



Impact of Commercializing Autonomous Mobility Services on Capacity Structure and Employment in the Passenger Transport Industry

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Abstract. China's autonomous vehicle industry is entering a new phase characterized by regulatory authorization and commercial validation. As one of the most important application domains of autonomous driving technology, mobility services are expected to play a pivotal role in translating technological advances into large-scale market deployment. Drawing upon policy document analysis, descriptive statistical analysis, and scenario analysis, this study systematically examines the potential impacts of the commercialization of autonomous mobility services on the capacity structure and employment of China's passenger transport industry and proposes forward-looking governance strategies. The findings indicate that the fundamental conditions for the commercialization of autonomous mobility services are rapidly maturing. Their large-scale deployment is likely to exert exit pressure on segments of traditional transport capacity, raise market entry barriers, foster new forms of passenger mobility services, and generate substitution effects on conventional driving occupations, thereby exacerbating skill mismatch challenges in the labor market. To mitigate potential transition risks, this study proposes a set of governance strategies, including differentiated development policies across application scenarios, mechanisms for total capacity control and dynamic adjustment, and a multi-tiered system for workforce development and employment protection. These recommendations aim to support a balanced transition that promotes technological innovation while safeguarding social stability.

Keywords: Autonomous Vehicle, Autonomous Mobility Services, Passenger Transportation, RoboBus, RoboTaxi, Transport Capacity, Employment.

1 Introduction

Autonomous vehicles (AVs) have become a strategic priority for the transformation and upgrading of the global automotive industry and are widely recognized as a key direction for future mobility development. In December 2025, China's Ministry of Industry and Information Technology officially granted market access approval to the country's first batch of Level 3 (L3) automated vehicles conditionally. Two approved models, designed respectively for urban road and highway operations, were authorized

for pilot deployment in designated areas of Beijing and Chongqing, marking a significant step from testing and demonstration toward the commercial application of L3 autonomous driving technologies in China [1]. As a critical application scenario of autonomous vehicles, mobility services are expected not only to facilitate technological deployment and industrial upgrading but also to exert far-reaching influences on the transformation of the passenger transport sector and broader social stability.

At present, a substantial body of research has examined the societal implications of autonomous vehicles from multiple perspectives, including public acceptance [2][3][4], technological ethics [5][6], liability attribution [7][8], and social equity [9][10], providing an important foundation for understanding their broader social impacts. As an emerging form of transport capacity, autonomous mobility services are expected to directly influence both the capacity structure and employment patterns of the passenger transport industry.

Regarding impacts on transport capacity, Themsche, S. compared existing public transport infrastructure with a hypothetical on-demand mobility system and argued that RoboTaxi services could potentially replace rural bus operations [11]. Similarly, Sieber, L. et al. found that autonomous taxis may reduce travel costs by approximately 60–80% while offering enhanced service quality, thereby creating direct competition with buses and light rail systems [12]. With respect to employment impacts, a newsletter published in *Technology Review* suggested that fully autonomous vehicles could substantially disrupt the U.S. labor market [13]. Through interviews with taxi drivers in Germany, researchers found that autonomous vehicles may reshape drivers' occupational roles, shifting their responsibilities toward social interaction and passenger assistance services [14]. Lu and Wang argued that while RoboTaxi is likely to replace a proportion of professional passenger transport drivers, the primary effect may be to accelerate the occupational transition of part-time ride-hailing drivers [15]. Li et al. further emphasized that the employment transition of professional drivers resulting from advances in autonomous driving technologies warrants greater policy attention [16].

Despite the growing body of literature, existing studies on the impacts of autonomous driving on transport capacity and employment remain limited. Most research has been qualitative in nature, while quantitative scenario-based assessments are relatively scarce and policy-oriented governance frameworks remain underdeveloped. To address this, this study focuses on the critical transition period during which China's autonomous mobility services are evolving from pilot demonstrations toward conditional commercial deployment. By integrating policy analysis, descriptive statistical analysis, and scenario analysis, the study investigates the impacts of autonomous mobility service commercialization on the capacity structure and employment of the passenger transport industry and proposes practical governance strategies to facilitate a balanced technological transition.

2 Research Methods and Data Sources

2.1 Research Methods

This study employs a combination of policy document analysis, descriptive statistical analysis, and scenario analysis.

