

Article

Research on the Evaluation of Talent Ecosystem in Industrial Parks from the Perspective of Capital Endowment: Evidence from China's Hainan Free Trade Port

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Abstract

A well-functioning talent ecosystem serves as a crucial foundation for promoting high-quality development of Hainan Free Trade Port (HFTP) in China, holding strategic significance for enhancing the competitiveness and sustainable development of its industrial parks. This study aims to evaluate the talent ecosystem within key industrial parks of HFTP and identify its key influencing factors. Data were collected through questionnaire surveys, with respondents who fully completed relevant measurement items selected as research subjects. Multiple linear stepwise regression analysis and robustness tests were comprehensively employed for data analysis. The findings reveal that: (1) gender, age, and political affiliation exert significant influences on talent ecosystem evaluations; (2) social capital demonstrates a significant positive impact on ecosystem assessments; (3) economic capital shows no statistically significant effect; and (4) cultural capital exhibits a significant negative influence. Based on these results, governors should embrace an ecological governance mindset. This approach involves establishing an innovative “Talent Ecosystem Health Index” monitoring system, with periodic evaluation and public reporting of its findings. A multi-stakeholder “Talent Ecosystem Governance Committee” should be formed to coordinate strategic planning and policy alignment. Additionally, “policy mix experiments” should be conducted to explore the optimal integrated conditions for talent policies. Ultimately, these initiatives aim to establish a self-adaptive regulatory mechanism based on dynamic monitoring and feedback, thereby enhancing the adaptability and long-term resilience of the talent ecosystem.

Keywords: capital endowment; industrial parks; talent ecosystem; talent policy; Hainan Free Trade Port



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1. Introduction

Hainan Free Trade Port (HFTP) represents a pivotal gateway for China's new era of opening-up and stands as one of the nation's key strategic initiatives for reform and opening. It aims to establish itself as a globally leading free trade port and an international tourism and consumption center. To achieve these strategic objectives, the government has implemented a series of political and economic policies. These include steadily expanding institutional openness, further enhancing the liberalization and facilitation of trade and investment, and deepening commodity and factor flow-oriented opening measures to better facilitate cross-border flows of production factors. Concurrently, administrative system reforms have been advanced to optimize government services, with focused efforts

on creating a first-class business environment characterized by market orientation, rule of law, and international standards. Moreover, open talent mechanisms are being developed to provide robust human capital support for HFTP's construction.

Since 3 June 2020, Hainan Provincial Government has designated 13 key industrial parks to advance HFTP development, including Modern Service Industry Parks, High-tech Industrial Parks, and Tourism Industry Parks. Among these, Yangpu Economic Development Zone, Boao Lecheng International Medical Tourism Pilot Zone, Haikou Jiangdong New Area, Sanya Yazhouwan Science and Technology City, and Wenchang International Aerospace City demonstrate strong alignment with core industries and receive substantial policy support. Each park maintains distinctive industrial positioning and development directions. These 13 parks serve as pilot zones for implementing HFTP's policies, leveraging institutional innovations to optimize the business environment, accelerate project and market entity clustering, and gradually manifest economic benefits—thereby significantly driving HFTP's innovative development. Through comprehensive deployments across three key dimensions—talent residence permits, talent services, and immigration management—and by leveraging policy dividends, institutional advantages, industrial agglomeration, innovation drivers, and talent attraction mechanisms, these parks continuously strengthen investment promotion and vigorously advance key project construction. This multifaceted approach provides substantial momentum for the rapid expansion of Hainan's economic aggregate.

The industrial park serves as a platform and carrier for industrial development, a window for attracting investment, and a hub for elites. Its role in the construction of the Hainan Free Trade Port has become increasingly prominent. From the outset of Hainan Free Trade Port initiative, the goal has been to promote high-quality development through industrial parks as pioneers by 2025, as outlined in Hainan Provincial Government Work Report. By 2024, cumulative fixed asset investment in these parks had reached 134.121 billion yuan, representing a growth of 4.8% [1]. Under China's workforce development strategy, by 2025, the Hainan provincial government required key industrial parks to continuously adjust their planning and industrial positioning according to the needs of building a Chinese-characteristic HFTP and industry trends. This includes introducing and nurturing outstanding talent to promote industrial agglomeration, differentiated development, and new business model development, thereby facilitating healthy and efficient park development [2]. Therefore, the quantity, quality, and ecosystem of talent directly impact the development of key industrial parks in Hainan Free Trade Port construction and national strategy implementation.

As key hubs for talent concentration, the industrial parks bear the fundamental imperative of cultivating a talent ecology capable of attracting, retaining, and fostering talent development. Within the new strategic development context of Hainan Free Trade Port, constructing a sustainable talent ecosystem has emerged as a central objective and integral component of its talent policy framework. This endeavor holds significant strategic importance for expediting the optimization of developmental environments—spanning policy landscapes, ecological conditions, and the overall business climate. Forging a resilient talent ecosystem will constitute a distinct comparative advantage and source of core competitiveness for Hainan's key industrial parks. It will furnish both empirical evidence and theoretical support for identifying and enhancing Hainan's strengths in talent development, thereby contributing to the establishment of a modernized governance environment for talent development within Hainan Free Trade Port.

With the deepening of talent studies, examining the interaction between talent and their social environment from an ecological perspective has emerged as a new research trend. In particular, theories related to talent ecosystems offer unique insights for scientifically guiding talent development within key industrial parks of Hainan Free Trade Port.

Existing research has largely focused on macro-level interpretations of talent ecosystems, with relatively limited investigation from the subjective perspective of individual talents. Given that talent constitutes the core and key factor of any talent ecosystem, it is essential, based on feedback from park talents, to investigate the current status of the talent ecosystem in key industrial park of Hainan Free Trade Port and evaluate its effectiveness.

Based on this background, the primary contribution of this research lies in addressing the talent ecosystem in key industrial parks of Hainan Free Trade Port within the dual contexts of institutional and socio-cultural dynamics. Grounded in Social Capital Theory and Ecosystem Theory, and adopting the subjective perceptions of talents as the analytical entry point, this study seeks to address three core questions: First, how do professionals in key industrial parks of Hainan Free Trade Port evaluate the local talent ecosystem? Second, what are the key factors influencing the evaluation of the talent ecosystem in these industrial parks? Third, how can a resilient talent ecosystem be constructed for the key industrial parks of Hainan Free Trade Port?

Therefore, this research provides a novel theoretical lens for understanding the underlying logic of talent ecosystem evaluation. It offers policy-makers insights into talent ecological governance that emphasize “optimizing conditional configurations” over merely “strengthening individual factors.” Consequently, it holds significant theoretical and practical value for advancing the transformation of talent policies in Hainan Free Trade Port from fragmented reforms toward systematic innovation.

2. Literature Review and Hypothesis

2.1. Talent and Talent Ecosystem

The academic discourse on talent in international scholarship has evolved into a multidimensional research domain characterized by distinct theoretical frameworks and empirical investigations. The field is principally anchored in human capital theory [3,4], which conceptualizes talent as a form of capital yielding economic returns through education and skill acquisition. Contemporary research has expanded to examine global talent flows through push-pull frameworks [5], with particular emphasis on the migration patterns of highly skilled professionals and the phenomenon of brain circulation within multinational enterprises [6].

Scholarly inquiry further extends to talent ecosystems, exploring the dynamic interplay between institutional environments, technological infrastructure, and human capital development [7]. Policy-oriented research systematically compares selective immigration mechanisms [8] and regional talent governance models, while innovation studies consistently demonstrate positive correlations between talent agglomeration and regional innovative capacity [9]. Recent investigations have begun addressing emerging phenomena, including digital talent transformation, the impact of remote work on geographical talent distribution [10], and the role of human capital in sustainable development transitions. The methodological approaches predominantly employ quantitative analyses of transnational datasets, increasingly complemented by mixed-method designs that integrate sociological, economic, and geographical perspectives. This evolving research paradigm continues to refine our understanding of talent as both a driver of economic competitiveness and a critical factor in organizational and regional development strategies.

