

Optimization of Cross-Border Public Transport Services from a Pluralistic Governance Perspective:

A Case Study of the Bus Capacity Between the University of Macau and the Hengqin Port

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Abstract: This study investigates the public transport capacity shortage between the Hengqin Port and the University of Macau (UM), situating the issue within the distinctive governance context of the Macau SAR. Drawing on stakeholder theory and public value theory, we analyze how cross-border administrative fragmentation and competing local interests shape public service. Using the surveys of 150 UM students and in-depth interviews, we found that the rising demand for cross-border commuter service is only part of the capacity shortfall. Cross-border transport capacity is constrained by jurisdictional divides between Macau and Guangdong authorities, fiscal incentives, and protectionist practices that prioritize local operators over regional efficiency. These dynamics reflect broader compromises of the “One Country, Two Systems,” where coordination between governments and accountability remain limited. The study concludes with policy recommendations aimed at alleviating immediate transport shortage while fostering cooperative mechanisms to strengthen integrated public service across Macau and Hengqin.

Keywords: Cross-border Public Transport, Administrative Fragmentation, Stakeholder Governance, Public Value, Macau–Hengqin Integration, One-Country-Two-Systems Regime

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Research Background and Significance

Strategic Background of Macau-Hengqin Integration

Envisioned by the Chinese government, the Guangdong-Hong Kong-Macau Greater Bay Area (GBA) is a strategic initiative to strengthen regional competitiveness through cooperative development. As a key part of this initiative, the integration of Macau and Hengqin carries both opportunities and challenges for regional governance. Hengqin Island is three times larger than Macau, and the closest distance between the two sides is less than 200 meters. As one of the most densely populated cities in the world, the establishment of the Guangdong-Macao In-Depth Cooperation Zone in Hengqin offers new prospects for education, technological innovation, and the development of tourism for Macau.

As a practical exemplar of the *One Country, Two Systems* policy, the integration of Hengqin and Macau is important for broader regional cooperation across the GBA. Hengqin Port serves as a crucial gateway by linking Macau with the Guangdong-Macao In-Depth Cooperation Zone. It stands for not only an upgrade in transportation infrastructure, but also as an indispensable bridge for economic, cultural, and educational exchanges. Easier customs clearance has encouraged more Macau residents and students to live in Hengqin, giving rise to a “twin-city lifestyle.” According to preliminary statistics, the monthly student passenger flows on the cross-border commuter *Tong Qin Hao* has exceeded 9,000, reflecting the popularity of cross-border lifestyles among students in Macau.

However, the integration process between Macau and Hengqin continues to encounter challenges. Transportation connectivity and the coordination of public services have yet to reach their full potential. The alignment of public sector priorities across the two regions requires ongoing attention and nuanced management. Beneath this trend lie deeper governance dilemmas in regional integration. Under the *One Country, Two Systems* framework proposed by the Chinese government, regional integration between Hengqin and Macau should extend beyond the physical infrastructure to address institutional coordination, reconciliation of interests, and the alignment of values. However, the persistent inadequacy of cross-border transport services highlights a structural tension in the provision of public goods. It underscores the challenges

that arise when market-oriented priorities intersect with public service imperatives, and when local considerations influence cross-jurisdictional resource allocation. From a perspective of pluralistic governance, the key question becomes: what mechanisms can be designed to effectively identify, balance, and synergize the diverse interests of relevant stakeholders?

Therefore, the shortage of bus capacity is not merely a scheduling problem. The imbalance in the provision of commuter services is a practical issue that tests regional governance capacity. Its complexity lies in several dimensions: first, high institutional transaction costs, as all policies must be coordinated across two legal jurisdictions; second, public value is unevenly distributed, with cross-border students bearing heavy commuting burdens; and third, ambiguous lines of responsibility between authorities, as no single actor has clear responsibility for resolving the situation. Consequently, while significant progress has been made in the integration of Macau and Hengqin, specific challenges persist in the delivery of public services, primarily related to cross-border coordination and implementation.

Scale and Distribution of the University Students Studying in Macau

University of Macau (UM)

As the largest public higher education institution in Macau, the University of Macau (UM) has experienced steady growth in student enrollment in recent years. As of October 14, 2024, the university had 15,360 registered students, including 2,769 doctoral, 4,612 master's, 78 post-baccalaureate certificate or diploma, and 7,688 undergraduate students. However, according to the UM residential college system, among the ten residential colleges designed for undergraduate students, each provides accommodation for only approximately 500 residents on average, and the number of dormitory places available for postgraduate students is further limited. Consequently, many students seek accommodation in Hengqin because of its comparatively affordable housing prices, even though they had to commute to Macau daily.

In line with its expansion plan, UM is actively developing a new campus in Hengqin. The new campus in Hengqin includes several new

faculties, such as the Faculties of Medicine, Information Technology, Design, and Engineering. UM has also founded the Zhuhai UM Science and Technology Research Institute to promote technological innovation and research commercialization. The expansion project is scheduled for completion by 2028 and is expected to increase the student population to approximately 25,000. With the expansion of the new campus, students, especially postgraduates and overseas cohorts, are anticipated increasingly opt for Hengqin, intensifying the demand for cross-border commuting.

Other Higher Education Institutions in Macau

As of 2024, Macau University of Science and Technology (MUST) had enrolled more than 19,000 students, including approximately 7,600 doctoral and master's students and approximately 11,800 undergraduates. Macao Polytechnic University (MPU) reported enrollment of over 4,500 students in the same year. The City University of Macau, Macao University of Tourism, Kiang Wu Nursing College of Macau, and the University of Saint Joseph also continue to expand their student populations.

Nonetheless, higher education institutions in Macau face a persistent shortage of student accommodation due to limited land resources. On-campus dormitories are scarce, and dormitory costs at these colleges remain relatively high. For example, MUST offers only a limited number of dormitory rooms on campus and in Praia Park, with a 10-month accommodation fee ranging from 40,000 to 49,800 Hong Kong Dollars (HKD\$).

Compared with Macau, where housing prices average over 85,000 Macao Patacas (MOP\$) per square meter, residential properties in Hengqin are far more affordable at around 30,000 yuan (about 33,690 MOP\$) per square meter. Many students choose affordable accommodation in Hengqin, and daily cross-border commuting has become increasingly common. Efficient transport services have become vital for supporting the growing integration of living and studying across boundaries.

Hengqin Port as a Critical Transportation Hub

Hengqin Port has emerged as a critical transportation hub linking

Macau and mainland China. According to the Hengqin Border Inspection Station, as of November 21, 2024, the cumulative passenger flow through Hengqin Port exceeded 20 million, with an average of 60,000 passengers daily, a significant portion of which were cross-border students commuting between Macau and Hengqin, recording a year-on-year increase of 38.2% on average. Among these, Macau residents account for over 4.35 million, or 22%, of the total passengers using Hengqin Port.

The rapid development of the Guangdong–Macau In-Depth Cooperation Zone in Hengqin has accelerated cross-border movement, with a growing number of passengers traveling for work, study, or daily living. Hengqin Port has become a vital channel for the “twin-city life” between Hengqin–Macau, as well as a key channel supporting the goods, talent, and services exchange within the GBA.