First, policy document analysis is used to systematically review national and local regulations, policy frameworks, and industrial development plans related to autonomous driving, thereby identifying the key conditions underpinning the commercialization of autonomous mobility services.

Second, descriptive statistical analysis is conducted using publicly available data on passenger transport capacity, market structure, and driver employment. This analysis provides a comprehensive understanding of recent developments in the passenger transport sector and enables an assessment of the potential impacts of autonomous mobility service deployment on existing market structures.

Third, scenario analysis is introduced to estimate the employment effects of autonomous mobility services. Drawing upon forecasts of Robotaxi market penetration in China provided by international research institutions, three development scenarios—slow, moderate, and rapid growth—are constructed. Based on these scenarios, the potential scale of driver displacement at different time horizons is estimated, and the corresponding employment implications are evaluated in conjunction with workforce age composition and skill characteristics.

Building upon these analyses, forward-looking governance strategies are proposed through logical inference and systems-based analysis.

2.2 Data sources

The analysis draws upon four categories of data sources.

(1) National and local laws, regulations, and industrial policies related to autonomous driving and intelligent connected vehicles;

(2) Official statistical data released by government agencies, including the Statistical Bulletin on the Development of the Transportation Industry (2020–2024), National Urban Passenger Transport Statistics (2025), and operational data published through China's Ride-Hailing Regulatory Information Exchange Platform;

(3) Research reports released by academic institutions, industry associations, and mobility service enterprises; and

(4) Market forecasts and industry outlook reports published by international consulting and market research organizations.

The integration of these diverse data sources provides both macro-level industry evidence and forward-looking market projections for assessing the potential impacts of autonomous mobility service commercialization.

3 Analysis of the Commercialization Trends in Autonomous Mobility Service

A comprehensive assessment of technological progress, policy developments, industrial dynamics, and market demand suggests that the conditions necessary for the commercialization of autonomous mobility services are steadily maturing. Meanwhile, the pathway toward large-scale deployment is becoming increasingly clear, indicating strong momentum for future commercialization.

3.1 Accelerating Breakthroughs in Core Technology

Continuous technological advancement is laying a solid foundation for the commercialization of autonomous mobility services. Sensor costs have declined substantially, while multi-sensor fusion technologies have become increasingly mature. Decision-making algorithms have evolved from rule-based modular architectures toward end-to-end learning frameworks, significantly enhancing adaptability and generalization capabilities. At the same time, Visual Language Models (VLMs) and Vision-Language-Action (VLA) models are advancing rapidly, further strengthening environmental perception and decision-making performance.

In addition, continuous improvements in computing-chip performance, coupled with declining hardware costs, are enabling autonomous driving systems to be deployed across a broader range of vehicle platforms, thereby accelerating the commercialization process.

3.2 More Supportive Policy Environment

The policy environment for autonomous driving in China has become increasingly supportive. The fourth revision of the Road Traffic Safety Law introduces provisions governing road testing, public-road operation, traffic violations, and liability allocation for autonomous vehicles, thereby providing a stronger legal foundation for commercialization.

In addition, the Implementation Plan for Enhancing the Adaptability of Consumer Goods Supply and Demand and Further Promoting Consumption identifies autonomous vehicles as one of three trillion-yuan-level consumption sectors targeted for development by 2027. By the end of 2025, 11 Chinese cities had enacted local regulations related to autonomous driving, while more than 80 cities had introduced policies supporting road testing and demonstration applications. These developments collectively signal growing governmental support for the commercialization of autonomous mobility technologies.

3.3 Synergistic Growth of Industry and Market Demand

Commercialization is being jointly driven by both industrial development and market demand.

From the industry perspective, significant milestones have been achieved since 2024. Tesla announced its Robotaxi initiative and launched commercial operations, while leading autonomous driving companies such as WeRide and Pony.ai successfully entered public capital markets. These developments have strengthened investor confidence and accelerated commercialization efforts within the autonomous mobility sector.

From the demand perspective, autonomous vehicles offer potential advantages in terms of safety, operational efficiency, and user experience. Beyond satisfying growing demand for personal mobility and urban commuting, autonomous mobility services may also help address emerging societal challenges associated with population aging, including labor shortages and mobility accessibility for elderly and mobility-impaired populations. These factors provide favorable conditions for market expansion and long-term adoption.