The concept of “talent” represents a distinctly Chinese construct, whose conceptual definition within Chinese academia is inextricably linked to the development of the discipline of talent studies. Collings et al. have proposed that talent refers to employees who excel in key positions [11]. Reviewing the research of many scholars, it is evident that the definition of “talent” almost universally emphasizes individual capabilities, defining talent as a worker who possesses certain professional knowledge and skills, good qualities, and makes a contribution to society. Therefore, this study adheres to this definition, combining

it with the actual talent situation in the construction of Hainan Free Trade Port and the definition of talent in the “The Strategy of Introducing 1 Million Talents to Hainan (2018–2025)”. In practical investigations, two types of talents are selected: those who benefit from Hainan Province’s talent policies and those who have made certain contributions and value within the park.

The study of talent ecosystem originated from the interdisciplinary research where the concept of ecosystem entered the realm of social sciences. In 1999, American scholar Deolalikar first introduced the concept of talent ecosystem, focusing on examples from some Asian countries to analyze changes in their talent environments before and after the financial crisis, as well as existing problems and human resource conditions [12]. Many scholars have also defined talent ecosystem from different perspectives. Shen Bangyi considers talent ecosystem to be the state of existence of talent life [13]. Zhou Fangtao defines talent ecosystem as a dynamic equilibrium system formed by the interaction between talent and entrepreneurial ecological environment [14]. Scholars like Wang Jieqiong view the talent ecosystem as a unified whole where individual talents, entrepreneurial enterprises, and entrepreneurial environments interact and depend on each other within a certain regional scope, with entrepreneurial talents at its core [15]. Research by scholars such as Gary [16], Atsutosh [17], Charlotta [18], Heather [19], and Daron [20] has found that factors such as salary level, company environment, innovation opportunities, self-development chances, interpersonal relationships, welfare policies, and educational levels all have an impact on talent ecosystem and human resource environments. Additionally, scholars like Charlotta [18] and Lloyd [21] argue that besides individual factors, elements of urban experience such as a city’s transportation convenience, openness, cultural inclusiveness, and living comfort also influence human resources and talent ecological environments.

A review of the existing literature reveals that research on talent ecology has evolved as an interdisciplinary field integrating perspectives from ecology, sociology, economics, and management. It emphasizes the dynamic interactions between talent and their environment, as well as among various elements within the system, with a focus on sustainable development. Research adopting the ecological perspective conceptualizes talent within the ecosystem as “biological populations” that are interdependent with environmental factors such as policy, economy, culture, and technology. This line of inquiry prioritizes the flow and balance of materials, energy, and information within the system [22], with a focus on analyzing issues such as talent inflow and outflow, competitive “ecological niches,” and adaptation to policy environments [23]. Research grounded in Complex Adaptive Systems (CAS) theory posits that talent ecosystems possess characteristics such as self-organization, dynamic evolution, and path dependence [24]. The interactions between talent and their environment continuously drive system adjustment and evolution, endowing it with a degree of systemic resilience [25]. The social capital theory stream investigates factors influencing talent development, asserting that such development relies on social networks, trust, and norms. These elements are seen as crucial facilitators of knowledge flow, collaboration, and innovation [26]. Conversely, research from the human capital theory perspective conceptualizes talent as “capital” formed through individual investments in education and training. The accumulation and allocation of this capital are understood to significantly impact economic output and contribute substantially to regional innovation [27]. Furthermore, studies employing the institutional theory lens confirm that both formal institutions and informal institutions [28] jointly shape the “rules of the game” for talent development [29]. Institutional barriers or incentive policies are shown to significantly influence talent mobility and effectiveness [30].

Therefore, drawing on existing research, this study defines talent ecosystem as the state of existence and mutual relationships of a community composed of various political,

economic, technological, social, and cultural organizations related to talent, with talent at its core. This study explicitly defines the “talent ecosystem” as a distinctive type of social-ecological system (SES). It focuses on analyzing the governance and adaptive evolutionary mechanisms of talent ecosystems within key industrial parks of Hainan Free Trade Port. This directly addresses the core research question within the stream of applying SES theory [31] to the governance of complex challenges: how to enhance the sustainability of complex systems through governance [32].

2.2. RBV and Institutional Theory

The core proposition of the Resource-Based View (RBV) is that the unique and difficult-to-imitate resources and capabilities within a firm constitute the fundamental source for gaining and sustaining long-term competitive advantage [33]. The VRIN/VRIO framework serves as the classic criterion for assessing the strategic value of resources, emphasizing that resources must be valuable, rare, inimitable, and organized to capture value. This theoretical foundation has subsequently spawned significant branches, including Dynamic Capabilities Theory, the Knowledge-Based View, and the Natural Resource-Based View [34]. RBV provides a multi-level analytical framework for understanding talent ecosystems: at the individual level, an individual’s skills and networks are viewed as personal VRIN resources; at the organizational level, the talent management capability of an industrial park is a key strategic resource; at the regional/ecosystem level, the scale, diversity, and governance capacity of the talent pool constitute a collective strategic resource for the region [35].

The core proposition of institutional theory is that organizational behavior and structure are driven not only by efficiency but are profoundly shaped by the pursuit of legitimacy [36]. Organizations are deeply embedded in an institutional environment composed of regulations, norms, and cultural-cognitive elements. To gain social acceptance and ensure survival legitimacy, they adopt structures and practices that conform to environmental expectations, leading to phenomena of organizational isomorphism [37]. Institutional theory provides a macro-level perspective on the external environment and legitimacy pressures for analyzing talent ecosystems. It helps explain how talent policies within parks (the regulative pillar) directly shape talent mobility and incentive frameworks, and how talent’s social values (the normative pillar) and shared cultural-cognitive beliefs (the cultural-cognitive pillar) influence evaluations of the talent ecosystem [38].

Institutional theory can systematically analyze how the unique institutional field of the Hainan Free Trade Port shapes the behavioral logic of parks, enterprises, and talents through multiple pressures. It forms a crucial complement to the Resource-Based View: institutional theory explains the external drivers and direction of the talent ecosystem, while the Resource-Based View explains the response capabilities and evaluative perceptions of internal actors arising from differences in their resource endowments [39]. Integrating the two allows for the construction of a comprehensive analytical framework that attends to both external constraints and internal agency, thereby revealing the formative mechanisms underlying the sustainability of talent ecosystems.

2.3. Capital Endowment and the Evaluation of Talent Ecosystem

Capital endowment refers to all natural or acquired resources and abilities possessed by an individual. Capital Endowment Theory originated from neoclassical economic growth theory, and its core paradigm has undergone a profound evolution from a static factor stock perspective to a dynamic institutional-contextual perspective. The early theoretical foundation was established by Solow’s growth model [40], which emphasized the fundamental role of measurable resource accumulation, including physical and human

capital, in economic development, viewing capital as an exogenous and homogeneous factor of production. Bourdieu [41] achieved a paradigmatic breakthrough in this theory by proposing the Theory of Forms of Capital, expanding the concept of capital to include social capital, cultural capital, and symbolic capital. This revealed that capital is not merely an economic resource but also a medium for the reproduction of power embedded within social structures and cultural fields. Contemporary theoretical frontiers focus on the institutional embeddedness and contextual dependence of capital [42], which emphasized the value of capital is not intrinsic but is rather constructed and conferred by the institutional logics within specific organizational fields. These logics encompass regulative rules, normative expectations, and cultural–cognitive schemas. Under certain institutional conditions, different forms of capital exhibit limited convertibility, and their actual effectiveness depends on the structural alignment between the capital portfolio and the institutional environment. Consequently, modern Capital Endowment Theory has evolved into a dynamic systemic analytical framework that examines the mutual constitution of resource structures, institutional contexts, and agentic strategies.

