



Volume 8 • Number 1
APRIL 2026

International Journal of Uncertainty and Innovation Research



International Journal of Uncertainty and Innovation Research

ISSN 2617-9571

Web Address: <http://www.grey.org.tw>

Publisher: Professor: Chaang-Yung Kung
Chair of the Board of Directors (Chinese Grey System Association)
National Taichung University of Education, Taichung, Taiwan
E-mail: cykung@mail.ntcu.edu.tw

Chief Editor: Professor: Ting-Cheng Chang
Taiwan *Kansei* Information Association, Taichung, Taiwan
E-mail: tcchang0615@gmail.com

Executive Editor: Associate Professor: Chih-Sheng Chang
Fo Guang University, Yilan, Taiwan
E-mail: cschang@mail.fgu.edu.tw

Executive Editor: Associate Professor: Jieh-Jang Liou
Fo Guang University, Yilan, Taiwan
E-mail: jjliou@mail.fgu.edu.tw

Executive Editor: Professor: Kun-Li Wen
Chung Yuan Christian University, Taoyuan, Taiwan
E-mail: klw@ctu.edu.tw

Editorial Board

M. Balaji	The Standard International Journals (The SIJ), Coimbatore, India
Kung-Hsiung Chang	Department of Business Administration, National Pingtung University of Science and Technology, Taiwan
Wei-Che Chang	Department of Civil Engineering, Kao Yuan University, Taiwan
Hsiu-Jye Chiang	Department of Industrial Design, National United University, Taiwan
Chun-I Chen	Department of Industrial Management, I-Shou University, Taiwan
Kuei-Hsiang Cheng	Department of Civil Engineering, Kao Yuan University, Taiwan
M. Dhanabhakym	Bharathiar University (State University), Coimbatore, India

Kuo-Hsien Hsia	Department of Management Information Systems, Far East University, Taiwan
Cheng-Hsiung Hsieh	Department of Computer Science and Information Engineering, Chaoyang University of Technology, Taiwan
Ker-Tah Hsu	Department of International Business, National Taichung University of Education, Taiwan
Pi-Fang Hsu	Department of Communications Management, Shih Hsin University, Taiwan
Ying-Fang Huang	Industrial Engineering and Management, National Kaohsiung University of Applied Sciences, Taiwan
Yo-Ping Huang	Department of Electrical Engineering, National Taipei University of Technology, Taiwan
Tian-Jong Hwu	Department of Business Management, National United University, Taiwan
Yo-Ping Kang	Bachelor's Program of Precision Systems Design, Feng Chia University, Taiwan
Chih-Sung Lai	Department of International Business, National Taichung University of Education, Taiwan
Ya-Ting Lee	Department of Beauty, National Taichung University of Science And Technology, Taiwan
Yu-Ting Lee	Business and Tourism Planning, Ta Hwa University of Science and Technological, Taiwan
Chin-Tsai Lin	Department of Business Administration, Ming Chuan University, Taiwan
Jiang-Long Lin	School of Creative Design, City College of Dong-guan University of Technology, China
Jung-Chin Liang	Department of Technology Product Design, Ling Tung University, Taiwan
Meng Lu	ARS Traffic & Transport Technology, The Netherlands
Masatake Nagai	Department of Engineering, Kanagawa University, Japan
Phung Tuyen Nguyen	Research Management and Quality Assurance Office, Kien Giang Teacher Training College, Vietnam

Phuoc Hai Nguyen Research Management and Quality Assurance Office, Kien Giang
Teacher Training College, Vietnam

DucHieu Pham Faculty of Primary Education, Hanoi Pedagogical University Number
2, Vinhphuc, Vietnam

Frode Eika Sandnes Faculty of Engineering, Oslo University College, Norway

Tian-Wei Sheu Graduate Institute of Educational Measurement and Statistics,
National Taichung University of Education, Taiwan

Jee-Ray Wang Department of Automation Engineering & Institute of
Mechatronic Systems, Chienkuo Technology University, Taiwan

Bot-Tyng Wang Foreign Language Center, Feng Chia University, Taiwan

Zhong-Yu Wang School of Instrumentation Science & Opt-electronics Engineering,
Beihang University, China

Yong Wei Department of Mathematics and Information, China West Normal
University, China

Xin-Tao Xia Mechatronical Engineering College, Henan University of Science and
Technology, China

Ming-Feng Yeh Department of Electrical Engineering, Lunghwa University of
Science and Technology, Taiwan

Mei-Li You Department of General Education, Chienkuo Technology University,
Taiwan

Jian-Min Zhu School of Mechanical Engineering, University of Shanghai for
Science and Technology, China

Staff

Cheng-Chun Chao CATHAY PAN ASIA, CO., LTD, Taiwan

Chia-Jung Tsai CATHAY PAN ASIA, CO., LTD, Taiwan

Spatial Embeddedness and Interethnic Integration: Practical Mechanisms and Pathways of Multidimensional Ethnic Embedding in Fujian Province, China

Ze-Rui Yuan

Abstract

The paper examines the multidimensional embedding mechanisms and integration pathways of ethnic minorities in Fujian Province, China, through the lens of spatial embeddedness theory. Drawing on mixed-method research combining spatial econometric analysis, social network analysis, and in-depth case studies of Hui, She, and Mongolian communities across five prefectural cities (Fuzhou, Xiamen, Quanzhou, Zhangzhou, and Ningde), we identify four critical dimensions of ethnic integration: economic embedding through market participation and entrepreneurship, social embedding via community networks and intergroup relations, cultural embedding through adaptive identity negotiation, and spatial embedding patterns reflecting settlement choices and urban-rural mobility. Our findings reveal that successful integration follows non-linear pathways characterized by reciprocal embeddedness, where both minority and majority populations undergo mutual adaptation processes. The study contributes to theoretical understanding of ethnic integration by demonstrating how spatial factors mediate social, economic, and cultural dimensions of embedding, while offering practical insights for policies promoting inclusive urbanization and community cohesion in ethnically diverse regions.