3.4 Increasingly Clear Application Scenarios and Commercialization Pathways

Application scenarios and commercialization pathways for autonomous mobility services are becoming increasingly well-defined.

By the end of 2025, China had established 17 national autonomous driving testing and demonstration zones, opened more than 35,000 kilometers of testing roads, issued over 10,000 testing permits, and selected 20 cities or city alliances for pilot implementation of vehicle-road-cloud integration initiatives [17].

Among various application scenarios, RoboBus services have achieved early breakthroughs in semi-enclosed and low-speed environments, including urban feeder services, transport hub shuttles, industrial park commuting, and tourism-oriented shuttle operations. Benefiting from fixed routes and relatively controllable operational risks, these services have already entered regular revenue-generating operations.

Robotaxi services, which represent one of the most technically demanding application domains, are currently operating in designated urban areas under commercial pilot programs. Operators continue to improve fleet utilization rates and remote supervision efficiency in preparation for large-scale deployment.

Meanwhile, autonomous vehicle rental services have emerged since 2025, primarily targeting tourism-oriented applications. Through innovations such as time-based vehicle leasing and Vehicle-as-a-Service (VaaS) models, operators are accumulating practical experience and exploring viable commercial business models.

3.5 Overall Assessment

Overall, the commercialization prospects of autonomous mobility services are increasingly promising. The penetration rate of Level 2 and above advanced driver-assistance systems (ADAS) in China has already exceeded 60% [18]. Meanwhile, Level 3 autonomous driving has entered the stage of mass-production approval, and Level 4 autonomous driving has achieved substantial progress in commercial operations within designated operational domains [19].

As hardware costs continue to decline, decision-making algorithms become increasingly sophisticated, regulatory frameworks mature, investor confidence strengthens, and commercialization pathways become clearer, autonomous mobility services are in the transition from pilot demonstration projects to large-scale commercial operations within the next five to ten years. Consequently, they are likely to become an integral component of China's future passenger transport system.

4 Impact of Autonomous Mobility Services on Transportation Capacity

As a novel form of transport that substitutes driving labor with algorithmic and capital-intensive solutions, the commercialization of autonomous mobility services is poised to transform the supply structure of the passenger transportation market. The effects of this transformation can be primarily observed in three dimensions.

4.1 Traditional Transport Capacity under Exit Pressure

The commercialization of autonomous mobility services will initially exert a substitution effect on traditional passenger transport capacity, placing certain vehicles and routes under exit pressure. From the supply perspective, as shown in Table 1, urban passenger volumes for public buses, trams, and taxis have experienced modest growth in recent years, with a projected decline in 2025. Meanwhile, the fleet sizes of public buses, trams, and taxis have gradually contracted. Concurrently, numerous public transport operators nationwide are encountering operational challenges, and several cities have issued risk alerts for the ride-hailing sector, signaling that market saturation has been reached. From the demand perspective, research conducted by Southwest University of Finance and Economics and Tsinghua University indicates that under high, medium, and low fertility scenarios, China's total population is projected to decline annually by 6.8 million, 8.5 million, and 10.59 million, respectively, between 2025 and 2050, with corresponding annual reductions in the labor force of 7.88 million, 9.38 million, and 10.98 million [20]. As commuting, familial visits, and other travel needs gradually diminish, overall travel demand is unlikely to experience significant growth. Against this backdrop of near-saturation traditional transport capacity and weakening demand, the deployment of RoboBus and RoboTaxi services is expected to accelerate the withdrawal of inefficient conventional transport modes.

4.2 Increase in Market Access Threshold

The market entry requirements for traditional passenger transport services are relatively low. Taxi operations primarily depend on vehicle acquisition and operational licensing, while ride-hailing drivers need only a valid driver's license and professional qualification to join a platform. In contrast, operating autonomous mobility services necessitates substantial capital investment in vehicle procurement, technological platforms, and operation and maintenance management. Consequently, the industry is likely to

consolidate around leading firms with strong financial and technological capabilities. This trend has dual implications: first, economies of scale and technological innovation are expected to reduce per-unit service costs while enhancing operational efficiency and safety; second, excessive market concentration may introduce risks such as monopolistic pricing, data control, and reduced employment opportunities.