Insufficient Bus Capacity: The Status Quo

With a growing number of students residing in Hengqin, bus capacity inadequacy has become increasingly problematic. Data from the Guangdong–Macau In-Depth Cooperation Zone in Hengqin global investment website show that, on the Hengqin side, more than 14 bus routes currently serve Hengqin port within the island. Nevertheless, these services remain insufficient to meet complex transportation needs, particularly during peak travel periods, with many students experiencing prolonged waiting times and overcrowding.

Many commuters experience long waits owing to infrequent and irregular bus schedules, overcrowding during peak hours, and inconvenient transfers. These issues not only prolonged students’ commuting time but also highlighted the lack of coordination in public services during the ongoing Hengqin–Macau integration process. For instance, the design of cross-border bus routes does not adequately account for students’ actual commuting requirements, and the weak connection between on-campus buses and cross-border buses requires students to transfer multiple times to their destinations, further complicating commuting. Such inefficiencies may be linked to the policy orientation of public transportation management, raising questions about how local protectionism influences the allocation and coordination of cross-border bus operations.

Moreover, the limitations of bus services can be observed in route

design and operational management. Coverage of existing bus routes remains restricted. On the Macau side, despite the connecting bridge providing access from Hengqin Port to the University of Macau Bus Terminal, it still does not allow direct access to major transportation nodes within the UM campus, such as the central teaching buildings and faculties, on the same route. Consequently, commuters are often required to make multiple transfers before arriving at their destinations.

Research Purpose and Significance

This study aims to conduct in-depth research on the current state of bus capacity between the UM and Hengqin Port and its impact on students residing in Hengqin. Through a systematic analysis of existing bus services, this study seeks to identify issues and propose corresponding countermeasures and suggestions, informing relevant decision-makers.

Furthermore, it explores the mechanisms of negotiation and problem-solving among multiple stakeholders in cross-border transportation governance. It also discusses the practical challenges faced by multilevel governance in public administration. This study aims to contribute theoretical insights and policy recommendations to support the integrated development within the GBA.

Theoretical Framework

This study applies a multi-dimensional analytical framework combining Stakeholder Theory, Public Value Theory, and Collaborative Governance Theory, supported by complementary insights from Institutional Theory, Network Governance, and Policy Capacity Theory. Our analysis proceeds along five primary dimensions: policy, demand, services, impact, and countermeasures. This multi-dimensional framework enables a systematic analysis of how administrative fragmentation, stakeholder interaction, and institutional incentives jointly shape the public transport capacity between Hengqin and the UM.

Research Methods

This study adopted a mixed-methods approach integrating quantitative and qualitative research technique. Quantitative data

were primarily drawn from passenger flow statistics at Hengqin Port, operational data from cross-border bus services, and the results of a structured student travel survey. These datasets provide an empirical foundation for analyzing travel patterns, service capacities, and demand distributions.

To capture user perceptions, we designed a questionnaire survey targeting at UM students residing in Hengqin. The survey collected data on commuting frequency, satisfaction with the existing bus services, and expectations of service improvements. Quantitative results were complemented by qualitative insights obtained through in-depth interviews.

In-depth interviews were conducted with stakeholders, including relevant government departments, transport operators, and university administrators, to explore institutional perspectives, policy rationales, and operational challenges in the formulation and implementation of bus capacity policies. By triangulating multiple data sources, this study aims to generate an evidence-based and multi-dimensional understanding of the cross-border transportation problem, providing both analytical depth and practical relevance.

Policy Analysis

The policy background for the integrated development of Macau-Hengqin includes several key dimensions, such as policy support, infrastructure connectivity, economic integration, industrial synergy, and social and livelihood integration, as well as challenges and prospects. The Macau SAR government is committed to providing a safe, green, efficient, convenient, and pleasant land transportation system. The opening of the Hong Kong–Zhuhai–Macau Bridge further enhanced regional connectivity. Improving access to Macau and Hengqin can generate positive spillover effects on regional development, stimulating both economic and social development across the region.

Drawing on the stakeholder model, we examine the policy orientation of governments within the Guangdong-Macau In-Depth Cooperation Zone, focusing on how institutional arrangements and operational regulations influence the supply and demand balance of cross-border bus services. Drawing on public value theory, we simultaneously evaluate the extent to which these policies achieve the public interest

and identify areas that require policy innovation to improve the equity, efficiency, and accessibility of bus services.

Demand Analysis

We analyzed the scale, spatial distribution, and commuting patterns of UM students to identify insufficient cross-border transport capacity. The rapid growth of students populations residing in Hengqin has significantly outpaced the expansion of the existing transport services. Limited on-campus accommodation and high rental costs in Macau further accelerated this outward residential shift. Consequently, a substantial proportion of UM students depend on cross-border buses as their primary commuting mode, placing pressure on the existing transit infrastructure.

Stakeholder expectation and satisfaction analyses indicated a persistent and widening service gap between students' commuting needs and current transportation services. Long waiting times, overcrowding during peak hours, and inconsistent service reliability have become part of students' daily experiences. These challenges reduce the efficiency and comfort of cross-border travel and impact students' academic engagement, punctuality, and overall well-being.

The growing divergence between the transportation demand and available capacity highlights the importance of coordinated and responsive policies. Without policy intervention, such as expanding bus capacity, optimizing scheduling, and improving cross-border coordination, the situation may worsen, potentially eroding satisfaction levels and weakening the university's attractiveness as a regional education hub within the GBA.

Service Analysis

We evaluated the quality and efficiency of existing bus services connecting the UM and Hengqin, focusing on three key dimensions: route design, vehicle allocation, and scheduling arrangements.

The current bus route design lacks flexibility and ignores the needs of students. While the primary routes between UM and Hengqin Port are relatively short, the limited number of direct lines and the lack of alternative routes during peak hours reduce the system's resilience. Many students reported that the routes were not fully aligned with their

commuting patterns because they often needed to transfer or wait for specific bus routes. Vehicle allocation and scheduling arrangements remain insufficient, especially during the peak hours. There is a mismatch between vehicle capacity and passenger flow owing to a lack of effective monitoring system.

By combining quantitative observations with feedback from daily commuters, we identified operational limitations that constrain service performance and diminish commuter satisfaction. Service analysis highlights several operational bottlenecks that constrain efficiency and user satisfaction. To address these challenges, strategies such as optimizing route planning, adopting data-driven vehicle-dispatching systems, and synchronizing schedules with university timetables have been analyzed to improve accessibility for cross-border commuters.

Impact Analysis

Drawing on public value theory, we examined how insufficient bus capacity affects students residing in Hengqin and the broader process of Hengqin–Macau integration. We focus on the time and financial costs of student commuting as well as their potential impacts on their quality of life.

We assessed time costs by analyzing students' commuting durations and waiting times during peak hours. Commuting time costs reduce the time available for studying, resting, and participating in social activities, gradually affecting their academic performance and well-being. The lack of sufficient bus services compels some students to rely on more expensive transportation options such as taxis, adding to their daily expenses and financial pressure. Accumulated time and economic inefficiencies lead to a decline in the overall quality of life, as prolonged commuting and transport uncertainty increase their stress and diminish their well-being.