Regarding the classification of capital endowment, this study adopts Bourdieu's perspective, dividing it into three types: economic capital, cultural capital, and social capital. Bourdieu was the first to link objective capital endowment with subjective behavioral decisions, explaining the influence of capital on people's behavioral logic from both "subjective construction" and "objective structure" perspectives. This study aims to use the concept of capital endowment to explain the effectiveness evaluation of the talent ecosystem in park talents. The study prefers to directly use the integrative concept of capital endowment to comprehensively and systematically examine how park talents' capital endowment affects their effectiveness evaluation in the talent ecosystem.

Departing from the traditional focus on "the impact of capital endowments on efficiency," this study adopts the path of "how the interaction of multiple capitals synergistically shapes the social-economic-governance sustainability of the talent ecosystem." It systematically introduces the "Social–Ecological Systems" framework, emphasizing that the talent ecosystem, as a complex adaptive system, derives its health from the dynamic balance among economic vitality, social equity, and governance resilience.

According to institutional theory, the behaviors of organizations and individuals are not solely driven by efficiency logic but are more profoundly shaped by the pursuit of "legitimacy." Legitimacy stems from conformity to the institutional environment, which is constituted by regulative rules, normative values, and cultural–cognitive shared conceptions. By adopting behavioral patterns that align with these institutional elements, individuals and organizations gain social recognition, access to critical resources, and a competitive advantage for sustained survival.

Social capital theory has undergone a paradigm evolution from micro-level individual resources to macro-level structural capital. Coleman [43], grounded in rational choice theory, defined it as scarce resources that actors obtain through social structures, emphasizing its productive function in the formation of human capital. Putnam [44] propelled the theoretical shift toward the macro level by proposing the classic definition of "social capital as features of social organization," systematically elucidating how trust, norms of reciprocity, and social networks enhance the efficiency of collective action and democratic governance. The development of this theory exhibits three critical shifts: analytically, from emphasizing the advantages of "structural holes" in closed networks [45] to focusing on the power of "weak ties" in open systems [46]; evaluatively, from unilaterally affirming positive effects to critically examining its "dark side"; and conceptually, from a unidimensional perspective to the three-dimensional integrated model proposed by Nahapiet and Ghoshal [47], encompassing structural, relational (trust and norms) and cognitive dimensions.

Social capital, as a research hotspot with much academic debate, has not yet formed a unified viewpoint. However, most scholars agree with Putnam's definition. Putnam defines social capital as characteristics of social organizations, such as social trust, social norms, and social networks, which can enhance social efficiency by facilitating coordination and action compared to material and human capital [48]. The theory of social capital emphasizes that factors such as trust, norms, and participation in interpersonal relationships are also important forms of capital endowment, positively influencing individuals' economic, political, and social behaviors. By participating in social organizations and community activities, individuals can accumulate social capital, thereby enhancing their status and influence in society. The theory of economic capital posits that economic resources such as wealth, income, and investments possessed by individuals are an important form of capital endowment. They are one of the dominant factors influencing individual behavior and decisions. Sources of economic capital include personal work income, investment returns, and material assets. Additionally, factors such as personal education level, skill level, and professional background also affect the accumulation and transformation of economic capital. Accumulating economic capital helps enhance an individual's competitiveness in society. The theory of cultural capital [49] suggests that factors such as education received by individuals, culture, and values are also important forms of capital endowment, significantly influencing their status and development in society. Cultural capital not only includes an individual's knowledge and skills but also their recognition and appreciation of cultural arts and historical traditions.

According to social capital theory, social capital contributes to enhancing trust, co-operation, and participation among individuals, thereby promoting social integration. Individuals with abundant social capital typically possess broader social networks, higher levels of social trust, and stronger cooperative intentions. These attributes facilitate their understanding of government, policies, and institutions, fostering positive interactions with the government. Existing research indicates that residents' social capital positively predicts their political efficacy [50] and political trust [51].

Social capital serves as the micro-level carrier and concrete manifestation of the "normative pillar [36]" representing the shared, informal "rules of the game" within a given field. According to the mechanism of normative isomorphism, individuals internalize and adhere to the shared norms and values of their group to attain social recognition (legitimacy). Abundant social capital indicates that individuals are deeply embedded in this positive informal institutional network, enabling them to access information, support, and collaborative opportunities more smoothly, thereby reducing environmental uncertainty and enhancing their sense of belonging and security [43]. Consequently, their evaluation of the talent ecosystem will be more favorable. Based on this, the following hypotheses are proposed:

Hypothesis 1. *The greater an individual's social capital, the more positive their evaluation of the talent ecosystem.*

Social capital has emerged as a prominent yet contested research domain in contemporary social sciences, characterized by ongoing theoretical debates regarding its precise conceptualization and measurement [52]. Despite the absence of a unified theoretical framework, Putnam's conceptualization has gained considerable scholarly recognition for its comprehensive approach to understanding civic engagement and social cohesion [53]. Following Putnam's foundational work, this study operationalizes social capital through three distinct yet interrelated dimensions: social trust, social norms, and social participation. This tripartite framework enables a nuanced examination of how different facets of social capital influence individual outcomes and institutional effectiveness.

Social trust constitutes the cornerstone of normative order [54]. As emphasized by institutional theory, a high degree of social trust signifies a predictable and equitable interactive environment, directly addressing individuals' fundamental needs for stability and predictability. Social trust influences the talent ecosystem through two distinct pathways: first, the relational pathway, wherein reliable interpersonal expectations and knowledge sharing reduce transaction costs associated with cross-organizational talent mobility and contractual arrangements, thereby facilitating the transformation of short-term collaborations into sustained partnerships and contributing to ecosystem stability; second, the systemic pathway, wherein trust in the administrative bodies and policy commitments of industrial parks strengthens talent expectations regarding institutional stability, encouraging long-term human capital investment and effectively mitigating potential uncertainties arising from the "institutional experimentation" inherent to Hainan Free Trade Port. Social norms provide actors with behavioral guidelines, reducing ambiguity and serving as the most direct pathway through which normative order operates [55]. A robust sense of normative alignment implies that individuals perceive the system as "operating on justified grounds," which itself constitutes a form of legitimacy perception. Shared conceptions of "talent" establish implicit, legitimizing value coordinates for career development, aligning individual objectives with organizational goals and serving an orienting function. Moreover, well-defined normative conventions lower cognitive load and negotiation costs in interpersonal exchanges, guiding talent behavior through "implicit governance" to uphold fairness and enhance evaluations of the talent ecosystem. Social participation networks serve as critical channels for acquiring normative information, learning appropriate behaviors, and engaging in social comparison [56]. A high degree of social participation enables individuals to cultivate a shared professional identity through social interaction, update innovative competencies, adjust role expectations, learn and internalize institutional rules, activate resource flows, and drive systemic learning and adaptation. This process fosters social recognition and facilitates synergistic co-evolution between individuals and the system, thereby strengthening positive evaluations of the talent ecosystem. Building upon this conceptual foundation, we propose the following hypotheses regarding the relationship between social capital dimensions and talent ecosystem evaluation:

Hypothesis 1a. *Strengthened social trust corresponds to more positive evaluations of the talent ecosystem.*

Hypothesis 1b. *Enhanced perception of social norms correlates with increased positivity in evaluations of the talent ecosystem.*

Hypothesis 1c. *Higher levels of social participation are associated with more favorable evaluations of the talent ecosystem.*

Extensive research in economic sociology has demonstrated that an individual's economic capital significantly shapes their social standing and influence within societal structures [57]. According to capital theory, economic resources serve not merely as monetary assets but as convertible instruments that facilitate access to privileged social positions and enhanced political recognition [58]. Empirically, studies have consistently shown that economically advantaged individuals typically benefit from superior social welfare provisions and public services, including enhanced healthcare systems, quality education opportunities, and comprehensive social security protections [59]. These material advantages fundamentally improve subjective well-being and life satisfaction, thereby potentially fostering more positive perceptions of institutional arrangements and governmental performance [60].