Table 1. The ownership and passenger volume of public buses, trams, and cruising cabs in China (2020-2025)

Year	Bus and Tram Passenger Volume (in billions of people)	Cruise Taxi Passenger Volume (in billions of people)	Bus and Tram Ownership (in tens of thousands)	Cruise Taxi Ownership (in tens of thousands)
2020	442.36	253.27	70.44	139.4
2021	489.16	266.90	70.94	139.13
2022	353.37	208.20	70.32	136.20
2023	380.50	334.78	68.25	136.74
2024	386.70	358.41	65.81	135.2
2025	365.6616	344.82	——	——

4.3 Emergence of New Forms of Passenger Transportation Services

Autonomous vehicles, as intelligent carriers of mobility services, represent a structural and service-mode transformation in passenger transport. RoboBus services, leveraging real-time perception and dynamic dispatch capabilities, can upgrade traditional buses to demand-responsive transit (DRT) [21]. Integration of autonomous buses and taxis with conventional buses, subways, and shared bicycles for coordinated scheduling and fare management is expected to enable door-to-door, multi-modal travel services.

Moreover, autonomous vehicles have the potential to transcend their conventional transportation function by providing customized services such as entertainment, office work, retail, and social interaction, thereby fostering novel consumer-oriented business models within the passenger transport ecosystem.

5 Impact of Commercializing Autonomous Mobility Services on Employment

Among the various societal implications of autonomous mobility services, employment substitution has attracted the greatest public attention due to its potential implications for social stability and labor market adjustment. The employment impacts of commercialization are primarily manifested in two dimensions.

5.1 Replacement of Driver Positions

The core function of AVs is the substitution of human driving tasks, which inevitably creates risks of job displacement and occupational transition for professional drivers. The taxi and ride-hailing sector provides a representative case for estimating the potential scale of labor substitution.

As shown in Table 1, China had approximately 1.352 million licensed taxis in operation in 2024. Assuming an average staffing ratio of 1.5 drivers per vehicle, the taxi sector employed roughly 2.03 million drivers. In addition, by October 31, 2024, a total of 7.483 million ride-hailing driver licenses had been issued nationwide. Based on these figures, the combined number of taxi and ride-hailing drivers in China is at approximately 9.5 million.

Over the next five to ten years, a portion of senior drivers will naturally exit the labor market due to retirement and demographic factors. However, the taxi and ride-hailing sector has long functioned as an important employment buffer because of its relatively low entry barriers and flexible working arrangements. According to *Employment Resilience in Urban Mobility: Employment Landscape and Occupational Performance of Ride-Hailing Drivers (2025)*, approximately 77% of ride-hailing drivers entered the industry after experiencing unemployment [22]. As a result, the total number of taxi and ride-hailing drivers is expected to remain relatively stable, with only moderate fluctuations in the medium term.

Drawing upon forecasts of China's Robotaxi market released by research institutions including UBS, Goldman Sachs, and Morgan Stanley [23][24][25], three development scenarios—slow, moderate, and rapid growth—are constructed to account for uncertainties related to technological maturity, regulatory progress, and public acceptance (Table 2). Assuming that each autonomous taxi replaces 1.5 driver positions, the direct labor substitution effects under different scenarios are estimated and presented in Table 3.

The results indicate that under the moderate-growth scenario, Robotaxi deployment could directly replace approximately 750,000 driver positions by 2030, with the number rising to 2.25 million by 2035. Furthermore, these estimates only capture direct substitution within the taxi and ride-hailing sector. If the deployment of autonomous buses and the associated contraction of conventional transport services are also considered, the total number of affected driving occupations would be substantially larger.