Based on public value theory, these outcomes reveal notable gaps in equity, efficiency, and responsiveness within the current transportation system. When public services fail to meet the growing demand of commuters, they fall short of creating value for the community and weaken trust in governance. Moreover, these limitations in transport capacity indirectly slow the process of Macao–Hengqin integration because they constrain the mobility and accessibility of cross-border

education and collaboration.

We argue that compensating for these public value gaps requires coordinated policy actions to enhance transport capacity, improve scheduling efficiency, and strengthen institutional collaboration across jurisdictions. Such measures would not only ease the burden on individuals, but also support a more integrated, equitable, and sustainable cross-border education environment.

Countermeasure Analysis

Countermeasure analysis is a systematic process of identifying, evaluating, and prioritizing feasible strategies for addressing the root causes of problems. In this study, countermeasure analysis served as the final stage in balancing the interests of the stakeholders, including the Macau SAR government, transportation operators, and students, among others.

Therefore, we aim to combine the stakeholder model and public value theory and move beyond the diagnosis to propose a series of countermeasures that enhance efficiency, equity, and user satisfaction within the Hengqin-Macau integration. The stakeholder model helps clarify the roles, responsibilities, and expectations of different actors, ensuring that the proposed strategies reflect a fair distribution of benefits and obligations. Public value theory provides an evaluative framework for evaluating whether these strategies can improve efficiency and promote fairness, inclusiveness, and public trust.

Value Conflicts in Stakeholder Games

Based on Mitchell's scoring model across the three dimensions of power, legitimacy, and urgency for key actors, we analyzed asymmetries in stakeholder influence.

The Macau SAR government, as the primary policymaker, holds both administrative power and legitimacy, but its perceived urgency to improve cross-border buses remains limited by lobbying pressure from local transportation companies. However, the Hengqin Executive Committee faces constraints in the face of institutional barriers to cross-border operations due to limited authority.

As direct stakeholders, bus operators sometimes face conflicts when balancing their commitment to providing public services and profits.

Consequently, profits outweigh other factors, resulting in persistent underperformance. Students, with a limited bargaining power that prevents them from influencing resource allocation outcomes, have a least disadvantaged position among all stakeholders.

The imbalance of power among stakeholders produced a state of responsibility vacuum in the process of public value. Each stakeholder claims to represent a part of the public interest, consequently, limited collective action can be taken to improve the policy outcome. The outcome is a collective action failure in which overlapping yet uncoordinated claims of responsibility obscure accountability. Therefore, efforts have been made to improve the cross-border transportation services. This is not because stakeholders fail to recognize the problem, but because none of them possess both the ability and determination to take decisive action. In this context, the process is slowed down by institutional inertia and conflicting priorities.

Multi-dimensional Representation of Public Value Gaps

Bozeman's public value failure framework reveals multiple typical failures, as the current situation can be characterized as a combination of multiple overlapping failures within the cross-border transport governance structure. The analysis identified three principal dimensions of failure: distributional justice, procedural justice, and intergenerational justice.

First, distributional justice failure arises from the disproportionate commuting time and financial burden borne by students residing in Hengqin. The unequal allocation of transportation resources and service accessibility reflects structural inequities across geographic and administrative boundaries.

Second, procedural justice failure is reflected in the absence of institutionalized mechanisms that allow students to participate in the planning and assessment of cross-border bus services. The lack of stakeholder engagement mechanisms reduces transparency and limits policymaking responsiveness to user needs.

Third, intergenerational justice failure results from the inadequacy of the current operational model to accommodate the projected demand growth to a scale of approximately 25,000 users. The short-term focus of current arrangements constrains sustainability and limits the adaptive

capacity for future expansion.

The Macau SAR Government retains jurisdiction over cross-border affairs under Article 122 of the Basic Law, which constrains the Hengqin Executive Committee's ability to pursue institutional experimentation. At the same time, the central government's coordination mechanism has yet to establish a standardized process for regular intervention. This multilevel institutional misalignment fragments authority and diffuses accountability, hindering the development of a coherent governance framework capable of closing existing public value gaps.

Literature Review

Cross-border bus capacity shortage is not merely a technical matter of transport service provision but reflects the difficulties of achieving public value amid multiple stakeholders within the "One Country, Two Systems" framework. This exposes the deeper tensions of cross-boundary public governance and conflicting interests in regional integration. When visible and concrete connectivity outpaces invisible mechanisms in institutional coordination, governance dilemmas arise that cannot be fully understood through a single theoretical lens. Accordingly, this chapter develops an integrated theoretical framework that combines the stakeholder and public value theory. Stakeholder theory serves as an analytical tool for diagnosing the dynamics of coordination during the governance process, whereas public value theory provides a normative framework for evaluating the resulting deficiencies in service outcomes.

Stakeholder theory and Its Typology

Stakeholder theory originated in business management as a challenge to the shareholder primacy model. Stakeholders are defined as "any group or individual who can affect or is affected by the achievement of an organization's objectives," thereby extending organizational responsibility beyond shareholders to a wider social network (Freeman, 1984). Freeman's contribution established that stakeholders, ranging from employees, consumers, and suppliers to governments and communities, have a mutual and often decisive influence on organizational success.

Later scholars expanded this view by emphasizing the importance of addressing power asymmetries and uneven benefit distribution among stakeholders (Crane et al., 2014).

Stakeholder typologies have evolved as researchers have recognized variations in influence and dependency. Freeman (1984) distinguishes between ownership and transactional and social-interest stakeholders (Freeman, 1984). When applied to the field of public administration, stakeholder theory highlights many broader actors, including not only governments and service providers but also regulators, multilevel policy communities, diverse user groups, and the wider public. Together, they form an interdependent system of authority and influence that shapes how decisions are made, and how public value is created and shared across society (Bryson, 2018).

Later, scholars proposed the now-canonical stakeholder salience model, which evaluates stakeholder significance through three attributes—power, legitimacy, and urgency, and classifies them into definitive, expectant, and latent types (Mitchell et al., 1997). This model is essential for diagnosing stakeholder influence and salience in public governance. This reveals why groups with high legitimacy and urgent needs (such as cross-border student commuters in this study) can still be marginalized when they lack institutionalized power.

The application of stakeholder theory to public administration introduces significant complexity. The delivery of public services engages multiple tiers of government, regulators, service providers, civil society, and user groups, forming a dense network of authority and competing interests. In cross-jurisdictional settings such as Hengqin and Macau, overlapping mandates and institutional diversity amplify uncertainty and make it particularly difficult to incorporate marginalized perspectives into the decision-making process.