Keywords: Spatial embeddedness, Ethnic integration, Multidimensional embedding, Fujian Province, Interethnic relations, Urbanization

1.Introducion

China's rapid urbanization and economic transformation over the past four decades have profoundly reshaped interethnic dynamics, creating both opportunities and challenges for ethnic minority integration[1,2]. While scholarship on ethnic relations in China has traditionally focused on border regions and autonomous areas, coastal provinces with smaller but economically significant minority populations present distinct integration patterns that remain

Corresponding Author: Ze-Rui Yuan is with the school of languages and cultures of Ningde Normal University, Fujian, China

E-mail: niceandy123@163.com

Received: January 12, 2026

Revised: March 04, 2026

Accepted: March 12, 2026

underexplored[3,4]. Fujian Province, situated along China's southeastern coast, exemplifies this phenomenon. Home to approximately 580,000 ethnic minority residents-primarily Hui, She, and Mongolian communities-Fujian's ethnic landscape is characterized by long-established urban merchant networks, rural heritage communities, and recent migration flows driven by economic opportunities [5].

The concept of spatial embeddedness, originating from economic sociology and geography[6,7], provides a powerful analytical framework for understanding how ethnic minorities navigate integration processes. Unlike traditional assimilation models that emphasize one-directional cultural convergence, spatial embeddedness theory recognizes integration as a multi-scalar, multi-dimensional process wherein social actors are simultaneously embedded in economic networks, social relationships, cultural systems, and geographic spaces[8,9]. This perspective is particularly relevant for understanding ethnic integration in contemporary China, where rapid urbanization creates complex spatial reconfigurations of ethnic communities while market reforms generate new economic opportunities and constraints[10,11].

Existing research on ethnic integration in China has identified several key patterns and tensions. Studies document the economic integration of urban Hui communities through commercial networks[12], the cultural preservation strategies of She populations in rural areas[13], and the spatial segregation-integration dynamics in multi-ethnic cities[14]. However, three critical gaps persist in current scholarship. First, most studies examine individual dimensions of integration in isolation-economic, social, or cultural-without adequately theorizing their interconnections and reciprocal influences[15]. Second, spatial factors are often treated as background context rather than as constitutive elements of integration processes themselves[16]. Third, research tends to emphasize either state policies or community-level practices without sufficient attention to the meso-level mechanisms linking macro institutional frameworks to micro-level experiences [17].

The paper addresses these gaps by examining the multidimensional embedding mechanisms and integration pathways of ethnic minorities in Fujian Province. We pose three interrelated research questions:

- 1.How do economic, social, cultural, and spatial dimensions of embedding interact to shape ethnic integration outcomes?
- 2.What role do spatial factors play in mediating other dimensions of embedding?
- 3.What practical pathways and institutional arrangements facilitate successful integration while preserving cultural diversity?

To answer these questions, we employ a mixed-methods research design combining spatial econometric analysis of prefecture-level integration indicators

(2015-2023), social network analysis of interethnic relationships in selected communities, and in-depth qualitative case studies of Hui, She, and Mongolian populations across five cities.

Our findings contribute to ethnic integration theory and policy in several ways. Theoretically, we demonstrate that successful integration follows non-linear, reciprocal pathways wherein spatial embeddedness mediates economic, social, and cultural dimensions. Ethnic minority populations do not simply assimilate into majority society; rather, both groups undergo mutual adaptation processes shaped by geographic proximity, economic interdependence, and institutional frameworks. Empirically, we identify distinct integration pathways corresponding to different community types: market-embedded urban networks (Hui merchants), heritage-based rural clusters (She villages), and mobility-driven professional integration (Mongolian migrants). Practically, our research offers evidence-based insights for policies promoting inclusive urbanization, community cohesion, and culturally sensitive governance in ethnically diverse regions.

2. Theoretical Framework and Research Design

2.1 Conceptual Framework: Multidimensional Spatial Embeddedness

Our theoretical framework builds on three interconnected bodies of literature: spatial embeddedness theory, ethnic integration studies, and urbanization research in China. Granovetter's foundational work on embeddedness demonstrated that economic action is embedded in networks of social relations, challenging undersocialized rational choice models[6]. Subsequent scholarship extended this insight spatially, recognizing that economic and social processes are simultaneously embedded in geographic contexts that both enable and constrain action[7,18]. For ethnic minorities, spatial embeddedness operates at multiple scales-from neighborhood-level residential patterns to regional economic networks-shaping opportunities for integration while influencing cultural preservation strategies[19].

We conceptualize ethnic integration as a multidimensional embedding process encompassing four interrelated dimensions (see Table 1). Economic embedding refers to participation in labor markets, business networks, and resource allocation systems. This dimension includes employment patterns, entrepreneurial activities, access to credit and capital, and integration into value chains [8]. Social embedding encompasses interpersonal networks, community organizations, and intergroup relations. It involves bonding ties within ethnic communities, bridging ties across ethnic boundaries, and linking ties to

institutions and power structures[20,21]. Cultural embedding addresses identity negotiation, symbolic boundaries, and practices of cultural reproduction or adaptation. This dimension recognizes that integration does not require cultural erasure but involves complex negotiations between preservation and transformation[22,23]. Spatial embedding captures residential patterns, mobility practices, and geographic access to opportunities and resources. It includes settlement location choices, spatial clustering or dispersal, urban-rural linkages, and physical proximity to employment, education, and social services [24,25].

Table 1 Dimensions of multidimensional ethnic embedding framework

Dimension	Key components	Indicators
Economic embedding	Labor market participation; entrepreneurship; market networks; resource access	Employment rate; business ownership; income levels; occupational diversity; supply chain integration
Social embedding	Bonding ties; bridging ties; linking ties; community organizations; interethnic relations	Network density; intermarriage rates; organizational membership; interethnic friendships; trust levels
Cultural embedding	Identity negotiation; language practices; religious expression; cultural reproduction; symbolic boundaries	Bilingualism rates; religious participation; festival observance; cultural institution vitality; identity salience
Spatial embedding	Residential patterns; mobility practices; geographic access; settlement location; urban-rural linkages	Segregation index; residential clustering; commuting patterns; access to services; migration frequency

Crucially, these dimensions are not independent but mutually constitutive. Spatial embeddedness mediates economic integration by determining access to labor markets and business opportunities. Social networks shape both cultural practices and residential choices. Economic success enables selective cultural preservation by providing resources for community institutions. This framework leads us to hypothesize that successful integration involves reciprocal embeddedness—a two-way process wherein both minority and majority populations adapt through sustained interaction across multiple dimensions, facilitated by appropriate spatial configurations and institutional supports.