Furthermore, economic capital enables greater access to policy-making processes and increases visibility to governmental entities. Through mechanisms including political donations, elite networking, and institutional lobbying, economically endowed individuals often secure disproportionate policy benefits and governmental attention [61]. This privileged access subsequently shapes their evaluation of government actions, typically resulting in more favorable assessments compared to economically marginalized groups [62]. The cumulative effect of these dynamics reinforces the cyclical relationship between economic capital and positive institutional perceptions, creating self-reinforcing patterns of political satisfaction among affluent populations.

Economic capital is primarily linked to the “regulative pillar” within the institutional framework [41]. Formal institutional arrangements, such as compensation policies and tax incentives, explicitly define the mechanisms for acquiring, distributing, and safeguarding economic resources. Under the influence of coercive isomorphism, individuals tend to actively comply with formal regulations in pursuit of material resources and to avoid penalties. Possessing relatively abundant economic capital indicates that an individual has become a successful adapter or direct beneficiary within the existing institutional structure. This practical experience of “institutional adaptation success” significantly reinforces their perception of the fairness and effectiveness of the system’s regulatory framework [63], thereby prompting more positive evaluations. From this perspective, economic capital can be understood as a concentrated reflection of the outcomes individuals achieve through competition within the formal institutional environment. Based on the aforementioned theoretical foundation and analytical framework, this study proposes the following research hypotheses:

Hypothesis 2. *The greater an individual’s economic capital, the more positive their evaluation of the talent ecosystem.*

Drawing upon Bourdieu’s seminal theory of cultural reproduction [57], this study conceptualizes cultural capital as multidimensional assets encompassing formal educational qualifications, institutionalized knowledge systems, and internalized value dispositions. According to this framework, individuals possessing substantial cultural capital typically exhibit higher educational attainment, broader intellectual repertoires, and more sophisticated critical thinking capacities [64]. These cognitive and evaluative competencies enable them to engage in more systematic scrutiny of governmental actions and policy formulations [65].

Empirical evidence from political sociology consistently demonstrates that culturally endowed individuals possess distinct cognitive frameworks that shape their engagement with governance structures. Building on Verba et al.’s foundational work on civic voluntarism, research indicates these individuals exhibit heightened awareness of policy-making processes and enhanced capacity for independent evaluation of institutional performance [66]. This pattern is further elaborated in Lareau’s ethnographic studies, which reveal how advanced analytical skills and familiarity with bureaucratic rationales acquired through cultural capital accumulation lead to more rigorous assessments of policy coherence and distributive justice [67]. The critical orientation of culturally advantaged populations toward governmental performance has been systematically documented across comparative contexts. Norris’s cross-national research on democratic deficits establishes that when encountering governance deficiencies or procedural irregularities, this population segment demonstrates significantly greater propensity to formulate critical judgments regarding governmental effectiveness [68]. This tendency suggests that cultural capital enables more nuanced decoding of institutional practices, while Lamont’s comparative

work illuminates how evaluative standards vary across social groups with different cultural resources [65].

Cultural capital is closely aligned with the “cultural–cognitive pillar,” manifesting as symbolic systems, knowledge structures, and aesthetic tastes that are tacitly regarded as “superior” or “legitimate” within specific fields. Regarding the negative effects of cultural capital, there exist two contextual explanatory pathways. First, individuals with high cultural capital tend to internalize more critical modes of thinking, leading them to apply stricter “legitimacy criteria” [63] when evaluating systems. When they observe a significant discrepancy between the operation of the actual talent ecosystem and their internalized normative ideals, cognitive dissonance arises, thereby triggering more negative evaluations. This process reflects the inherent tension between different “cultural–cognitive” scripts [69]. Second, in rapidly changing industrial environments, traditional cultural capital symbols may face the challenge of “legitimacy devaluation” [70]. When individuals realize that the cultural capital they take pride in is inadequately recognized or suffers from diminished exchange value in emerging fields, a sense of relative deprivation emerges, which may translate into negative evaluations of the talent ecosystem. Based on this theoretical reasoning and empirical evidence, we postulate the following hypothesis:

Hypothesis 3. *The greater an individual’s cultural capital, the more negative their evaluation of the talent ecosystem.*

2.4. Present Study

Previous research on talent ecology has been predominantly guided by macro-structural and systems theory perspectives. The majority of studies focus on the impact of talent policies and institutional environments on the ecosystem, often conducting international comparisons or policy evaluations. However, studies that situate multiple forms of capital within an integrated framework to systematically analyze how their interactions ultimately influence talent ecosystem evaluations through individual psychological perceptions remain notably scarce. This study integrates the capital endowment perspective, covering social, economic, and cultural capital, with ecosystem theory (see Figure 1). It shifts the analytical focus from macro-system structures to the micro-psychological processes of talent as the primary agents. By investigating how individuals subjectively perceive and evaluate their own capital endowments, the research aims to unveil the “psychological black box” underlying the formation of talent ecosystem evaluations.

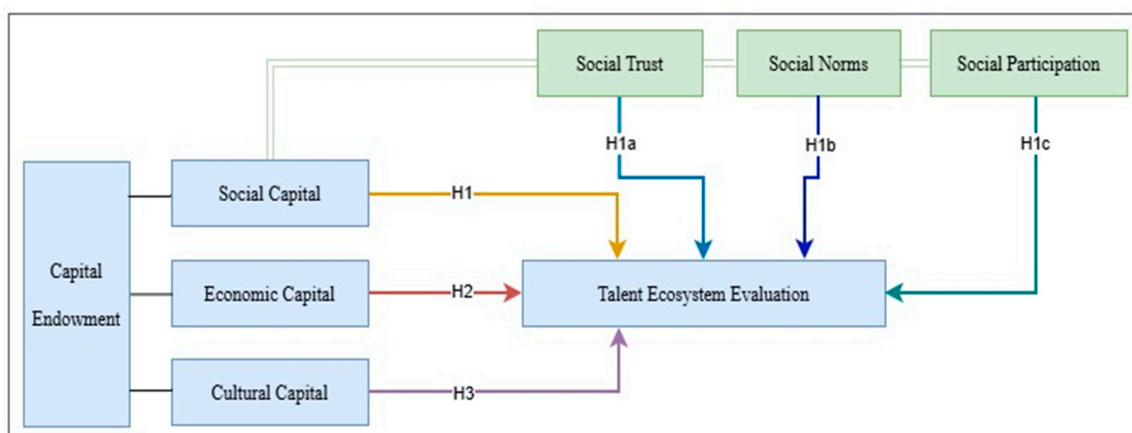


Figure 1. Framework of the present study.

3. Materials and Methods

3.1. Participants and Procedures

This cross-sectional study was conducted from October to December 2024, with participants recruited from the sample pool of the online survey platform Wenjuanxing (<https://www.wjx.cn>). The sampling frame covered all 13 key industrial parks within Hainan Free Trade Port. Based on demographic data from Hainan Province's Seventh Population Census, we established quota ranges for age and gender to ensure the sample's key demographic characteristics approximated the overall population structure of the industrial parks in Hainan Free Trade Port. The inclusion criteria required participants to be both adult urban residents and meet the study's operational definition of "talent." To prevent duplicate responses, each IP address was permitted to submit the questionnaire only once. The study employed anonymous self-administered questionnaires, and all participants were required to read and sign an electronic informed consent form before commencing the survey. Upon completion, participants received a monetary incentive of ¥10 (approximately \$1.4). A total of 800 questionnaires were collected. After excluding 47 responses that failed quality control checks (including inconsistencies in attention-check items and logical validation tests), 753 valid questionnaires were retained, yielding a final valid response rate of 94.13%.