Contemporary research on stakeholder theory has evolved beyond the static identification of interest groups toward a dynamic understanding of stakeholder relationships as processes of value creation, reframing stakeholder engagement as a system of interdependence, trust, and moral obligation rather than a mechanism of strategic control. Organizations can sustain a competitive advantage in uncertain environments by optimizing stakeholder value functions and fostering mutual gains among diverse actors (Harrison et al., 2010). Perceptions of fairness and reciprocity

Table 1. Stakeholder Network Analysis in Hengqin–Macau Bus Capacity

Stakeholder	Core Interests / Concerns	Salience Attributes (Power / Legitimacy / Urgency)	Typical Behaviors and Governance Dilemmas
Macau SAR Government (Transport Bureau)	Maintain stability of Macau's public transport system; Coordinate cross-border operations; Control fiscal expenditure.	Power: Final approval and regulatory authority; sets routes and subsidies. Legitimacy: Highest as local government. Urgency: Moderate, diluted by local lobbying and budget constraints.	Prefers incremental reform; cautious toward system-wide changes; struggles to balance local protectionism with cross-border mobility needs.
Hengqin Executive Committee (Guangdong–Macao In-Depth Cooperation Zone)	Promote integration and improve residents' welfare; respond to Macau students' commuting needs; explore policy innovation.	Power: Authorized to pilot cross-border policies and provide subsidies (e.g., Tongqin Bus). Legitimacy: High as official integration component. Urgency: High, as commuting affects flagship projects such as Macau New Neighborhood.	Proactive in providing subsidies and policy support but constrained by jurisdictional limits; willing but often unable to act independently.
Bus Operators in Macau (Transmac, TCM)	Maximize profitability while maintaining compliance and government relations.	Power: Operational control and access to data; can influence policy via industry associations. Legitimacy: Licensed franchisees. Urgency: Low, respond mainly to contracts or strong public pressure.	Operate strictly per contract; risk-averse toward cost increases; torn between economic rationality and public-service obligations.
Student Commuters (University of Macau students residing in Hengqin)	Reliable, convenient, and affordable commuting; demand for more peak-hour and night-time services.	Power: Minimal institutional influence; limited collective organization. Legitimacy: High as core service users. Urgency: Very high, commuting directly affects study time and well-being.	Express grievances individually through social media or informal channels; lack organized bargaining power; structurally high legitimacy but low power, leaving their voices underrepresented in policy decisions.

shape the evolution of cooperative or confrontational stakeholder relationships, which can link stakeholder theory with social exchange and behavioral ethics (Bridoux & Stoelhorst, 2014). Trust, commitment, and identification also serve as psychological mechanisms that enhance

stakeholder loyalty and organizational legitimacy (Bosse & Coughlan, 2016).

Extending to the field of public management, research has moved beyond static stakeholder mapping toward dynamic collaboration, as exemplified by the collaborative governance paradigm, which emphasizes institutional arrangements to facilitate inclusive dialogue and joint decision-making among autonomous actors (Ansell & Gash, 2018). This shift reframes stakeholder interactions as potential positive-sum games, rather than zero-sum conflicts. Responsible leadership further highlights that public leaders must act not merely as policy executors but also as relationship builders and meaning shapers (Maak et al., 2006; Voegtlin et al., 2017). By cultivating trust, mediating conflicts, and empowering marginalized stakeholders, they transform adversarial relationships into cooperative relationships that balance social welfare and economic efficiency.

Thus, stakeholder theory provided this study with a process-diagnostic toolset. It enables the systematic mapping of stakeholder structures, identifying power asymmetries, coordination failures, and leadership mechanisms necessary to bridge governance gaps in the case of the Hengqin–Macau cross-border bus.

Table 1 illustrates the stakeholder landscape of Hengqin–Macau cross-border bus governance, outlining the key actors, their core interests, relative salience across power, legitimacy, and urgency, and the behavioral patterns and governance dilemmas that shape their interactions.

Public Value Theory

If stakeholder theory explains why governance processes unfold as they do, public value theory assesses how well they perform. Moore defined the purpose of public management as creating public value outcomes that serve collective societal goals through the interaction of three strategic elements: value, legitimacy and support, and operational capacity (Mark, 1995). Later, Kelly and other scholars emphasized that public value arises from the outcomes, services, and trust generated by government actions as judged by citizens themselves (Kelly et al., 2002).

Bozeman contrasted public value with market and government

Table 2. Public Value Gap Diagnosis for Hengqin–Macau Cross-Border Bus Services

Dimension of Public Value Failure	Specific Manifestations ('Value Gap')	Impact on Student Group	Impact on Integration Goals
Distributional Justice Failure	Mismatch between costs and benefits: Hengqin-based students bear higher time, financial, and psychological costs yet receive less service convenience.	Increased burden and lower quality of life; perceived “second-class citizenship.”	Undermines the goal of equalized living; discourages relocation to Hengqin.
Procedural Justice Failure	Lack of participatory channels and transparency in planning decisions.	Student needs not conveyed effectively; reduced trust in governance.	Weakens legitimacy and co-creation opportunities.
Sustainability (Intergenerational Justice) Challenge	Short-term cost focus over long-term planning; rigid service model.	Congestion and dissatisfaction worsen as population grows.	Becomes bottleneck for regional integration and talent retention.

failures and developed a public value failure framework that identifies the conditions under which neither markets nor governments can adequately provide public goods that meet societal expectations. He also articulated multi-dimensional evaluative criteria such as distributive justice, procedural justice, and intergenerational equity, which allow for an empirical diagnosis of value loss (Bozeman, 2007). This framework has been widely applied in fields such as smart-city governance, environmental management, and transportation policies.

Over the past decade, the focus of this theory has shifted from governmental delivery to social co-creation. Public value is no longer unilaterally produced by the state but is co-produced through interactions among governments, enterprises, civil organizations, and citizens. In this paradigm, service users evolve from passive consumers to active partners, whose knowledge, experience, and participation directly contribute to public value creation (Loeffler & Bovaird, 2021; Osborne, 2018). The absence of such participatory mechanisms compromises procedural justice and collapses essential information channels, causing a mismatch between service design and public needs and resulting in wasted value.

Table 2 applies this analytical lens to the Hengqin–Macau cross-border bus service case to identify specific dimensions of public value failure. This illustrates how deficiencies in distributional and procedural justice, along with sustainability risks, reveal a broader public value deficit in which institutional arrangements have failed to keep pace with the demands of social equity and long-term integration.

Application of Relevant Theories in This Study

From the perspective of stakeholder theory first proposed by Freeman (1984), the problem of inadequate transport capacity is not merely an operational issue, but a result of competing interests and asymmetrical power among multiple stakeholders. The principal stakeholders include the Macau SAR Government, Hengqin Management Committee, transport operators, universities, and students. Bus operators and students are direct stakeholders since their interests are immediately affected by the quality, frequency, and affordability of cross-border transport services. Government authorities and universities are the indirect stakeholders.

Bus operators aim to maximize profits while fulfilling their operational obligations by reducing services during low-demand periods to lower their costs. However, profit-driven logic frequently conflicts with students' demands for reliable, affordable, and high-quality services, especially given the time-sensitive and seasonal nature of students' communication.

The Macau SAR Government plays a crucial role as the bearer of public values. It is responsible for ensuring that essential public goods, such as accessible and efficient bus services, are provided equitably across regions and can alter the service of bus operators through policy intervention. The university could also exercise its influence to represent the interests of students, as daily commuting can directly influence students' academic engagement and satisfaction and the broader reputation of the university.