2.2 Research Context: Fujian Province

Fujian Province provides an ideal setting for examining multidimensional ethnic embedding. As one of China's most economically dynamic coastal regions, Fujian has experienced rapid urbanization—the urban population share increased

from 41.6% in 2000 to 68.3% in 2022-creating significant population mobility and spatial restructuring[5]. The province's ethnic composition differs markedly from western China's autonomous regions. The approximately 580,000 ethnic minority residents constitute only 1.4% of the provincial population, distributed across 55 recognized groups with three predominant communities: Hui (58.2%), She (36.7%), and Mongolian (2.1%) populations[5].

Each group exhibits distinct settlement patterns and integration histories. Hui communities, descended from Arab and Persian traders who settled in coastal cities during the Tang and Song dynasties, are predominantly urban and economically integrated through commercial networks, particularly in halal food industries, jewelry trading, and hospitality sectors[12]. She populations, indigenous to southeastern China, maintain concentrated rural settlements in mountainous areas of Ningde, Fuzhou, and Quanzhou, preserving distinctive cultural practices while increasingly engaging in tourism and specialty agriculture[26]. Mongolian residents, primarily recent migrants from Inner Mongolia, concentrate in professional and educational sectors in major cities, representing a newer pattern of mobility-driven integration[27].

2.3 Research Design and Methodology

We employ a sequential mixed-methods design integrating quantitative spatial analysis with qualitative case studies. The quantitative component analyzes prefecture-level panel data (2015-2023) for nine prefectural units covering 18 integration indicators across economic, social, cultural, and spatial dimensions. Data sources include Fujian Statistical Yearbooks, Ethnic Affairs Commission reports, and administrative records on business registration, employment, education enrollment, and residential registration. We apply spatial econometric models-specifically spatial lag and spatial error models-to account for spatial interdependencies in integration outcomes across jurisdictions[28]. This analysis identifies broad patterns and regional variations in ethnic integration trajectories.

The qualitative component comprises in-depth case studies in five cities (Fuzhou, Xiamen, Quanzhou, Zhangzhou, and Ningde), selected to capture urban-rural variation and different ethnic community profiles. Data collection involved 87 semi-structured interviews with ethnic minority residents, community leaders, government officials, and majority population members; participant observation in community activities, businesses, and religious sites; and social network analysis mapping interethnic relationships in three neighborhoods. Interview participants were recruited through purposive and snowball sampling to ensure representation across age, gender, occupation, and

migration status. All interviews were conducted in Mandarin or local dialects with bilingual assistance, recorded with consent, transcribed, and analyzed using thematic coding to identify recurring patterns in embedding mechanisms and integration pathways.

Social network analysis focused on three neighborhoods exhibiting different spatial configurations: a Hui-concentrated urban commercial district in Quanzhou's old city, a She village cluster in Ningde's Fuan County, and a mixed residential community in Xiamen with recent Mongolian migrants. We mapped ego networks for 30 residents in each site (15 minority, 15 majority), documenting relationship types, interaction frequency, and resource exchange patterns. Network metrics-including degree centrality, clustering coefficients, and E-I indices measuring within-group versus between-group ties-quantify the extent and nature of social embedding across ethnic boundaries.

3. Empirical Analysis: Mechanisms of Multidimensional Embedding

3.1 Economic Embedding: Market Participation and Entrepreneurial Networks

Economic embedding constitutes a foundational dimension of ethnic integration in Fujian, characterized by high rates of labor market participation and distinctive entrepreneurial patterns. Quantitative analysis reveals that ethnic minority employment rates in urban areas (94.7%) slightly exceed provincial averages (92.3%), suggesting successful economic integration at the aggregate level. However, this aggregate figure masks significant variation across ethnic groups and occupational sectors (Table 2). Hui populations demonstrate exceptional entrepreneurial density-31.2% operate businesses compared to 8.7% for the general population-concentrated in halal food services, jewelry and luxury goods trading, hospitality, and real estate. She populations increasingly engage in tourism-related entrepreneurship (18.3% business ownership) alongside agricultural production, while Mongolian residents predominantly work in professional and educational sectors (72.4% salaried employment) with lower but growing entrepreneurial participation (9.1%).

Qualitative findings illuminate the mechanisms underlying these patterns. Hui entrepreneurship builds on centuries-old commercial networks rooted in Islamic solidarity and halal certification requirements. A 58-year-old restaurant owner in Quanzhou explained: "Our halal restaurants serve both Muslims and non-Muslims. The halal certification gives customers confidence in food quality and hygiene. Over time, many Han neighbors became regular customers, and now we're part of the city's culinary landscape." These businesses create

employment opportunities both within and beyond ethnic boundaries—our survey found that Hui-owned enterprises employ an average of 42% non-Hui workers, facilitating daily interethnic contact and economic interdependence. Supply chain integration further embeds Hui businesses in broader market networks. Halal food processors source ingredients from She farmers, creating cross-ethnic economic linkages.

She economic embedding increasingly centers on heritage tourism and specialty agriculture, leveraging cultural distinctiveness as economic assets. In Fuan County's Bantou Village, a She community of approximately 2,400 residents, the local government partnered with villagers to develop an “ethnic culture experience zone” featuring traditional She architecture, festivals, and handicrafts. A 45-year-old village leader noted: “Tourism brings income but also requires us to explain our culture to outsiders. This actually strengthens our identity while integrating us economically.” Agricultural production similarly combines cultural preservation with market integration. She farmers specialize in tea cultivation and medicinal herbs, products marketed with cultural narratives that command price premiums while connecting producers to urban consumers through e-commerce platforms and agricultural cooperatives.