The sociodemographic characteristics of the participants are presented in Table 1. In terms of gender, 46.6% were male and 53.4% were female. Specifically, 36.0% of participants were aged 18 to 30 years, 46.9% were aged 31 to 50 years, and 17.1% were aged 51 years or older. Regarding marital status, 56.4% of participants were married and 43.6% were unmarried. Regarding political affiliation, 17.9% of participants were Communist Party members while 82.1% were non-party members. Regarding religious composition, 13.7% of participants were religious beliefs and 86.3% without religious affiliations. For education level, 20.3% had completed associate degrees or below, 59.9% had bachelor's degrees, and 19.8% had attained master's degrees or higher. Concerning annual personal income, 42.6% earned ¥100,000 or less, 27.5% earned between ¥100,001 and ¥200,000, 24.7% earned between ¥200,001 and ¥300,000, and 5.2% earned more than ¥300,001.

Table 1. Sociodemographic characteristics of participants.

Characteristics	Number of Participants (<i>n</i>)	Percentage (%)
Gender		
Male	351	46.6
Female	402	53.4
Age		
18–30	271	36.0
31–50	353	46.9
≥51	129	17.1
Marital status		
Married	425	56.4
Unmarried	328	43.6
Political Affiliation		
Party Member	135	17.9
Non-Party Member	618	82.1
Religious status		
Religious	103	13.7
No religion	650	86.3

Table 1. *Cont.*

Characteristics	Number of Participants (<i>n</i>)	Percentage (%)
Education level		
Below associate degree	12	1.6
Associate degree	141	18.7
Bachelor's degree	451	59.9
Postgraduate and above	149	19.8
Annual Personal income		
<¥100,000	321	42.6
¥100,001–¥200,000	207	27.5
¥200,001–¥300,000	186	24.7
<¥300,001	39	5.2

3.2. Measures

3.2.1. Evaluation of Talent Ecosystem

In this study, we operationalized the evaluation of the talent ecosystem by constructing a multi-level measurement system. This system comprises eight primary dimensions and sixteen specific secondary indicators, forming a structured assessment framework. The survey instrument specifically queried: “Based on your actual experience in the industrial park, please rate the performance of the following aspects of park governance and services? (Details in Table 2)”. Responses were measured on a 5-point Likert scale (1 = Very dissatisfied, 5 = very satisfied). Factor analysis was conducted on the 16 measurement indicators, resulting in their reduction to one common factor, designated as “Evaluation of Talent Ecosystem.” The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy yielded a value of 0.967, while Bartlett’s test of sphericity showed statistical significance ($p < 0.001$), confirming the data’s suitability for factor analysis. Furthermore, the total variance explained reached 70.81%, demonstrating that these 16 indicators collectively provide adequate representation and effectively capture individual assessments of evaluation of talent ecosystem.

Table 2. Operationalization of Talent Ecosystem Evaluation.

Primary Indicator	Secondary Indicator	Question
Natural Ecology	Natural Environment Transportation Environment	Natural Environment of the Park Regional Transportation Conditions
Economic Ecology	Income Treatment Tax Incentives	Income and Benefits for Talents Tax Incentives for Talents
Legal Ecology	Legal Policies Talent Policies	Provision of Legal Guidance Talent Approval Process Policies
Educational Ecology	Education and Training Support Facilities for Education	Specialized Educational and Training Programs Educational Resources and Facility Support Services in the Park
Technological Innovation Ecology	Technological Environment Information Consulting	Required Technological Environment Entrepreneurial Incentives and Information Consultation Assistance
Public Service Ecology	Lifestyle Services Welfare Policies	Required Living Services Required Welfare Services
Cultural Ecology	Cultural Services Cultural Integration	Cultural Services Provided Initiatives to Facilitate Understanding and Integration into the Local Culture
Social Ecology	Social Governance Social Security	Corporate/Park Social Governance Status Corporate/Park Social Safety Environment

It should be further clarified that the evaluation of the talent ecosystem is a multi-dimensional latent variable that cannot be directly observed, and is measured indirectly through 16 observable indicators. The variance of these observable indicators can be

explained by common latent variables, which objectively determines the optimal weight for each indicator and ensures that the final comprehensive indicator maximizes the reflection of latent variable information (with a total variance explanation rate of 70.81%). Using factor scores can accurately reflect the relative position of individuals on the latent variable, reduce measurement errors, and enhance the validity and reliability of subsequent statistical inferences [71]. Therefore, adopting factor scores for the evaluation of the talent ecosystem is a rigorous choice based on the triple foundation of latent variable measurement theory, existing academic practices [72], and the data characteristics of this study. This ensures that the research conclusions are grounded on a key variable that has been statistically optimized and is fully supported by the literature.

3.2.2. Capital Endowment

This study adopts Bourdieu's framework of capital forms to examine capital endowment through three dimensions: social, economic, and cultural capital. Following Putnam's conceptualization, social capital is operationalized through three components: social trust, social norms, and social participation.

Social trust was measured using the item: "Please rate the current level of interpersonal trust on a 10-point scale, 1 (lowest) to 10 (highest)." Social norms were assessed through two items evaluating moral norms ("Please rate the prevailing moral standards in society on a 10-point scale") and legal norms ("Please rate the current level of law-abiding consciousness on a 10-point scale"). These two items demonstrated satisfactory internal consistency (Cronbach's $\alpha = 0.801$) and were combined to form a composite social norms score.

Social participation was measured using the item: "Have you engaged in any of the following activities in the past three years?" The item covered four aspects of civic engagement: (1) reporting social issues to media outlets; (2) providing feedback on government policies; (3) participating in decision-making discussions within residential/working units; and (4) joining community-organized social activities. Responses were coded dichotomously (0 = no, 1 = yes), with a composite score calculated by summing across the four items.

Economic capital was measured by the item: "Your highest annual personal income in the past three years," with a logarithmic transformation applied in analyses. Cultural capital was assessed through educational attainment, measured on a 4-point ordinal scale (1 = below associate degree, 2 = associate degree, 3 = bachelor's degree, 4 = postgraduate degree).

3.3. Statistical Analysis

Data analysis was performed using IBM SPSS (Version 26.0). Multiple linear stepwise regression was employed to develop the statistical models, with robustness test conducted to validate the findings. The analysis incorporated several demographic and behavioral factors as control variables, including gender, age, political affiliation, religious belief, and internet usage. Dichotomous variables were coded as follows: gender (0 = female, 1 = male), political affiliation (0 = non-Communist Party member, 1 = Communist Party member), religious belief (0 = non-religious, 1 = religious), internet usage (0 = non-user, 1 = user), ethnicity (0 = ethnic minority, 1 = Han Chinese), and marital status (0 = other, 1 = married). Age was treated as a continuous variable, calculated as 2025 minus the respondent's birth year.

4. Results

4.1. Evaluation of Talent Ecosystem in Industrial Parks of Hainan Free Trade Port

As shown in Table 3, the overall evaluation of talent ecosystem in industrial parks of Hainan Free Trade Port (HFTP) reflects a relatively positive assessment. Analysis of subsystem effectiveness scores reveals the following hierarchical pattern: legal ecosystem

> cultural ecosystem > social ecosystem > natural ecosystem > economic ecosystem > educational ecosystem > public service ecosystem > sci-tech innovation ecosystem.

Table 3. Evaluation of Talent Ecosystem Effectiveness in Industrial Parks of HFTP.

Primary Indicator	Secondary Indicator	M ± SD	t	p	95%CI
Natural Ecology	Natural Environment	3.89 ± 0.919	30.319	0.000 ***	0.86~0.98
	Transportation Environment	3.81 ± 0.960	24.281	0.000 ***	0.75~0.89
Economic Ecology	Income Treatment	3.82 ± 1.037	23.612	0.000 ***	0.78~0.92
	Tax Incentives	3.88 ± 0.910	29.572	0.000 ***	0.87~1.00
Legal Ecology	Legal Policies	4.13 ± 0.814	41.428	0.000 ***	1.07~1.18
	Talent Policies	3.72 ± 1.072	21.050	0.000 ***	0.69~0.83
Educational Ecology	Education and Training	3.83 ± 0.992	24.567	0.000 ***	0.78~0.91
	Support Facilities for Education	3.65 ± 1.089	15.071	0.000 ***	0.51~0.66
Technological Innovation Ecology	Technological Environment	3.63 ± 1.073	14.001	0.000 ***	0.47~0.62
	Information Consulting	3.68 ± 1.064	17.750	0.000 ***	0.60~0.75
Public Service Ecology	Lifestyle Services	3.62 ± 1.097	16.232	0.000 ***	0.56~0.71
	Welfare Policies	3.79 ± 0.985	23.852	0.000 ***	0.74~0.87
Cultural Ecology	Cultural Services	3.91 ± 0.904	31.312	0.000 ***	0.89~1.00
	Cultural Integration	3.88 ± 0.935	26.644	0.000 ***	0.81~0.94
Social Ecology	Social Governance	3.94 ± 0.878	29.756	0.000 ***	0.87~0.99
	Social Security	3.84 ± 0.998	24.867	0.000 ***	0.82~0.98

Note: *** $p < 0.001$.