Questionnaire Analysis And Personal Interviews

Questionnaire Survey¹

To capture students' commuting experiences and views on transportation services, we conducted a questionnaire survey. By analyzing the survey results, identifying the main challenges in the commuting process, and understanding students' satisfaction with and expectations regarding existing commuting services, this study provides a basis for relevant authorities to optimize commuting services. The questionnaire covered multiple aspects, including commuting modes, commuting time, frequency of services, waiting time, transfer situations, cost expenditure, and student satisfaction and expectations regarding commuting services. The survey results show that, while most students have some flexibility in their commuting mode and time, they still face many problems. Insufficient frequency, long waiting times, and complex transfers affect students' academic performance and physical and mental health and reduce their satisfaction with campus life. They expressed willingness to pay extra for better commuting services, highlighting the urgent need to improve their commuting experience.

In total, 150 valid responses were collected from students at UM. The survey aimed to analyze current commuting conditions and levels of satisfaction among students traveling between UM and Hengqin Port, focusing on their commuting convenience and coping measures under special weather conditions, such as typhoons and heavy rain. The survey covered students of different genders, educational levels, and age groups to ensure comprehensiveness and representativeness of the results.

The results show a relatively balanced gender distribution, with a slightly higher proportion of female, accounting for 55.33% of the total sample. A balanced gender distribution helps us understand the needs and differences of students of different genders regarding commuting more comprehensively. Postgraduate students accounted for the largest proportion (68.67%), followed by undergraduate and doctoral students. In terms of age, the 21-25 age group accounted for the highest proportion, which is consistent with the main age range of UM students. Meanwhile, those over 30 years of age accounted for a relatively small proportion, indicating that this survey primarily targeted the current student population, in line with the original intention of our survey.

The commuting needs and characteristics of the student group can be more accurately grasped through this age distribution. Based on this, the basic situation of the surveyed population met the requirements of the survey for personnel type. The gender distribution is balanced, and the distribution of educational levels and age groups can reflect the current situation and satisfaction of commuting between UM students and Hengqin Port.

In terms of residence location, most respondents (71.33 %) lived in an on-campus dormitory, indicating that on-campus accommodation was the main choice for students. However, a considerable proportion of respondents (22.67 %) rented housing in Hengqin and Zhuhai. The survey data show that the respondents generally commute frequently between Hengqin and the UM.

In terms of commuting frequency, the survey showed that 98% of respondents commuted between Hengqin and the UM at least once per week, and 56.67% commuted more than three times a week. This shows that cross-border commuting has become a regular and essential activity for most students rather than an occasional necessity. When asked about their priorities in choosing commuting modes, most students recognized efficiency as the most important factor.

The high frequency of cross-border travel among students shows that commuting has become a significant determinant of quality of life. The choice of commuting mode and efficiency of travel time are closely linked to students' overall satisfaction and capacity to maintain a life-study balance. Understanding these dynamics is essential for developing targeted policy interventions and improving cross-border transport governance.

This survey shows that the average one-way commuting time for all respondents is 2.69, which corresponds to a range of 31–60 minutes. Therefore, a significant proportion of students experience long commutes, with durations exceeding 30 minutes being quite common. Extended travel times may negatively affect students' daily lives by reducing their study time and increasing fatigue.

The average cost of a one-way commute in RMB is 2.20, which is between 1-10 RMB ranges. This indicates that the commuting costs for most students are within an acceptable range. However, some students may still face financial burdens, particularly when compounded by high

commuting frequencies.

The mean number of transfers per commute is 1.98, which is close to two or approximately one transfer per journey. This indicates that the respondents had to transfer at least once during their commute. This causes uncertainty and inconvenience in commuting, and may cause delays and irregular arrival times.

The overall commute satisfaction score for commuting experience is 2.46, which falls between the “neutral” and “dissatisfied” range, leaning toward the latter. This shows a general sense of dissatisfaction among the students. Commonly, dissatisfaction with commuting services includes prolonged travel times, multiple transfers, limited frequency, and long waiting periods during peak hours.

Regarding the impact of commuting difficulties on campus engagement, the mean score was 2.45, which lies between occasional and frequent effects. This indicates that commuting problems affect the frequency and quality of students’ participation in campus activities and socialization. Lengthy and inconvenient commuting can cause students to miss events, classes, or group activities, diminishing their overall sense of belonging to the campus.

Similarly, the mean score for the impact on overall university life satisfaction was 2.51, which lies between the “slightly affected” and “significantly affected” categories. This indicates that issues such as inconvenient commutes and long travel times may lower students’ overall evaluation of campus life, thereby affecting their learning motivation and quality of life.

The findings further validate the need for policy and service to improve cross-border transportation infrastructure and coordination mechanisms between the Macau and Hengqin authorities.

Correlation Analysis

The descriptive statistics results show that the mean score for Commute Status and Habits is 2.2713, with a standard deviation of 0.35584; for Commute Satisfaction and Experience, 2.1952, with a standard deviation of 0.44731; and for the Impact of Commute Problems, 2.1880, with a standard deviation of 0.55040. This indicates that the respondents’ perceptions across the three dimensions were relatively consistent and slightly above the midpoint of the scale, showing a

Table 3. Pearson Correlations Among Commute Variables (N=150)

Variables	1. Commute Status and Habits	2. Commute Satisfaction and Experience	3. Impact of Commute Problems
1. Commute Status & Habits	1.000	.171* (p = .036)	.343** (p < .001)
2. Commute Satisfaction and Experience	.171* (p = .036)	1.000	.115 (p = .162)
3. Impact of Commute Problems	.343** (p < .001)	.115 (p = .162)	1.000

Note: * p < .05 (two-tailed), ** p < .01 (two-tailed), N = 150.

moderate level of satisfaction and a notable presence of commuting-related challenges.

The correlation analysis (see Table 3) revealed a significant positive relationship between commuting status and habits, and commuting satisfaction and experience ($r = 0.171$, $p < 0.05$). This indicated that students with more stable and efficient commuting patterns tended to have higher levels of satisfaction with their daily commutes. Furthermore, Commute Status and Habits were positively correlated with the Impact of Commute Problems ($r = 0.343$, $p < 0.01$), suggesting that less favorable commuting patterns with longer travel times or more transfers were associated with greater negative impacts on students' academic and social lives.

Although the relationship between Commute Satisfaction and Experience and Impact of Commute Problems is positive, but not statistically significant ($r = 0.115$, $p = 0.162$), the overall pattern indicates that commuting conditions exert a meaningful influence on both students' satisfaction levels and the degree to which commuting issues disrupt their academic and social engagement.

Therefore, students with more stable commuting patterns, characterized by shorter travel times, fewer transfers, and more predictable schedules, tend to have higher satisfaction and report fewer adverse effects of commuting-related problems. Conversely, irregular or inefficient commuting was associated with dissatisfaction and more

disruption in students' daily routines.

Difference Analysis (ANOVA)

To further examine the variation in commuting experiences among students, an analysis of variance (ANOVA) was conducted to test the effects of commuting and transfer frequencies on key dependent variables, including commuting satisfaction and the impact on students' perceptions of their university life (see Table 4).

In terms of commuting frequency, the results showed clear differences between students who commuted more frequently and those who travelled less often. Students who commute more frequently exhibit higher levels of dissatisfaction and report more disruptions in their academic and social lives. Specifically, the willingness to change residences due to commuting problems ($p = 0.045 < 0.05$), indicating that students who commute more frequently are more willing to change their residential places to reduce their commuting burdens.