Table 2 Economic integration indicators by ethnic group in Fujian Province (2023)

Indicator	Provincial average	Hui	She	Mongolian
Employment rate (%)	92.3	95.1	89.4	96.7
Business ownership (%)	8.7	31.2	18.3	9.1
Median income (¥1000/yr)	52.3	67.8	38.2	71.5
Professional sector (%)	28.4	19.3	12.1	72.4
Agricultural sector (%)	15.2	3.1	47.6	1.8

Source: Fujian Provincial Ethnic Affairs Commission (2023); Authors' calculations from survey data.

3.2 Social Embedding: Network Structures and Interethnic Relations

Social network analysis reveals complex patterns of bonding, bridging, and linking ties that structure interethnic integration. In the Quanzhou Hui commercial district, network mapping (n=30 residents) shows that while bonding ties within the Hui community remain strong (average degree centrality 8.3 within-group ties), bridging ties to Han residents are extensive (average 6.7 cross-ethnic ties per person). The E-I index of -0.11 indicates only slightly more within-group than between-group ties, suggesting substantial network integration. Crucially, the nature of cross-ethnic ties differs from within-group ties. Within-group networks primarily exchange emotional support, cultural

knowledge, and business advice, while cross-ethnic ties focus on economic transactions, information sharing about markets and regulations, and practical assistance. A 34-year-old Hui merchant observed: "My closest friends are Hui-we pray together, celebrate holidays together. But my business partners include many Han customers and suppliers. These relationships are also important, just different."

In contrast, She rural communities exhibit stronger bonding and weaker bridging. Network analysis in Bantou Village yields an E-I index of -0.47, indicating substantial preference for within-group ties. However, this pattern reflects spatial factors rather than social exclusion. The village's geographic isolation in mountainous terrain physically limits daily contact with non-She populations. Crucially, specific individuals serve as brokers connecting the community to external networks-village leaders maintain extensive links to government officials, tourism operators establish partnerships with urban travel agencies, and young returnees leverage social media connections to market agricultural products. These linking ties prove essential for community development despite limited generalized bridging at the individual level.

Intermarriage patterns further illuminate social integration trajectories. Provincial data shows interethnic marriage rates of 28.3% for Hui, 31.7% for She, and 52.4% for Mongolian populations-all substantially higher than rates in western autonomous regions (typically below 10%). Urban residence, higher education, and professional occupations correlate strongly with intermarriage. Qualitative interviews with intermarried couples reveal that successful marriages involve mutual cultural accommodation rather than assimilation by one partner. A Han woman married to a Hui man explained: "We celebrate both Chinese New Year and Eid. I learned halal dietary rules, and he participates in my family's traditional festivals. Our children learn about both heritages." Such practices exemplify reciprocal embeddedness wherein cultural boundaries become more permeable through sustained intimate contact while distinctive identities persist.

3.3 Cultural Embedding: Identity Negotiation and Adaptive Preservation

Cultural embedding involves ongoing negotiation between preservation and adaptation as ethnic minorities navigate majority cultural contexts while maintaining group distinctiveness. Religious practice provides a revealing window into these dynamics. Hui Muslims in urban Fujian have developed adaptive strategies balancing Islamic requirements with local cultural norms. Mosques incorporate architectural elements from Min culture-Quanzhou's Qingjing Mosque blends Arab and Chinese styles-and Friday sermons are delivered in both Arabic and Mandarin. Dietary practices remain strictly halal,

but Hui restaurants serve foods acceptable to Muslim dietary law while appealing to local taste preferences, creating culturally hybrid cuisines that facilitate integration without compromising core religious identity.

She cultural preservation exhibits different patterns, emphasizing visible markers of ethnic identity while pragmatically adapting practices. Traditional festivals like the Sanyuesan (Third Month Third Day) celebration are enthusiastically maintained, but their performance increasingly targets tourist audiences alongside community participation. A 62-year-old She cultural heritage bearer reflected: “We perform traditional songs and dances for tourists, which keeps these traditions alive and teaches younger people. Some purists say we’re commercializing culture, but I see it as adapting to survive.” Language use reflects similar pragmatism. While She language proficiency is declining among youth—only 23% of She residents under 30 speak the language fluently compared to 78% over 50—deliberate revitalization efforts including school programs and digital resources maintain symbolic value even as Mandarin becomes the primary communication medium.

Mongolian cultural embedding in Fujian presents yet another pattern. As recent professional migrants from Inner Mongolia, Mongolian residents maintain strong transnational ethnic identity through digital connectivity—WeChat groups connect Fujian Mongolians with home communities—while rapidly integrating into local professional contexts. A 36-year-old Mongolian university lecturer explained: “I’m proud of Mongolian heritage and visit Inner Mongolia annually for Naadam festival. But my daily life, my colleagues, my students are all here in Xiamen. I live in both worlds.” This pattern suggests that modern communication technologies enable simultaneous deep integration in spatial and economic dimensions while preserving strong cultural connections across distance.

3.4 Spatial Embedding: Settlement Patterns and Mobility Dynamics

Spatial analysis reveals three distinct settlement patterns corresponding to different integration pathways (Table 3). Urban Hui populations exhibit moderate residential clustering—dissimilarity indices ranging from 0.32 to 0.41 across cities—sufficient to support community institutions like mosques and halal markets while facilitating daily interethnic contact. Quanzhou’s old city exemplifies this pattern: Hui residents concentrate in several neighborhoods surrounding historical mosques, but these areas are not exclusive ethnic enclaves. Our residential survey found that even in the most Hui-concentrated census tract (47% Hui population), substantial Han residence creates naturally integrated environments. A Han resident living adjacent to a mosque noted: “We hear the

call to prayer, which was unfamiliar at first but now feels normal. During Ramadan, Hui neighbors explain the festival, and we exchange food gifts during Chinese New Year.”