At the secondary indicator level, relatively higher scores were observed in the legal policy environment, cultural services, and social governance dimensions. Conversely, lower evaluations were recorded for educational infrastructure, technological environment, information consulting services, and public service provision.

The current assessment pattern suggests that while the Master Plan for the Construction of Hainan Free Trade Port has generated developmental opportunities for key industrial parks—evidenced by substantial increases in newly registered enterprises—the operational reality reveals notable gaps. Specifically, a significant proportion of newly registered enterprises maintain primarily registration presence without substantial operational activities. Furthermore, parks including Haikou National Hi-Tech Industrial Development Zone demonstrate lower enterprise operational rates than anticipated. This phenomenon is partly attributable to the prevalent practice among domestic and international corporations of establishing sales centers while maintaining R&D facilities in mainland locations, thereby constraining the development of technological environments and information consulting services within the local talent ecosystem.

4.2. Regression Analysis

As demonstrated in Table 4, this study employs multiple linear stepwise regression analysis to examine the determinants of evaluation of talent ecosystem in key industrial parks of the Hainan Free Trade Port. The empirical results demonstrate a structured modeling approach: Model 1 established the baseline with control variables; Model 2 incorporated social capital variables; Model 3 introduced economic capital measures; and Model 4 integrated cultural capital factors. Collectively, the progressively increasing adjusted R^2 values across sequential models indicate continuous improvement in model fit.

Table 4. Results of Regression Analysis.

	Model 1	Model 2	Model 3	Model 4
Gender	−0.076 *** (0.023)	−0.068 *** (0.021)	−0.067 *** (0.021)	−0.063 *** (0.021)
Age	−0.013 ** (0.005)	−0.013 *** (0.005)	−0.013 *** (0.005)	−0.019 *** (0.005)
Age Squared Divided by 100	0.018 *** (0.006)	0.014 *** (0.005)	0.014 ** (0.005)	0.018 *** (0.005)
Political Affiliation	0.244 *** (0.037)	0.111 *** (0.033)	0.112 *** (0.033)	0.162 *** (0.035)
Religious Belief	0.023 (0.033)	0.022 (0.029)	0.022 (0.030)	0.008 (0.030)
Internet Utilization	−0.201 *** (0.030)	−0.141 *** (0.027)	−0.141 *** (0.027)	−0.105 *** (0.028)
Social Trust	-	0.086 *** (0.006)	0.087 *** (0.006)	0.087 *** (0.006)
Social Norms	-	0.106 *** (0.004)	0.106 *** (0.004)	0.105 *** (0.004)
Social Participation	-	0.050 *** (0.017)	0.050 *** (0.017)	0.052 *** (0.017)
Economic Capital	-	-	0.000 (0.003)	0.002 (0.003)
Cultural Capital	-	-	-	−0.056 *** (0.011)
Sample Size	753	753	753	753
Adjusted R ²	0.020	0.237	0.237	0.239

Note: (SE); “-” indicates no data available; ** $p < 0.01$, *** $p < 0.001$.

Model 1 reveals several significant relationships regarding control variables. Gender exerts a significant influence, with male respondents demonstrating more negative evaluations compared to their female counterparts. Age displays a significant U-shaped relationship, where evaluations of talent ecosystem initially decline and then subsequently increase with advancing age. Political affiliation significantly affects assessments, with Communist Party members reporting more positive evaluations than non-members. Internet usage frequency shows a significant negative association, wherein heavier users provide more critical assessments.

Model 2 confirms the positive impact of social capital, with all three dimensions—social trust, social norms, and social participation—demonstrating statistically significant positive coefficients. This indicates that enhanced social trust, stronger normative perceptions, and greater civic engagement all contribute to more favorable talent ecosystem evaluations, thereby supporting Hypothesis 1 and Hypotheses 1a–1c. The findings confirm that social capital and its core dimensions—social trust, social norms, and social participation—exert significant positive effects on the evaluation of the talent ecosystem. This conclusion resonates with Putnam’s seminal theory [73] on how social capital enhances collective cooperative efficacy, while simultaneously contextualizing the theory within the unique setting of key industrial parks in Hainan Free Trade Port as an “institutionally managed talent ecosystem.” It is particularly noteworthy that the dimension of social participation demonstrates the strongest explanatory power. This may indicate that in semi-structured organizational fields such as industrial parks, formal and informal

interaction channels including industry associations and technology salons constitute a critical mechanism for translating latent relational resources into substantive collaborative performance. This discovery reveals an important divergence in the mechanisms of capital conversion between meso-level managed ecosystems and macro-level regional or national spontaneous social networks, a distinction that has not been sufficiently elucidated in existing research [74].

Model 3 shows non-significant effects of economic capital on evaluation outcomes, with no substantial improvement in model fit. This suggests the absence of direct influence, leading to rejection of Hypothesis 2. This finding presents a tension with certain theoretical expectations derived from the Resource-Based View. However, it strongly corroborates a core proposition of institutional theory: the value and efficacy of resources are not inherent but are highly contingent upon the legitimacy recognition they obtain within a specific institutional field. Specifically, if economic capital fails to become deeply embedded in and aligned with the regulative pillars of industrial parks, such as policy frameworks, incentive systems, and contractual norms, it is unlikely to be perceived by actors as a legitimate and trustworthy institutional resource. Consequently, it cannot be effectively translated into positive evaluations of the ecosystem. This result resonates with Fligstein's institutional analysis [75] concerning how "market institutions shape the value of resources and action strategies," while also providing a significant extension to the theoretical boundaries of Barney's classic Resource-Based View [76]. It suggests that within the distinctive field of a managed ecosystem, the institutional fit of capital may hold greater explanatory power than its static, absolute resource stock.

Model 4 reveals a significant negative relationship between cultural capital and ecosystem evaluations. Higher levels of cultural capital correlate with more critical assessments, thus supporting Hypothesis 3. The negative relationship between cultural capital and talent ecosystem evaluation constitutes a theoretically significant and insightful finding. While existing literature predominantly emphasizes the positive or neutral role of cultural resources, the results of this study resonate with the emerging scholarly discourse on the "paradox of cultural capital" in transitional or hybrid institutional fields [33]. Specifically, individual talents with high cultural capital, such as those possessing advanced academic credentials or refined industry expertise, tend to internalize more stringent critical standards. If the development practices of an industrial park prioritize pragmatic skills over symbolic knowledge, the cultural capital they hold may encounter "institutional devaluation." This finding stands in sharp contrast to conclusions drawn from research in mature innovation districts [42], thereby revealing that the "legitimacy conversion rate" of cultural capital is highly context-dependent. In rapidly industrializing fields that emphasize immediate production functions, its conversion efficacy may be significantly diminished.

4.3. Robustness Test

Robustness tests examine the stability of evaluation methods and the explanatory power of indicators, specifically assessing whether these methods and indicators maintain consistent and stable interpretations of evaluation outcomes when certain parameters are modified. As presented in Table 5, this study employs split-sample regression analysis to conduct a robustness test. The original sample was divided into male and female subsamples, with separate regression analyses performed to establish Model 5 and Model 6, respectively. These were subsequently compared with the baseline model (Model 4).