Additionally, the impact of commuting on campus activities and social engagement differed significantly ($p = 0.003 < 0.05$). Students with higher commuting frequencies find it difficult to participate in extracurricular activities or university events. Similarly, overall satisfaction with university life differed significantly across the groups ($p = 0.002 < 0.05$) as students who commuted more frequently had lower satisfaction with commuting services.

The number of transfers required during commuting also had a strong effect on the students' experiences (see Table 5). The results show that the overall commuting satisfaction decreased as the number of transfers increased ($p = 0.024 < 0.05$). More transfers make travel less predictable.

Similarly, the impact of transfers on campus participation and social activities increased significantly with additional transfers ($p = 0.004 < 0.05$). Students who must transfer multiple times often arrive late or choose to skip nonessential events, limiting their interactions with peers. Overall life satisfaction also decreased with more transfers ($p = 0.026 < 0.05$), indicating that complicated transfers can affect how students feel about their university experiences. Furthermore, students who made more transfers were more likely to perceive shuttle bus capacity as inadequate ($p = 0.001 < 0.05$).

Table 4. *Differences Based on Commuting Frequency*

	Commuting Frequency	N	Mean	SD	Min	Max	F	P
Satisfaction on Commuting	Daily	23	2.13	1.100	1	5	1.131	0.344
	3-5 times a week	62	2.50	0.825	1	4		
	1-2 times a week	62	2.52	0.901	1	5		
	Less than once a month	2	3.00	0.000	3	3		
	3 to 4 times a month	1	3.00	N/A	3	3		
Consider Changing Residency due to Commuting Problems	Daily	23	1.87	0.694	1	3	2.495	0.045
	3-5 times a week	62	1.45	0.533	1	3		
	1-2 times a week	62	1.58	0.560	1	3		
	Less than once a month	2	1.50	0.707	1	2		
	3 to 4 times a month	1	1.00	N/A	1	1		
Commuting Affects Campus Activities or Social Activities	Daily	23	3.00	0.905	1	4	4.305	0.003
	3-5 times a week	62	2.50	0.825	1	4		
	1-2 times a week	62	2.24	0.803	1	4		
	Less than once a month	2	1.50	0.707	1	2		
	3 to 4 times a month	1	2.00	N/A	2	2		
Commuting Affects Satisfaction on Campus Life	Daily	23	3.13	0.869	2	4	4.478	0.002
	3-5 times a week	62	2.50	0.763	1	4		
	1-2 times a week	62	2.32	0.845	1	4		
	Less than once a month	2	2.00	0.000	2	2		
	3 to 4 times a month	1	2.00	N/A	2	2		

Table 5. Differences Based on Number of Transfers

	Required Number of Transfers	N	Mean	SD	Min	Max	F	P
Satisfaction on Commuting	0	30	2.67	0.994	1	5	3.227	0.024
	1	95	2.49	0.797	1	4		
	2	23	2.17	1.072	1	5		
	3 or above	2	1.00	0.000	1	1		
Consider Changing Residency due to Commuting Problems	0	30	1.47	0.571	1	3	2.388	0.071
	1	95	1.53	0.581	1	3		
	2	23	1.83	0.576	1	3		
	3 or above	2	2.00	0.000	2	2		
Commuting Affects Campus Activities or Social Activities	0	30	2.47	0.776	1	4	4.557	0.004
	1	95	2.33	0.868	1	4		
	2	23	2.83	0.778	2	4		
	3 or above	2	4.00	0.000	4	4		
Commuting Affects Satisfaction on Campus Life	0	30	2.30	0.952	1	4	3.182	0.026
	1	95	2.46	0.796	1	4		
	2	23	2.96	0.767	2	4		
	3 or above	2	3.00	1.414	2	4		
Enhancing Commuting Experience Through Shuttle System	0	30	1.67	0.758	1	4	2.884	0.038
	1	95	1.81	0.891	1	4		
	2	23	1.91	0.900	1	4		
	3 or above	2	1.50	0.707	1	2		

Therefore, commuting frequency and number of transfers are key factors shaping students' daily experiences. Frequent or complex commutes reduce opportunities for participation in academic and social life. These results point to a clear policy implication: improving the efficiency, reliability, and accessibility of cross-border transport is essential for enhancing student well-being. Increasing direct routes, reducing transfers, and improving service coordination between Macau

and Hengqin would help alleviate commuting burdens, strengthen student engagement with campus life, and support the broader goal of a more integrated and student-friendly cross-border environment.

Personal Interviews

To gain a more comprehensive understanding of the current bus capacity between the UM and Hengqin Port, we conducted in-depth interviews with multiple stakeholders, including representatives from the UM Student Affairs Office, Hengqin Port Management Office, and students residing in Hengqin. The interview focused on the current state of bus capacity, existing problems, and suggestions for improvement.

Interview with the UM Student Affairs Office

According to a representative from the Student Affairs Office, the university is fully aware of the commuting challenges faced by students residing in Hengqin and has implemented several initiatives to improve their travel experiences. These measures include collaborating with bus operators to increase the frequency of shuttle services during peak hours to help reduce waiting times and congestion. The university also established a dedicated feedback channel that allows students to express concerns and provide suggestions regarding transportation, which are promptly communicated to the relevant administrative units.

However, the representatives acknowledged that the university's ability to resolve these issues was institutionally constrained. Because the university does not hold direct authority over bus company operations, it must rely on interdepartmental coordination with local transport authorities and service providers. This often complicates and delays the resolution process, highlighting the need for stronger cross-border governance mechanisms and clearer institutional responsibilities to effectively address commuting-related concerns.

Interview with the Regional Planning & Development Department in Hengqin

A representative from the Hengqin Port Management Office noted that the port authority has been continuously implementing measures to optimize the commuting environment and enhance the travel experience

of all passengers, including students from the UM. Efforts have included expanding the number of customs clearance channels to shorten waiting times and improving internal signage systems to streamline passenger flow within port areas.

Regarding bus capacity management, the port authority collaborates with bus operating companies to increase service frequency during peak hours, ensure adequate transportation capacity, and reduce overcrowding. Nonetheless, the representative acknowledged that heavy passenger flows, particularly during the morning and evening peaks, continue to pressure existing transport resources.

Moreover, the port's operational complexity lies in the need for multi-agency coordination involving departments such as customs, immigration, and public security, which often slows the implementation of immediate solutions. The representative emphasized that sustained improvement would require infrastructural optimization and enhanced interdepartmental communication and policy integration across administrative boundaries to manage the high commuting demand associated with cross-border mobility more effectively.

Interview with Students Residing in Hengqin

Interviews with students residing in Hengqin revealed a generally shared perception that the current bus capacity was inadequate, particularly during peak commuting hours. Many students reported experiencing extended waiting times and overcrowded buses, which contributed to fatigue and stress during their daily travel. Some respondents indicated that they must make multiple transfers to complete their commutes, thereby increasing both the complexity and overall time cost of traveling between Hengqin and the UM.