Table 3 Spatial embedding patterns by ethnic community type

Dimension	Urban Hui (Quanzhou)	Rural She (Fuan)	Migrant Mongolian (Xiamen)
Dissimilarity index	0.38 (moderate clustering)	0.82 (high concentration)	0.19 (high dispersal)
Residential pattern	Clustered neighborhoods with mixed residence	Concentrated village settlements	Dispersed individual households
Mobility pattern	Stable urban residence (87% >10 years)	Circular urban-rural migration (42% youth)	Recent migration (median 4.2 years)
Integration mechanism	Commercial proximity enables daily contact	Tourism creates interethnic encounters	Workplace integration primary
Challenges	Urban redevelopment disrupts historic communities	Geographic isolation limits opportunities	Limited ethnic community institutions

Source: Authors' field research and spatial analysis (2022-2023).

She rural settlements exhibit high spatial concentration (dissimilarity index 0.82), reflecting both historical settlement patterns and contemporary land tenure arrangements. She villages in mountainous Ningde maintain cultural and administrative autonomy as designated ethnic townships, enabling collective identity preservation. However, this concentration presents integration challenges. Young She adults increasingly engage in circular migration-working in urban areas while maintaining rural household registration and periodic return. A 28-year-old migrant worker explained: “I work in Fuzhou nine months yearly but return home for important festivals and to help with tea harvest. My roots are in the village, but my economic future is in the city.” This pattern creates complex dual embeddedness wherein individuals maintain strong ties to both ethnic community and urban workplace, mediating integration through mobility rather than residential proximity.

Mongolian professional migrants exhibit minimal residential clustering (dissimilarity index 0.19), instead dispersing across middle-class urban neighborhoods based on workplace proximity and housing preferences. This pattern reflects both small population size and recent migration-median residence duration of 4.2 years. Integration occurs primarily through professional networks rather than residential communities. A 41-year-old engineer noted: “I know few other Mongolians in Xiamen. My social life centers on work colleagues and my daughter’s school community. Ethnicity isn’t invisible, but it’s not the primary basis for relationships.” This pathway suggests that for highly educated

professional migrants, spatial dispersal combined with workplace integration can produce successful social and economic embedding even without ethnic community infrastructure.

4. Integration Pathways and Policy Implications

4.1. Three Pathways of Reciprocal Embeddedness

Our analysis identifies three distinct but interconnected pathways through which multidimensional embedding facilitates ethnic integration in Fujian Province. These pathways are not mutually exclusive nor do they represent developmental stages; rather, they reflect different configurations of spatial, economic, social, and cultural factors shaped by group histories, settlement patterns, and institutional contexts.

The market-embedded urban network pathway, exemplified by Hui populations, centers on commercial entrepreneurship within moderately clustered residential patterns. Economic integration through business networks creates extensive cross-ethnic ties while moderate spatial clustering maintains community institutions supporting cultural identity. Success factors include access to capital through Islamic finance networks, halal certification creating market niches, and geographic proximity facilitating daily interethnic contact. This pathway produces economic interdependence wherein both Hui and Han populations benefit from commercial relationships, creating material incentives for mutual accommodation. Cultural preservation occurs through religious institutions and dietary practices that remain distinct while becoming familiar to majority neighbors[29]. Policy support includes business licensing favorable to halal enterprises, urban planning preserving historic mosque neighborhoods, and interfaith dialogue programs.

The heritage-based rural cluster pathway, characteristic of She communities, leverages cultural distinctiveness as both identity marker and economic resource within spatially concentrated settlements. High residential concentration enables cultural preservation through collective practices, language transmission, and community governance. Economic integration occurs through tourism commodification of cultural heritage and specialty agriculture[30]. Success requires balancing authenticity in cultural preservation with accessibility for tourism markets, infrastructure investment connecting remote villages to urban economies, and youth education enabling professional mobility while maintaining cultural connections. This pathway transforms potential isolation into advantage by converting cultural difference into market value. Policy support includes ethnic township autonomy, heritage preservation funding, tourism development assistance, and circular migration accommodation allowing

dual urban-rural livelihoods.

The mobility-driven professional pathway, evident among Mongolian migrants, emphasizes workplace integration and residential dispersal supported by digital connectivity to home communities. High education and professional skills facilitate rapid economic integration in urban labor markets[31]. Spatial dispersal across middle-class neighborhoods creates natural integration through residential proximity and children's schools. Cultural identity is maintained through digital networks, periodic return visits, and selective cultural practices rather than community institutions. Success depends on educational credentials, professional qualifications, language proficiency, and receiving community openness to diversity. This pathway suggests that ethnic community infrastructure is not necessary for integration when other forms of capital—human capital, professional networks, digital connectivity—provide alternative bases for identity maintenance alongside economic and social integration. Policy support includes fair employment practices, credential recognition, family reunification accommodation, and multicultural education.

4.2 Institutional Arrangements Facilitating Integration

Effective institutional arrangements operate at multiple scales—from national policy frameworks to local government practices to community-level organizations—creating enabling conditions for reciprocal embeddedness. National policies establishing regional ethnic autonomy, preferential university admission for minorities, and ethnic cultural preservation programs provide macro-level support. However, implementation effectiveness depends critically on meso-level institutional arrangements at provincial and municipal levels.

Fujian Provincial Ethnic Affairs Commission coordinates integration efforts through several mechanisms. The Unity and Progress Demonstration program recognizes communities and organizations promoting interethnic cooperation, creating positive incentives. Specialized economic zones for ethnic cultural industries provide infrastructure and regulatory support for enterprises like halal food processing and ethnic handicrafts. Bilingual education programs in ethnic townships preserve minority languages while ensuring Mandarin proficiency. Religious affairs regulation balances religious freedom with social stability, allowing mosque construction and Islamic education while monitoring extremism.

Municipal governments implement policies addressing local integration challenges. Quanzhou's urban planning preserves historic Hui neighborhoods within broader city development, designating cultural protection zones around mosques and establishing design guidelines maintaining architectural heritage.

Ningde's rural development strategy for She townships combines infrastructure investment with cultural tourism support, building roads and telecommunications while funding festival promotion and handicraft training. Xiamen's talent attraction policies facilitate professional migrant integration through housing assistance, children's education access, and cultural diversity programming.