The robustness check results demonstrate that across both new models, social trust, social norms, and social participation maintain statistically significant positive effects on the evaluation of talent ecosystem. Similarly, cultural capital continues to exhibit a significant negative influence, while economic capital remains statistically insignificant.

In summary, the two new models show complete consistency with the baseline model in terms of significance levels and coefficient signs, confirming the robustness of our empirical findings and establishing the baseline model's representative capacity in explaining the evaluation of the talent ecosystem.

Table 5. Results of Robustness Test.

	Original Model	Model 5	Model 6
Social Trust	0.087 *** (0.006)	0.094 *** (0.008)	0.081 *** (0.008)
Social Norms	0.105 *** (0.004)	0.107 *** (0.005)	0.102 *** (0.005)
Social Participation	0.052 *** (0.017)	0.047 ** (0.023)	0.056 ** (0.026)
Economic Capital	0.002 (0.003)	0.005 (0.005)	0.001 (0.003)
Cultural Capital	−0.056 *** (0.011)	−0.030 * (0.017)	−0.072 *** (0.015)
Control Variables	Controlled	Controlled	Controlled
Sample Size	753	351	402
Adjusted R ²	0.239	0.243	0.238

Note: (SE); * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

5. Discussion

Based on capital theory and social capital frameworks, this empirical investigation identifies and analyzes the key factors influencing the evaluation of talent ecosystem in industrial parks of Hainan Free Trade Port, with particular focus on their operational mechanisms and effect magnitudes.

5.1. Effects of Demographic and Behavioral Factors on the Evaluation of Talent Ecosystem

Empirical analysis reveals significant influences of demographic and behavioral factors on the evaluation of the talent ecosystem. Gender demonstrates a statistically significant influence on talent ecosystem evaluations, with female respondents demonstrating more positive assessments compared to their male counterparts. Concurrently, age emerges as another significant determinant, manifesting a characteristic U-shaped relationship with evaluation outcomes. According to life cycle theory, individuals exhibit distinct behavioral patterns and value orientations across different life stages. During early career phases, individuals typically possess limited socio-political experience, which may contribute to relatively optimistic ecosystem evaluations, potentially amplified by heightened expectations toward their industrial park environments. Conversely, mid-career professionals demonstrate increased awareness of practical concerns including taxation systems, social security provisions, and environmental regulations. These policy-sensitive issues directly implicate governmental responsibilities and capabilities, potentially explaining the observed decline in satisfaction ratings during middle career stages before subsequent recovery in later phases.

Furthermore, internet usage frequency significantly correlates with ecosystem evaluations. The existing literature indicates that digital media exposure amplifies risk perception [77] while eroding political trust [78]. Consequently, compared to traditional media consumers, internet-reliant professionals are more likely to encounter amplified negative

information flows, potentially contributing to their more critical assessments of talent ecosystem effectiveness.

These findings substantiate the theoretical proposition that demographic characteristics and media consumption patterns systematically shape individual perceptions of institutional environments. The demonstrated U-shaped age effect particularly enriches our understanding of how evolving personal priorities and accumulated experiences dynamically influence the evaluation of talent ecosystem across professional life courses.

5.2. Effects of Social Capital on the Evaluation of Talent Ecosystem

Fundamentally, the talent ecosystem constitutes a dynamic network system that interconnects individual professionals, organizational entities, and external environments, facilitating continuous exchange and interaction among various elements and information [79]. Social capital, conceptualized as a collective resource embedded in trust relationships, reciprocal norms, and network connections, demonstrably reduces collaboration costs while enhancing operational efficiency and organizational performance [80]. Within talent ecosystems, social capital functions as a critical mechanism that promotes the ecological circulation efficiency of various elements. We therefore postulate that professionals endowed with richer social capital reserves exhibit stronger cooperative tendencies within social networks and consequently formulate more positive evaluations of the talent ecosystem.

Our empirical investigation confirms the significant positive relationship between social capital dimensions and talent ecosystem evaluations. Social capital enables the establishment of collaborative information flows and trust-based cooperative mechanisms within the ecosystem. This finding aligns with established literature documenting the constructive roles of social trust, normative adherence, and civic participation—core social capital components—in political and social domains [81–84]. Particularly noteworthy is our demonstration that all three social capital components significantly enhance professionals' positive ecosystem assessments. The introduction of these social capital measures substantially improved the adjusted R^2 values, indicating superior model fit and underscoring social capital's predominant position within the capital endowment framework influencing evaluations of talent ecosystem.

Multiple mechanistic pathways explain why socially enriched professionals report higher ecosystem ratings. Primarily, social capital acts as a vital conduit linking individuals to external resources, enhancing their sensitivity and accessibility in information acquisition, policy perception, and opportunity identification—thereby elevating subjective perceptions of ecosystem functionality. Simultaneously, the interpersonal trust and network reciprocity inherent in social capital significantly reduce institutional friction, facilitating smoother professional mobility, collaborative engagements, and career development within the ecosystem. Furthermore, social capital cultivates stronger territorial attachment and organizational commitment, motivating professionals to associate personal development trajectories with systemic operations and generating more positive affective evaluations. Individuals with substantial social capital typically receive more responsive institutional support, transforming positive personal experiences into generalized ecosystem affirmations [84,85]. Ultimately, social capital not only extends individual capabilities but fundamentally restructures the cognitive frameworks and value judgment systems through which ecosystem perceptions are formed.

5.3. Effects of Economic Capital on the Evaluation of Talent Ecosystem

The analysis reveals no statistically significant effect of economic capital on talent ecosystem evaluation. This finding aligns with existing research indicating that citizens' economic capital often does not directly influence their perceptions and evaluations of

governmental conduct [86,87]. Economic capital, primarily manifested through material resources and wealth accumulation, predominantly determines individuals' freedom and choices in daily life. However, its capacity to enhance evaluations of institutional experiences, policy perceptions, and interpersonal support remains substantially limited. Paradoxically, professionals with greater economic capital often develop higher environmental expectations, potentially amplifying perceptions of service and resource inadequacies and consequently generating more critical assessments.

Notably, Bourdieu's theoretical framework posits that the three capital forms maintain convertible relationships rather than hierarchical structures, with economic capital serving as the foundation from which other capital forms derive [57]. This suggests that while economic capital may not directly affect talent ecosystem evaluations, it potentially exerts indirect influence through its conversion into social capital [88], cultural capital [89], or other mediating factors. Consequently, the primary policy implication emerging from this finding emphasizes that governmental strategies for optimizing talent ecosystems should transcend purely economic incentives and material investments. Instead, policy should prioritize facilitating the conversion of economic capital into social capital and enhancing institutional service satisfaction, thereby fostering more positive feedback mechanisms within talent ecosystems.

5.4. Effects of Cultural Capital on the Evaluation of Talent Ecosystem

This study reveals a significant negative correlation between cultural capital and talent ecosystem evaluations. Based on theoretical reasoning, one possible explanation is as follows: Talents with high cultural endowments, typically characterized by advanced educational attainment and extensive knowledge reserves, may possess enhanced capacity for critical assessment of ecosystem policies. Their potentially sophisticated evaluative capabilities and possible heightened critical tendencies could enable effective identification of perceived systemic deficiencies, which may consequently be associated with negative ecosystem evaluations. Essentially, these individuals' dissatisfaction might stem not from general discontent but potentially from their hypothesized heightened ability to identify shortcomings [67,90]. Their elevated cognitive levels could simultaneously raise expectations regarding system performance, creating a greater likelihood of negative assessments when institutional practices are perceived to fail to meet these elevated standards.

Conversely, professionals with limited cultural capital often lack the necessary knowledge frameworks and analytical skills for systematic evaluation. Faced with complex institutional designs, this group might tend to operate in a state of "intuitive sensing rather than critical assessment." These individuals typically rely on personal experiences or isolated incidents for judgment formation, resulting in more conservative or neutral evaluations, possibly accompanied by conformist or acquiescent tendencies [91].