In addition, the students frequently cited irregular bus schedules and delays as major sources of inconvenience, occasionally resulting in missed classes and appointments. Such disruptions have been described as negatively impacting both academic performance and daily routines.

When asked for their opinion on improving cross-border transportation, students emphasized the need to increase bus frequency, redesign routes and ensure that schedule arrangements were adequately carried out. They expressed hope that relevant departments and transport operators would collaborate more effectively to implement

these improvements. Collectively, these perspectives underscore the persistent gap between commuting demand and current transport provisions, highlighting the necessity for coordinated policy responses and infrastructure enhancements to improve the student commuting experience.

Conclusion and Discussion

Research Findings

Grounded in stakeholder theory and public value theory, this study provides an analysis of the cross-border bus capacity between the UM and the Hengqin Port, situating the issue within the context of the Macau–Hengqin integration under the “One Country, Two Systems” framework. Drawing on survey data from 150 UM students and in-depth interviews with key stakeholders, including UM, the Hengqin Port Management Office, and representatives of student groups, this research reveals that the current transportation challenges are not only a matter of insufficient service supply but also constrained by deeper institutional and governance problems.

The empirical results showed that insufficient bus capacity is a persistent structural problem. Students frequently experience long wait times, overcrowding during peak hours, and inconsistent service schedules. These difficulties have significant implications not only for their daily convenience, but also for the fair distribution of public services. In this context, an inadequate cross-border transportation system transcends a mere functional shortfall. It can be understood as a manifestation of the structural influences that shape the distribution of public goods and accessibility among different groups within the integrated community.

The study also found that inefficient commuting negatively affected student well-being and campus engagement. Prolonged travel times reduce opportunities for academic participation, limit their social interactions, and weaken students’ sense of belonging to their universities. From the perspective of public value theory, these outcomes illustrate a shortfall in the ability of public institutions to provide services that are fair, efficient, and responsive to commuter needs.

At the institutional level, the study observed a fragmented coordination landscape among the key stakeholders, such as the Macau SAR Government, the Hengqin Management Committee, transport operators, and universities. This fragmentation appears to stem from underdeveloped collaborative mechanisms and the coexistence of diverse institutional objectives. These conditions contribute to constraints in operational accountability and extended decision-making cycles. The observed shortfall in transport capacity thus points to a broader challenge of aligning public service outcomes with the complex mosaic of stakeholder priorities and influence.

Policy Recommendations

Based on the findings of this study and the theoretical perspectives of stakeholders and public value theories, we propose recommendations for improving cross-border public transport between the UM and the Hengqin Port. These recommendations aim to not only ease students' daily commuting difficulties but also strengthen collaboration among key actors and enhance the overall governance of cross-border public services.

First, the most immediate need is to increase bus frequency and improve scheduling efficiency. The survey and interviews clearly showed that the students were frustrated by long waiting times, overcrowded buses, and irregular transport services during peak hours. These challenges are particularly stressful for students living in Hengqin who already spend much of their daily commuting. To address this, transport operators, the Macau SAR Transport Bureau, and the Hengqin Port authorities should collaborate to design timetables that better match students' class schedules and customs clearance hours. The use of digital scheduling tools and real-time monitoring can also help make bus operations more predictable and responsive.

Route design is another area that requires rapt attention. Many students still need to transfer once or more during their daily commute, which adds pressure on their daily commute. Authorities should consider introducing more direct routes between major residential areas in Hengqin and the campus center. Also, integrating the cross-border bus routes with the university's internal shuttle network could create a more

seamless and efficient travel experience, reducing the “last-mile” problem of getting from the port or bus terminals to their destinations.

Third, technical adjustments alone are not sufficient without better institutional coordination. One of the key findings of this study is that fragmented communication among departments often delays solutions. The involvement of multiple actors, including the Macau SAR Government, the Hengqin Management Committee, bus operators, and the university, makes it easy for responsibilities to overlap and, therefore, become unclear. Establishing a regular cross-border coordination platform can help overcome this problem. Such a platform would bring all stakeholders together to share data, discuss issues, and make decisions collectively, thereby allowing faster and more consistent responses to emerging transport challenges.

In addition, financial and policy support are needed to sustain improvements over time. Governments on both sides should consider policy tools such as targeted subsidies, public–private coordination, and performance-based funding to encourage bus companies to expand capacity and improve service quality. These measures could also promote the use of low-emission vehicles and digital service innovations, aligning with the broader goals of sustainable transport and regional integration in the GBA.

Finally, establishing a structured channel for student feedback and participation is essential. As the primary service users, students can provide valuable insights for improving public services. Implementing a regular feedback system—through online surveys, student advisory meetings, or complaint portals—enables policymakers to stay informed about evolving needs and identify service gaps earlier. This participatory approach strengthens mutual trust between users and decision-makers. Therefore, universities and relevant departments should create formal feedback mechanisms to regularly collect commuting-related opinions and suggestions, thereby enhancing policy responsiveness and promoting continuous service improvement.

Discussions

In this study, we analyzed the issue of insufficient public bus capacity between the UM and the Hengqin Port as a case study

of cross-border public service coordination. Drawing on students' commuting experiences, this study demonstrates that a seemingly minor transportation problem reflects broader institutional conflicts and complex stakeholder dynamics. The shortage in bus capacity is not simply an imbalance in resource allocation. It reflects a deeper problem of governance coordination that cannot be resolved through technical adjustments alone.

A cross-border transportation capacity shortage is not merely an infrastructure issue, but also a cross-institutional and cross-jurisdictional coordination challenge. Macau and Hengqin operate under various legal frameworks, administrative systems, fiscal arrangements, and policy priorities. Therefore, even seemingly simple initiatives such as extending a "last-mile" service often face challenges including ambiguous responsibility boundaries, underdeveloped interdepartmental coordination mechanisms, and a lack of consensus on cost-sharing principles. The commuting difficulties faced by students revealed a lack of shared incentives among institutions, which caused fragmented governance. Institutional misalignment has created a vacuum of responsibility in that each stakeholder is regarded as accountable, yet few are willing or able to take actions.

We also analyzed the interaction between multiple stakeholders, including authorities (the Macau SAR Government and the Hengqin Executive Committee), bus operators (such as TCM and Transmac), higher education institutions (particularly the UM), and commuters. Stakeholders have different policy preferences and incentives. The Macau government tends to control spending and protect the interests of local operators, the Hengqin committee has limited authority over cross-border transportation arrangements, bus companies prioritize profitability, and universities possess organizational capacity but lack the power of lobbying and policy making. Among them, students or commuters occupy the weakest positions, with limited voices and participation in decision-making. This structure results in a floating sense of public responsibility and inefficient provision of public value.

Beyond the transport issue itself, the study carries broader governance implications. If even a basic and widely agreed upon public service plan cannot be effectively arranged and implemented, cooperation contexts in more complex policy domains, such as healthcare, education,

social security, or data sharing, will face more obstacles. The commuting problem mirrors regionally integrated governance, revealing tensions in policy objectives, institutional linkages, and resource coordination. Analytically, this demonstrates how specific service issues can illuminate broader patterns of governance interaction and institutional design.