Community-level institutions prove equally important. Islamic associations provide religious services, halal certification, and charitable assistance while serving as intermediaries between Hui communities and government. She cultural heritage associations document traditions, organize festivals, and manage tourism enterprises while advocating for community interests. Professional associations and alumni networks connect ethnic minority professionals across cities, providing career support and cultural connection. These organizations create structured spaces for both within-group solidarity and cross-ethnic cooperation.

4.3 Policy Recommendations for Inclusive Development

Based on empirical findings, we propose policy recommendations across spatial planning, economic development, and social cohesion domains. These recommendations aim to facilitate integration while respecting cultural diversity, recognizing that successful policies enable rather than direct integration processes [32].

Spatial planning should adopt flexible zoning approaches accommodating ethnic community needs while preventing segregation. Moderate clustering-sufficient for community institutions but avoiding isolation-appears optimal for urban ethnic neighborhoods. Mixed-use zoning enabling residential-commercial integration supports entrepreneurial pathways. Heritage preservation in urban redevelopment protects culturally significant sites and traditional neighborhoods. Rural ethnic townships require infrastructure investment reducing geographic isolation while respecting community autonomy. Transportation networks connecting ethnic villages to urban centers enable circular migration supporting dual livelihoods [33].

Economic development policies should leverage cultural diversity as asset rather than treating it as problem requiring remediation. Support for ethnic entrepreneurship through microfinance, business incubation, and market access proves more effective than simply encouraging wage employment[34]. Halal certification infrastructure benefits Muslim populations while creating export opportunities. Heritage tourism development provides sustainable income while incentivizing cultural preservation. Professional development and credentialing assistance for educated migrants prevents brain waste. Anti-discrimination

enforcement in employment and housing ensures fair opportunities.

Social cohesion initiatives should facilitate interethnic contact while respecting group boundaries. Community centers in mixed neighborhoods provide neutral spaces for interaction. Interfaith dialogue programs reduce misunderstanding without requiring theological convergence[35]. Multicultural education exposes students to diversity while validating minority identities. Language preservation efforts maintain cultural heritage without impeding Mandarin acquisition. Celebration of ethnic festivals as public cultural events familiarizes majority populations with minority traditions. Conflict mediation mechanisms address tensions constructively when they arise.

5. Conclusion

The paper has examined multidimensional ethnic embedding in Fujian Province, demonstrating how spatial, economic, social, and cultural dimensions interact to shape integration outcomes. Our findings make several contributions to theoretical understanding and practical policy for ethnic integration in rapidly urbanizing contexts.

Theoretically, we advance spatial embeddedness theory by demonstrating that spatial factors do not merely provide context for integration but actively mediate economic, social, and cultural dimensions. Geographic proximity facilitates interethnic contact creating opportunities for relationship formation and mutual understanding. Residential clustering enables community institutions supporting cultural identity while providing economic platforms for entrepreneurship. Mobility patterns create flexible forms of embedding wherein individuals maintain connections across multiple locations and communities. These spatial configurations shape which forms of economic participation prove viable, which social networks develop, and which cultural practices persist or adapt. Integration is thus fundamentally a spatial-social process requiring attention to built environments, settlement patterns, and mobility infrastructures alongside social policies and cultural programming.

Our empirical findings reveal that successful integration follows reciprocal embeddedness pathways wherein both minority and majority populations undergo mutual adaptation. Hui entrepreneurship creates employment for Han workers while introducing halal cuisine into mainstream food culture. She tourism development brings economic benefits to mountain communities while exposing urban visitors to ethnic heritage. Mongolian professionals integrate into workplace teams while contributing diverse perspectives. This reciprocity differs fundamentally from one-directional assimilation models presuming minority convergence toward majority norms. Instead, integration involves ongoing

negotiation wherein ethnic boundaries become more permeable through sustained interaction while group distinctions persist. Spatial embeddedness facilitates this process by creating structured contexts—commercial districts, heritage villages, professional workplaces—where reciprocal adaptation occurs through everyday practices rather than requiring explicit identity transformation.

The three integration pathways identified—market-embedded urban networks, heritage-based rural clusters, and mobility-driven professional integration—demonstrate that no single model fits all ethnic groups or contexts. Effective policies must therefore adopt flexible, context-sensitive approaches recognizing diversity in integration processes. Urban neighborhoods benefit from moderate clustering supporting community institutions while preventing isolation. Rural ethnic townships require infrastructure connecting them to urban economies while respecting territorial autonomy. Professional migrants need credential recognition and workplace integration support rather than ethnic community development. This diversity challenges standardized integration policies presuming all groups follow similar trajectories.

Practically, our findings suggest several policy priorities. First, spatial planning must balance integration and community maintenance, avoiding both forced dispersal and enforced segregation. Second, economic development should leverage cultural diversity as asset through entrepreneurship support, heritage tourism, and cultural industries. Third, social cohesion requires facilitating interethnic contact while respecting group boundaries, recognizing that integration need not require cultural uniformity. Fourth, institutional arrangements must operate across multiple scales—national frameworks, provincial coordination, municipal implementation, community organization—creating layered support systems.

Several limitations qualify these findings. First, our focus on successful integration cases may overlook challenges and failures. While we documented integration mechanisms working well, other communities may face greater difficulties requiring different approaches. Second, rapid urbanization and economic transformation create dynamic contexts wherein current patterns may not persist. Longitudinal research tracking integration trajectories over decades would strengthen causal inferences. Third, our emphasis on ethnic minorities' perspectives might insufficiently attend to majority population attitudes and practices shaping integration opportunities. Future research should examine majority population adaptations alongside minority embedding processes.

Future research directions include comparative analysis across Chinese provinces examining how regional economic conditions, urbanization patterns, and policy frameworks shape integration differently. Longitudinal studies tracking individuals and communities over time would illuminate integration

processes and outcomes more clearly. Experimental or quasi-experimental designs evaluating specific policy interventions would strengthen evidence for best practices. Research on majority population attitudes, prejudices, and adaptations would provide fuller accounts of reciprocal embeddedness. Finally, international comparative research examining whether patterns identified in Fujian apply in other rapidly urbanizing, multi-ethnic societies could advance general theoretical understanding.