Furthermore, cultural capital may demonstrate notable associations with political orientations, with highly culturally endowed professionals tending to potentially exhibit stronger preferences for radical or critical perspectives. This group might maintain particularly scrutinizing and frequently critical attitudes toward policies and institutions, likely questioning power structures and the appropriateness of policy instruments. This critical disposition could potentially foster heightened institutional sensitivity and feedback awareness, possibly leading these professionals to evaluate talent ecosystems not only based on outcome-oriented criteria but also potentially emphasizing procedural fairness and discursive inclusivity [92].

While culturally rich professionals provide invaluable contributions through systematic critique and institutional feedback, they simultaneously represent primary sources of negative perceptions in ecosystem evaluations. Consequently, developing more inclusive and adaptive

talent ecosystems requires careful consideration of cultural capital's profound influence on institutional perceptions. Enhancing institutional transparency and expanding participatory channels becomes essential for addressing high-cultural-capital professionals' expectations, ultimately fostering a more rational environment for talent ecosystem development.

6. Conclusions

6.1. Key Findings and Implications

This study reveals that talent ecosystem evaluations in the industrial parks of China's Hainan Free Trade Port demonstrate relatively positive assessments, while exhibiting distinct spatiotemporal characteristics. Demographic factors including gender, age, political affiliation, and internet usage frequency significantly influence ecosystem evaluations. Social capital manifests a statistically significant positive impact, whereas cultural capital demonstrates a significant negative relationship. Although economic capital shows no direct significant effect, this does not diminish its importance as a potential variable, as it may indirectly influence professional cognition and behavior through other mediating factors.

The academic advancement of this paper in the fields of talent ecosystems and sustainability governance research is primarily manifested in three aspects. Firstly, theoretical integration and contextualization. This study constructs a multidimensional capital framework for analyzing the sustainability of talent ecosystems. Within the unique "policy laboratory" context of China's Hainan Free Trade Port, it develops and empirically validates an integrated theoretical model conceptualized as "multidimensional capital → subjective perception → talent ecosystem evaluation." This not only validates the model's explanatory power but also reveals the potential for dynamic reconfiguration in the relative importance and interactive modes of different capital endowments, thereby expanding the contextual boundaries and conditional explanations of existing theories. Secondly, unpacking the micro-mechanisms. By placing talent's subjective perception at the core of the model, the research illuminates the key psychosocial micro-mechanisms underlying the "black box" of how macro-level institutions and structures influence the talent ecosystem. This integration effectively bridges the critical gap between macro-structural conditions and micro-level individual behaviors. It directly addresses the current scholarly demand for more nuanced mechanistic explanations within complexity science by focusing on the micro-foundational processes through which core system actors, particularly high-value talent, form perceptions and render evaluative judgments within institutional ecosystems. Thirdly, actionable insights for governance. The findings reveal multiple, concurrent causal pathways influencing talent ecosystem evaluations, providing policymakers with a more nuanced "diagnostic map." This study advances a paradigm shift in talent governance research, moving from standardized, supply-oriented management approaches toward adaptive, targeted, and evidence-based ecological governance models. This new approach, grounded in continuous monitoring, feedback, and policy experimentation, directly contributes to the strategic goal of fostering a more resilient, equitable, and adaptable talent ecosystem aligned with sustainable development objectives.

6.2. Recommendations

Based on these findings, during this crucial development phase of Hainan Free Trade Port, industrial parks should implement targeted services accommodating diverse social characteristics. Enhancing cultural ecosystem development through encouraging participation in public affairs and community activities can strengthen organizational cohesion and social responsibility, thereby improving talent ecosystem evaluations. Simultaneously, governmental support should foster the development of voluntary organizations and other non-profit entities, facilitating their engagement in talent-oriented activities. This approach

can expand professionals' social networks, progressively transcending "small-group trust" based on acquaintance societies toward developing "societal trust" applicable to modern social structures [93], ultimately promoting genuine integration into Hainan's cultural ecosystem. Furthermore, addressing the negative implications of internet usage, governments should enhance information transparency and democratic participation, establishing public-oriented, open, and transparent governance systems. Utilizing relevant media resources within a framework encompassing conceptual identification, behavioral identification, and visual identification systems [94], authorities should establish standardized e-government systems that emphasize public opinion guidance and regulation. These measures can mitigate misinformation dissemination while enhancing the objectivity of talent attention and evaluations regarding ecosystem effectiveness.

In summary, the sustainable development of the talent ecosystem in Hainan Free Trade Port is fundamentally a process of guiding the system toward a more advanced, stable, and innovative state through diversified capital, a resilient structure, synergistic social networks, and adaptive institutions. This necessitates a paradigm shift among policymakers from traditional, fragmented "policy management" to a systemic and dynamic "ecological governance" mindset, underpinned by systems thinking and a long-term vision.

To meet the post-customs-closure development needs of the Hainan Free Trade Port, key industrial parks should serve as pilot zones for strengthening the talent ecosystem through a three-pronged approach: First, establish a "Talent Ecosystem Health Index." Develop and implement a comprehensive assessment framework encompassing dimensions such as mobility, diversity, innovativeness, equity, and resilience, with regular publication of evaluation reports [95]. Second, form a Cross-Sectoral "Talent Ecological Governance Committee." Led by the park administrative committee, this body should integrate representatives from enterprises, universities, talent pools, and third-party research institutions. Its mandate would include strategy formulation, policy coordination, and impact evaluation [96]. Third, launch "Policy Mix Experimentation" Pilots. Select several key parks to pilot bundled policy packages ("policy toolkits") derived from the aforementioned recommendations [97]. Utilize controlled experiments to identify the optimal "conditional configurations" before scaling up successful initiatives.

Through these measures, a collaborative governance network involving government, industry, academia, communities, and individual talents can be constructed [98]. This network will facilitate an adaptive policy adjustment mechanism driven by continuous monitoring and feedback, enabling the talent ecosystem to engage in self-learning and evolution. The ultimate goal is to realize a talent ecosystem for Hainan Free Trade Port that demonstrates greater social equity, environmental adaptability, and long-term resilience.

6.3. Limitations and Prospects

While this study provides important insights into the factors influencing the talent ecosystem, several limitations warrant acknowledgment. First, the cross-sectional research design, while adept at revealing correlations among variables, possesses inherent limitations in rigorously establishing causal relationships and cannot definitively confirm causal direction or sequence. In terms of measurement, the use of single-item measures for economic and cultural capital, while justified by research precedents in specific contexts and validated through preliminary testing, may fall short of capturing the multidimensional richness of these constructs. Future research could employ more refined multi-item scales or integrate objective data with subjective perceptions to achieve a more comprehensive characterization of capital endowments. Nevertheless, as the first exploratory investigation of these relationships within the context of Hainan Free Trade Port, it provides valuable preliminary findings. Future

research could employ longitudinal designs or experimental/quasi-experimental approaches to further elucidate the underlying causal mechanisms.

Second, the primary reliance on self-administered questionnaires, despite demonstrating satisfactory scale reliability, means the self-reported data may introduce potential biases such as social desirability effects. Subsequent studies could enhance the robustness and ecological validity of the findings by incorporating behavioral indicators of talent engagement and a richer set of contextual environmental variables. Furthermore, adopting a mixed-methods approach that integrates qualitative techniques such as in-depth interviews or digital ethnography can compensate for the limitations of quantitative data in capturing deep-seated motivations and complex processes.

Finally, constrained by the research implementation scope, this study focused exclusively on key industrial parks within Hainan Free Trade Port. Its unique policy environment, developmental stage, and cultural context necessitate caution regarding the generalizability of the findings. The conclusions may be more applicable to similar policy-driven, rapidly developing regions, while their relevance to institutionally mature, market-dominated contexts requires further verification. Future research should conduct comparative case studies or large-sample cross-regional analyses across areas with differing institutional and cultural backgrounds to clarify the boundary conditions of this study's conclusions.

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