and efficient governance structures. They not only focus on the professionalism and diversity of the board but also emphasize the cohesion and execution capabilities of the management team. By introducing advanced management concepts and methods, they enhance the internal operational efficiency and decision-making quality of the company. In talent team building, women investors show a deep understanding of talent value and a strong emphasis on team building^[4]. They can keenly identify the talent needs of rare disease companies at different stages of development and, through their networks and professional judgment, introduce top talent to key positions. More importantly, women investors often pay more attention to corporate culture and employee development, promoting the establishment of comprehensive talent development and incentive mechanisms to enhance the company's appeal and cohesion to top talent. Market expansion and brand building are another key area where women investors provide value-added services. With a deep understanding of patient needs and market dynamics, they can develop more precise and effective market strategies for rare disease companies. They attach special importance to the shaping of corporate social image and the promotion of brand value, and help enterprises establish a good social reputation and professional recognition through organizing participation in public welfare activities, media publicity, academic exchanges and other ways.

2.3 Problems existing in the participation of female investors in innovative investment of rare diseases

(1) Market level problems

The market-level constraints faced by female investors in the field of innovative investments for rare diseases pose a fundamental barrier to their greater involvement. These constraints not only limit the depth of their participation but also structurally impact the diversified development of the entire rare disease investment ecosystem^[5]. The most obvious constraint is the relatively limited capital scale. Statistics show that the total size of funds managed by female investors is significantly smaller than that of male peers, especially in rare disease R&D projects that require substantial capital investment. The full-cycle investment in rare disease drugs, from early research and development through clinical trials to market access, often requires hundreds of millions of dollars. Female investors' funds are often insufficient to independently meet such large capital demands, forcing them to seek joint or phased investments to participate in projects. This financial constraint directly affects their leadership and influence in investment decisions^[6].

The lack of decision-making influence further marginalizes female investors in the investment of rare diseases. In traditional investment committees and board structures, female investors are often outnumbered, leading to their investment philosophies and value judgments being overlooked or downplayed. Especially in the technology-intensive investment decisions for rare diseases, the soft

indicators that female investors focus on, such as patient experience, social impact, and long-term value, are often considered secondary factors, while hard indicators like financial returns and technical feasibility dominate. This imbalance in decision-making power makes it difficult for female investors to fully express their unique values and investment philosophies in actual investment decisions, thereby limiting their influence on the direction and development models of rare disease innovation.

(2) Policy environment constraints

The imperfections and inconsistencies in the policy environment pose significant external constraints for female investors in the rare disease investment sector. These policy barriers not only increase investment uncertainty and complexity but also fail to adequately address the specific needs and concerns of female investors in institutional design. The regulatory policy framework is flawed in several ways: the complex and unpredictable approval process for orphan drugs poses significant challenges to investment decisions, especially for female investors who prioritize investment certainty and risk control. The lengthy and opaque approval procedures complicate the assessment of investment risks. The ambiguity in regulatory standards and inconsistencies in policy enforcement further exacerbate this uncertainty, making it difficult for female investors to establish clear risk expectations and benefit models when making investment decisions^[7].

The restrictive arrangements of the medical insurance payment system directly impact the commercial prospects and profitability of rare disease investment projects. Due to their high cost and limited patient base, rare disease drugs face numerous challenges under the current medical insurance access mechanism. The high entry threshold, long approval process, and limited coverage in the medical insurance directory make the market path for rare disease companies uncertain. For female investors who prioritize the social value and accessibility of investment projects, the restrictions imposed by medical insurance payment policies not only hinder the realization of investment returns but also conflict with their investment philosophy of health equity and social responsibility. This value-based contradiction leads to a dilemma in the commercial feasibility assessment of socially significant rare disease projects.

(3) Social cognitive limitations

The limitations of the social cognitive environment create deep-seated cultural and conceptual barriers for female investors in investing in rare diseases. Although these barriers are relatively subtle, their impact is comprehensive and long-lasting. The general public's low awareness of rare diseases directly affects society's understanding and support for the investment value of these conditions. Most people still view rare diseases through a lens of sympathy and charity, lacking a deeper understanding of them as innovative fields with significant medical value and commercial potential. This lack of awareness leads to insufficient attention from public opinion on investments in rare diseases, making it particularly challenging for female investors to gain social understanding and support, especially in investment projects that require public participation and social mobilization. The lack of awareness becomes a critical factor hindering project progress.

The relatively weak development of patient organizations has weakened the critical support in the investment ecosystem for rare diseases. Compared to developed regions like Europe and America, patient organizations in China are less organized, have limited influence, and lack professional standards. This situation makes it difficult to effectively convey the genuine needs and voices of patients to investors and policymakers. As a vital bridge between investors and patients, the absence of patient organizations hinders female investors from accurately understanding the actual needs and challenges faced by patients, thus affecting the precision and effectiveness of investment decisions. The insufficient role of patient organizations in policy advocacy, social promotion, and industry advancement also limits the broader societal recognition of the importance of investing in rare diseases.

The severe shortage of professional talent hinders the overall development and specialization in the investment sector for rare diseases. This investment involves multiple specialized fields, including medicine, biotechnology, drug development, regulatory affairs, and market access. It requires interdisciplinary knowledge and extensive practical experience. However, there is a significant shortage of professionals who are knowledgeable about rare diseases and have investment experience. Female investors face greater challenges in team building and talent recruitment, as they must compete with male investors for limited resources and overcome biases and concerns from top talents towards female-led investment institutions. The lack of a robust professional training system and continuing education mechanisms further exacerbates the talent supply-demand imbalance, hindering the rapid enhancement of professional capabilities within female investor teams.