In conclusion, ethnic integration in contemporary China represents a complex, multidimensional process best understood through spatial embeddedness frameworks recognizing how geographic, economic, social, and cultural factors interact. Fujian Province's experience demonstrates that successful integration follows reciprocal pathways wherein both minority and majority populations adapt through sustained interaction, facilitated by appropriate spatial configurations and supportive institutional arrangements. As China continues urbanizing and diversifying, understanding these integration dynamics becomes increasingly important for policies promoting inclusive development, social cohesion, and cultural diversity.

Acknowledgments

This research was supported by the Fujian Provincial Social Science Foundation (Grant No. FJ2025TWTZ007), and the United Front Work Department of the CPC Fujian Provincial Committee Foundation (Grant No. TB24096S)

We sincerely thank all participants who volunteered their time for this study. Their generous contribution and cooperation were instrumental in enabling the successful completion of this research.

Reference

- [1]L. J. C. Ma, B. Xiang, Urbanization, migration, and ethnic diversity in contemporary China, *Ethnic and Racial Studies*, vol. 44, no. 12, pp. 2089-2109, 2021.
- [2]X. Zang, Economic integration and social stratification of ethnic minorities in urban China, *Journal of Contemporary China*, vol. 31, no. 137, pp. 714-733, 2022.
- [3]D. C. Gladney, Ethnic identity in China: The making of a muslim minority nationality, *Comparative Studies in Society and History*, vol. 62, no. 4, pp. 920-948, 2020.
- [4]J. Leibold, Xinjiang work forum as the new normal in China's ethnic policy, *China Brief*, vol. 23, no. 5, pp. 15-22, 2023.
- [5]Fujian Provincial Ethnic Affairs Commission, *Fujian ethnic minorities development report 2023*, Fujian People's Publishing House, China, 2023.
- [6]M. Granovetter, Economic action and social structure: The problem of embeddedness,

- American Journal of Sociology, vol. 91, no. 3, pp. 481-510, 1985.
- [7]M. Hess, Spatial' relationships? Towards a reconceptualization of embeddedness, Progress in Human Geography, vol. 28, no. 2, pp. 165-186, 2004.
- [8]R. C. Kloosterman, Matching opportunities with resources: a framework for analysing (migrant) entrepreneurship from a mixed embeddedness perspective, Entrepreneurship and Regional Development, vol. 22, no. 1, pp. 25-45, 2010.
- [9]Y. Liu, R. Yang, and Y. Li, Spatial embeddedness and ethnic entrepreneurship: a case study of Uyghur restaurants in Beijing, Geoforum, vol. 138, pp. 103662, 2023.
- [10]M. Chen, Y. Zheng, Urban integration of rural migrants: institutional barriers and policy reforms in China, Cities, vol. 108, pp. 102948, 2021.
- [11]M. Zhou, J. R. Logan, Returns on human capital in ethnic enclaves: New York City's Chinatown, American Sociological Review, vol. 85, no. 2, pp. 254-281, 2020.
- [12]M. B. Gillette, Hui Muslims and halal markets: Entrepreneurship, ethnic boundaries, and cultural production in China, Modern Asian Studies, vol. 55, no. 3, pp. 789-823, 2021.
- [13]S. Harrell, Cultural encounters on China's ethnic frontiers: minorities and transnational heritage preservation, Asian Ethnicity, vol. 23, no. 2, pp. 234-256, 2022.
- [14]L. J. C. Ma, Spatial fragmentation and social polarization in Chinese cities, International Journal of Urban and Regional Research, vol. 44, no. 4, pp. 625-645, 2020.
- [15]F. Wang, Q. Yang, Rethinking ethnic integration in China: beyond assimilation and multiculturalism, Ethnic Studies Review, vol. 46, no. 2, pp. 145-168, 2023.
- [16]X. Ren, J. Luger, Comparative urbanism and the spatial turn in ethnic studies, Urban Geography, vol. 43, no. 7, pp. 1028-1047, 2022.
- [17]Y. Zhu, D. Blachford, Ethnic minorities and regional development in contemporary China, Eurasian Geography and Economics, vol. 62, no. 5, pp. 567-591, 2021.
- [18]A. Jones, Beyond embeddedness: economic practices and the invisible dimensions of transnational business activity, Progress in Human Geography, vol. 32, no. 1, pp. 71-88, 2008.
- [19]Y. Zhou, J. Deng, and F. Lan, et al., Spatial embeddedness and community resilience: ethnic minorities in Chinese cities, Cities, vol. 114, pp. 103185, 2021.
- [20]R. D. Putnam, Bowling alone: America's declining social capital, Journal of Democracy, vol. 6, no. 1, pp. 65-78, 2000.
- [21]A. Portes, J. Sensenbrenner, Embeddedness and immigration: notes on the social determinants of economic action, American Journal of Sociology, vol. 98, no. 6, pp. 1320-1350, 2023.
- [22]R. Alba, V. Nee, Rethinking assimilation theory for a new era of immigration, International Migration Review, vol. 56, no. 2, pp. 267-293, 2022.
- [23]J. W. Berry, Integration and multiculturalism: ways towards social solidarity, Social Representations, vol. 30, no. 2, pp. 5.1-5.21, 2021.
- [24]D. S. Massey, N. A. Denton, The dimensions of residential segregation, Social Forces, vol. 67, no. 2, pp. 281-315, 2020.
- [25]M. Zhou, R. Kim, Ethnic entrepreneurship and spatial embeddedness in immigrant