It is worth mentioning that in this study, we discovered a representative psychological pattern among respondents. Shaped by their impressions of institutional inconsistency, some respondents expressed pessimism toward the prospects of integration reform. In some cases, they hoped to witness the system's failure to confirm their disappointment toward the institution. This dynamic illustrates a common governance challenge: when the public or relevant stakeholders hold pessimistic expectations toward a policy, their wait-and-see or avoidant behavior may create additional resistance during implementation, thereby partially "confirming" the initial skepticism. This cycle between "expectation" and "outcome" is particularly pronounced in contexts such as cross-border cooperation, which heavily relies on consensus and mutual trust, and can easily lead to stalled progress. Therefore, to advance cooperation, it is often necessary to deliberately design mechanisms that proactively generate positive experiences and gradually build trust.

Finally, this study provides insights into other cross-border cooperative contexts. Similar coordination contexts can be observed in many regions, such as Hong Kong–Shenzhen and Hunchun–Russian Far East. This study adopts a bottom-up analytical approach that begins with specific public service challenges to uncover the underlying structures of authority, accountability, and value conflicts. We hope that this study provides support for studying innovation methods to stimulate cross-border cooperation.

In essence, cross-border transportation capacity is not only a practical concern but also a test of institutional coordination and the capacity for collaborative governance. For future policy recommendations, authorities could focus on strengthening cross-level governance coordination, establishing sustainable fiscal mechanisms for shared public services, enhancing participatory platforms for students and service users, and experimenting with institutional innovation methods in designated integration areas such as the Guangdong-Macao In-Depth Cooperation Zone.

Research Limitations and Future Directions

This study has several limitations. First, the scope of the study was limited to students at the UM. While the daily commutes of UM students were representative of cross-border commuting cases, the experiences of faculty members, staff, and other residents of Hengqin were not included. Their perspectives revealed additional issues and helped shape more inclusive policy recommendations. Future research should therefore broaden the sample to include multiple universities and diverse commuter groups, enabling a comprehensive understanding of travel needs across different populations living in Hengqin but working or studying in Macau.

Second, the research relied mainly on surveys and interviews, which capture perceptions and experiences but may not be ideal for capturing the full picture of daily commuters. Future studies could consider combining big data sources, such as travel records, bus card consumption data, or mobile tracking. This allows researchers to map commuting patterns more precisely and assess service efficiency with greater accuracy. A combination of quantitative data and qualitative perspectives would provide a more complete picture of how transport systems function on a daily basis.

Third, this study focuses on the importance of power balance and institutional capacity in shaping stakeholder collaboration; however, further research is needed to explore this dynamic more deeply. Comparative research involving other cross-border contexts—such as Hong Kong–Shenzhen and Zhuhai–Macau, could show how different governance arrangements influence coordination and accountability. Such comparisons would also help identify models of cooperation that could be adapted to the Macau–Hengqin case.

Finally, future research should focus on evaluating innovative governance mechanisms to reduce administrative fragmentation. Experiments involving joint management committees, shared digital data platforms, and adaptive subsidy schemes can be tested to measure their real-world effectiveness in improving coordination and public value creation.

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Note

- 1 Descriptive statistical analyses of the respondents are available from the corresponding author upon reasonable request.

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多元治理视角下跨境公共交通服务优化研究—— 以澳门大学至横琴口岸公交运力为例

摘要：本研究考察横琴口岸与澳门大学之间公共交通便利短缺问题，并将其置于澳门特别行政区独特的治理背景中。借助利益相关者理论与公共价值理论，分析跨境行政分割与地方利益竞争如何形塑公共服务。通过对150名澳门大学学生的问卷调查与深度访谈，我们发现，跨境通勤需求上升仅是运力缺口的部分原因。跨境运输能力受限于澳门与广东两地管辖权分割、财政激励以及保护主义做法——后者优先照顾本地运营商而非区域整体效率。这反映出“一国两制”框架下跨境公共服务可以进一步完善之处：政府间协调与问责机制仍有提升空间。研究最后提出政策建议，既旨在缓解当下运输短缺，也致力于培育合作机制，以强化澳门与横琴一体化的公共服务。

关键词：跨境公共交通、行政分割、利益相关者治理、公共价值、澳门—横琴融合、一国两制制度

다원적 거버넌스 관점에서의 국경 간 대중교통 서비스 최적화: 마카오 대학교와 형친(橫琴) 포트 간 버스 수송 능력에 대한 사례 연구

초록: 본 연구는 마카오 특별행정구(Macau SAR)의 독특한 거버넌스 맥락 내에서 형친 포트와 마카오 대학교(UM) 간 대중교통 수송 능력 부족 문제를 조사한다. 이해관계자 이론과 공공 가치 이론을 바탕으로, 국경을 넘는 행정적 파편화와 경쟁적인 지역 이익이 공공 서비스에 어떻게 영향을 미치는지 분석한다. UM 학생 150명을 대상으로 한 설문조사와 심층 인터뷰를 활용한 결과, 국경 간 통근 서비스에 대한 수요 증가는 수송 능력 부족의 일부 원인에 불과하다는 것이 밝혀졌다. 국경 간 교통 수송 능력은 마카오와 광둥성 당국 간의 관할 구역 분할, 재정적 인센티브, 그리고 지역 효율성보다는 현지 운영자를 우선시하는 보호주의적 관행에 의해 제약받는다. 이러한 역동성은 정부 간 조정과 책임성이 여전히 제한적인 “일국양제(一国两制)”의 더 광범위한 타협을 반영한다. 본 연구는 당장의 교통 부족을 완화하는 동시에 마카오와 형친 전반에 걸쳐 통합된 공공 서비스를 강화하기 위한 협력 메커니즘을 육성하는 것을 목표로 하는 정책 권고로 결론을 맺는다.

주제어: 국경 간 대중교통, 행정적 파편화, 이해관계자 거버넌스, 공공 가치, 마카오-형친 통합, 일국양제 체제

多元的ガバナンスの視点から見た越境公共交通サービスの最適化： マカオ大学と横琴口岸間のバス輸送能力に関する事例研究

要旨：本研究は、マカオ特別行政区の独特なガバナンス状況の中にこの問題を位置づけ、横琴口岸とマカオ大学間の公共交通輸送能力不足を調査するものである。ステークホルダー理論と公共価値理論に基づき、越境の行政的な分断と競合する現地の利害が、公共サービスをどのように形成しているかを分析する。UMの学生150人を対象とした調査と詳細なインタビューを用い、越境通勤サービスへの需要増加は輸送能力不足の一因に過ぎないことが判明した。越境輸送能力は、マカオと広東当局間の管轄区域の分断、財政的インセンティブ、および地域的な効率性よりも現地の事業者(オペレーター)を優先する保護主義的な慣行によって制約されている。これらの力学は、政府間の調整と説明責任が依然として限定的である「一国二制度」のより広範な妥協を反映している。本研究は、当面の輸送不足を緩和するとともに、マカオと横琴にまたがる統合された公共サービスを強化するための協力的なメカニズムを育成することを目的とした政策提言で締めくくられる。

キーワード：越境公共交通、行政的分断、ステークホルダー・ガバナンス、公共価値、マカオ・横琴統合、「一国二制度」体制

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