3. Strategies for female investors to participate in innovative investment in rare diseases (in detail)

3.1 Market capability improvement strategy

Women investors should enhance their capabilities through systematic capacity building and strategic resource integration to overcome market-level constraints, thereby establishing a competitive investment capability system and market influence. The key to expanding capital scale lies in innovating financing models and broadening funding sources. Women investors can achieve a capital aggregation effect by forming alliances, such as joint investments and the establishment of special funds, which can significantly boost the financial strength of individual investment institutions. Additionally, they should actively seek partnerships with government-guided funds, state-owned investment platforms, and large financial institutions, leveraging a mixed-ownership fund structure to secure larger-scale funding support. Furthermore, exploring deep cooperation with international investment institutions, by attracting foreign capital and setting up cross-border investment platforms, can help break through local capital constraints and allocate investment resources globally^[8].

To enhance the influence of female investors in decision-making, they need to take proactive strategies in institutional design and the development of their voice. *This ensures the voices of female investors are fully expressed and effectively represented. These initiatives will foster a collective voice and solidify their professional brand and authoritative standing in rare disease investment.*

3.2 Policy environment optimization strategy

Women investors should leverage their strengths in communication, coordination, and social mobilization to actively participate in improving and optimizing the policy environment, thereby creating more favorable institutional conditions for investments in rare diseases. To promote the improvement of regulatory policies, women investors should adopt a more proactive and constructive approach by participating in policy consultation meetings organized by regulatory bodies, submitting professional opinions and suggestions, and engaging in the public consultation process for draft regulations, thus contributing their expertise to policy formulation. A regular communication mechanism with regulatory bodies should be established to regularly address regulatory issues and policy barriers encountered in investments in rare diseases, promoting the refinement and standardization of regulatory policies and implementation standards. Women investors within the industry should form a unified stance, enhancing the impact and persuasiveness of policy advocacy through collective voices.

Promoting the reform of medical insurance payment requires female investors to actively promote the innovation and improvement of medical insurance policies, driven by a deep understanding of patient needs and a strong commitment to health equity. They should conduct in-depth research on advanced international models and practices of medical insurance payment, and propose practical policy recommendations and reform plans tailored to China's specific conditions. By collaborating with patient organizations, healthcare institutions, academic groups, and other stakeholders, they can work together to establish a multi-party co-payment mechanism and risk-sharing system for medical insurance. Additionally, they should actively participate in the adjustment of medical insurance directories and the formulation of access standards, providing professional support and policy recommendations for the inclusion of rare disease drugs in medical insurance^[9].

To secure tax incentives, female investors should leverage their professional knowledge and practical experience to provide detailed policy effectiveness analyses and feasibility studies for government departments. They should conduct in-depth research on the specific practices and implementation effects of tax incentives for rare disease investments in developed countries, and propose targeted policy recommendations that align with China's tax system.

To expand international cooperation channels, female investors should leverage their strengths in cross-cultural communication and international network building to create a global platform for collaboration and resource sharing. They should actively participate in international rare disease investment forums, cross-border cooperation projects, and multilateral investment agreements, establishing long-term partnerships with overseas investment institutions, regulatory bodies, and academic organizations. Efforts should be made to establish bilateral or multilateral cooperation mechanisms for rare disease investments, providing policy support and institutional guarantees for cross-border investments. An international project screening and evaluation system should be

established to enhance the efficiency and success rate of cross-border investments.

3.3 Social cognition improvement strategies

Women investors should leverage their natural advantages in social communication and public education to systematically improve and optimize the social environment, creating a more favorable atmosphere for investing in rare diseases. To raise public awareness, women investors should adopt diverse and innovative communication strategies, such as organizing public lectures, producing educational content, participating in media interviews, and hosting themed events to promote knowledge about rare diseases. Establishing a rare disease education fund or public welfare project can support the ongoing and expansion of public education activities. Collaborating with educational institutions, medical facilities, and research institutes, incorporating rare disease knowledge into formal education systems like medical, public health, and scientific literacy education can enhance societal understanding from the outset. Utilizing the dissemination advantages of the Internet and new media platforms, such as short videos, live broadcasts, and social media, can expand the reach and impact of these campaigns[10].

To strengthen the development of patient organizations, female investors should provide comprehensive support and assistance based on a deep understanding and care for the patient community. This includes financial support, capacity building, and resource integration to enhance the organizational structure and professional standards of patient organizations, and to establish modern governance structures and operational mechanisms. To enhance media coverage, female investors should establish long-term partnerships with mainstream media to promote specialized and in-depth reporting on investments in rare diseases.

4. Conclusion

Women investors have demonstrated unique value and a driving force in the innovative development of rare diseases, not only through capital support but also through their leadership in value concepts and the optimization of the ecosystem. Driven by social responsibility, long-term value orientation, and humanistic care, women investors bring a more diverse investment perspective and a more inclusive development model to the rare disease sector. By offering innovative funding methods, excellent resource integration capabilities, and comprehensive value-added services, they effectively address the shortcomings of traditional investment models in patient needs, social value creation, and sustainable development, contributing significantly to building a more complete and humane ecosystem for rare disease innovation. The market constraints, policy environment barriers, and social cognitive limitations faced by women investors in rare disease investments highlight both the real challenges of gender equality in the investment field and the weak links that need improvement in the rare disease investment ecosystem. Through systematic strategies to enhance market capabilities, optimize the policy environment, and improve social cognition, women investors can not only overcome their own development bottlenecks but also promote the entire rare disease investment sector towards a more mature, standardized, and sustainable direction. Looking ahead, as society increasingly values the concept of health equity, the policy environment continues to improve, and public awareness grows, female investors will play a more prominent role in the innovative development of rare diseases. Their unique investment philosophy and value pursuits will bring hope to more patients with rare diseases and contribute significantly to building a fairer, more inclusive, and more sustainable healthcare ecosystem.

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