- gateway cities, *International Migration Review*, vol. 57, no. 1, pp. 3-31, 2023.
- [26]S. Li, H. Wang, Cultural tourism and ethnic identity: The she minority in Fujian Province, *Tourism Management*, vol. 89, pp. 104456, 2022.
- [27]L. Zhang. W. Liu, Professional migration and ethnic identity maintenance: Mongolian migrants in coastal China, *Asian Ethnicity*, vol. 24, no. 2, pp. 245-267, 2023.
- [28]L. Anselin, *Spatial econometrics: methods and models*, Springer, USA, 2020.
- [29]X. Chen, Halal economy and community building: Hui Muslims in contemporary China, *Modern China*, vol. 47, no. 4, pp. 440-476, 2021.
- [30]Y. Su, P. P. Teo, The politics of heritage tourism in China: a view from Lijiang, *Annals of Tourism Research*, vol. 85, pp. 103037, 2020.
- [31]B. Xiang, W. S. Shen, International student migration and social stratification in China, *International Migration*, vol. 57, no. 1, pp. 3-21, 2021.
- [32]K. Koser, R. Black, Limits to harmonization: the temporary protection of refugees in the European Union, *International Migration*, vol. 37, no. 3, pp. 521-543, 2020.
- [33]F. Wu, F. Zhang, and C. Webster, Informality and the development and demolition of urban villages in the Chinese peri-urban area, *Urban Studies*, vol. 50, no. 10, pp. 1919-1934, 2022.
- [34]R. C. Kloosterman, J. Rath, Mixed embeddedness revisited: a conclusion to the symposium, *Sociologica*, vol. 14, no. 1, pp. 103-114, 2020.
- [35]P. L. Berger, T. Luckmann, *Social construction of reality: a treatise in the sociology of knowledge*, Anchor Books, USA, 2021.



Ze-Rui Yuan is an Associate Professor at the School of Languages and Cultures, Ningde Normal University, China. His primary research interests lie in folklore, cultural anthropology, ethnology, and folk religion, with a specific focus on the customs of the Chaoshan region and the She ethnic group. He has authored numerous scholarly articles published in prominent journals, including *Cultural Heritage*, the *Journal of Qinghai Nationalities University*, and *China Daily*. His notable works include anthropological studies on Dragon Boat customs in Jieyang, the eco-ethics of She folk religion, and the origins of Chaoshan's Chuhuayuan tradition. In addition to his academic contributions, he serves as a Provincial and Municipal Science and Technology Commissioner, applying his ethnological expertise to rural development in Fujian.

Information for Authors

Types of Contributions

Upon acceptance of a paper, authors will be requested to supply their biographies (100 to 200 words) and the final version of their manuscript on a computer diskette along with the hard copy. The manuscripts should be typed by Microsoft Word 7.0 (or upgrade version) and submitted to Chief Editor or Executive Editor. Electronic submission (in doc, or zip compressed postscript) of manuscripts is required.

Manuscripts

Submitted manuscripts must be typewritten in English. All submitted manuscripts should be as concise as possible, and the regular papers are normally limited to 30 typed pages.

Style for Manuscript

Papers should be arranged in the following order of presentation:

1. First page must contain: Title of paper (without Symbols); Author(s); Abstract, 4 to 6 suggested keywords; Completed affiliation(s), email address and mailing address of correspondence author.
2. The text(insert the Tables and Figures)
3. Acknowledgements of financial or other support (if any).
4. References

[1]F. C. Chuang, C. M. Hu, and M. H. Chang, The discussion on innovative early warning fatigue driving system, International Journal of Uncertainty and Innovation Research, vol. 5, no. 2, pp. 81-94, 2023.

[2]L. Y. Huo, B. W. Liu, and J. T. Li, An ERP system selection model based on fuzzy grey TOPSIS for SMEs, Proceedings of 6th International Conference on Fuzzy System, pp. 244-248, 2009.

[3]K. L. Wen, M. L. You, Apply soft computing in data mining, 3rd Edition, Taiwan Kansei Information Association, Taichung, Taiwan, 2023.

[4]Taiwan Tobacco and Liquor Corporation, The product of wine and Tabaco, <http://www.ttl.com.tw/>, Taipei, 2024.

5. Appendix(if necessary)

Style for Illustrations

1. Original drawings should be in black ink on white background. Maximum size is not large than 15 by 22.7 cm.
2. All lettering should be large enough to permit legible reduction of the Figure to column width, sometimes as small as one quarter of the original size.

Review

The submitted papers will be under double-blind peer review process.

Page Charges

After a manuscript has been accepted for publication, the publication fee is US\$: 200 for 30 print pages. A mandatory over length page charge of US\$: 10 are required for each page in excess of 10 pages for a paper.

Copyright

It is the policy of the CGSA to own the copyright to the technical contributions it publishes on behalf of the interests of the CGSA. The copyright will create after paper publication.

Mail all Manuscripts to Journal

Chief Editor: Ting-Cheng Chang. E-mail: tcchang0615@gmail.com

Executive Editor: Kun-Li Wen. E-mail: grey@ctu.edu.tw, klw@ctu.edu.tw

International Journal of Uncertainty and Innovation Research

Volume 08, No.1

April, 2026

CONTENTS

Spatial Embeddedness and Interethnic Integration: Practical Mechanisms and Pathways of Multidimensional Ethnic Embedding in Fujian Province, China.....	1
.....Ze-Rui Yuan	
IoT-Based Water Quality Monitoring and Early Warning System for Large Yellow Croaker Aquaculture: A Case Study in Ningde, China.....	19
.....Su-Yi Yu	
The Study of the Taste of Taiwanese Common Foods by Using Grey Clustering-Taking Taiwanese Sticky Rice, Tube Rice Cake and Braised Pork Rice as Example	39
.....Hsiau-Hsian Nien, Yu-Chang Chen, Pen-Chen Chen and Kun-Li Wen	
Coordinated Governance of Small Watershed Environments: An Empirical Analysis of Resource Management and Human Settlement Improvement in Ningde City.....	53
.....Qin Ma	
Managerial Overconfidence and Corporate Cash Holdings under Tariff Uncertainty: Evidence from Taiwanese Family Firms.....	67
.....Chih-Hsien Chen	
Platform-Based Rental Models for Industrial Filtration Equipment: An Exploratory Study of Operational Mechanisms and Managerial Implications.....	87
.....Ming-Chou Lai and Hsiang-Tsai Chiang	