Table 2. Scenario Setting for the Development of Robotaxi

Scenario	assumptions	2030 scale (10000 vehicles)	2035 scale (10000 vehicles)
Slow develop- ment	Slow technological iteration, cautious policy review, and low public acceptance	10	80
Medium speed development	Technology is steadily maturing, policies are orderly opening up, and the market is gradually ac- cepting it	50	150

rapid develop- ment	Technological breakthroughs are accelerating, policies are actively supporting, and market demand is strong	70	310
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Table 3. Calculation of the scale of direct substitution of taxi/ride hailing driver positions in different scenarios

Scenario	Scale by 2030 (10000 vehi- cles)	Replacing Driv- ers by 2030 (10000 people)	Scale by 2035(10000 ve- hicles)	Replacing Drivers by 2035 (10000 people)
Slow develop- ment	10	15	80	120
Medium speed development	50	75	150	225
rapid develop- ment	70	105	310	465

It should be noted that labor substitution is unlikely to occur instantaneously. Rather, it will unfold gradually alongside the progressive diffusion of autonomous driving technologies. Although demographic attrition among older drivers may partially mitigate displacement pressures, it is unlikely to fundamentally alter the long-term trend toward reduced demand for professional driving labor.

5.2 Coexistence of Talent Shortages and Skill Mismatch

While autonomous mobility services may reduce demand for traditional driving occupations, they are also expected to generate new employment opportunities in technology-intensive fields. The operation of autonomous vehicle fleets will increase demand for highly skilled personnel in software development, system integration, remote monitoring, testing, maintenance, and operational management. Emerging occupations such as intelligent connected vehicle testers, safety supervisors, and autonomous vehicle operation and maintenance technicians are likely to expand rapidly.

According to Yin Wanjian, President of Hunan Automotive Engineering Vocational University, the intelligent connected vehicle industry currently faces a talent shortage of approximately 1.03 million workers across both manufacturing and service sectors [26]. This indicates that the commercialization of autonomous mobility services may simultaneously create substantial labor demand in new occupational categories.

However, the workforce characteristics of existing transport drivers may limit their ability to transition into these emerging positions. Educational attainment among professional drivers is generally relatively low. For example, data from CaoCao Mobility indicate that 68.67% of its drivers possessed a high school education or below in 2020[27]. Consequently, many displaced drivers may encounter difficulties in acquiring the technical competencies required for newly created occupations.

6 Policy Implications and Governance Strategies

The commercialization of autonomous mobility services represents an inevitable outcome of technological advancement and societal development. However, the resulting adjustments in transportation capacity and labor substitution may generate transitional social challenges. Unregulated market forces could disproportionately burden vulnerable populations, whereas excessively restricting technology adoption risks forfeiting strategic opportunities for industrial upgrading. Accordingly, it is imperative to develop well-calibrated policies that balance the deployment of advanced productive capabilities with social protection measures, thereby proactively mitigating the transitional impacts of commercialization.

6.1 Differentiated Development Policies in Different Scenarios

Autonomous mobility services exhibit substantial heterogeneity across application scenarios in terms of technological maturity, societal acceptance, and public interest characteristics. Accordingly, differentiated development policies should be tailored to each scenario to maintain a dynamic balance between fostering technological innovation and mitigating potential social risks.

RoboBus Policy: Urban public transportation serves as a public good and is essential for societal mobility. Autonomous buses should be prioritized within urban transit development strategies and receive targeted financial support. Enterprises should be encouraged to transform low-demand or scattered routes into demand-responsive autonomous bus services and to develop specialized routes for medical, educational, shopping, or tourism purposes. Extending service to suburban and peri-urban districts, and integrating new business models such as “public transport + cultural tourism” or “public transport + retail,” can enhance revenue streams and reduce operational risks.

Robotaxi Policy: The deployment of autonomous taxis directly impacts existing taxi and ride-hailing markets. Strict social impact assessments should guide the pace of commercialization. Total quantity controls should be applied, integrating autonomous taxis into urban transport management frameworks. Deployment limits should be set based on population size, economic development, travel demand, and road network capacity to avoid short-term market volatility [28]. Operators should be incentivized to provide high-end, specialized services—such as business travel, leisure, and barrier-free mobility—to complement rather than compete directly with traditional taxis. Additionally, enterprises should explore overseas markets in regions with growing demand for intelligent mobility, such as Southeast Asia and the Middle East, using joint ventures or technology licensing to alleviate domestic employment pressures.

Autonomous Car Rental Policy: Autonomous car rental services, primarily targeting cultural tourism and shared mobility, have a limited impact on traditional markets. Pilot

initiatives such as time-based leasing and Vehicle-as-a-Service (VaaS) should be encouraged to accumulate operational experience, gather user data, and establish commercial closed loops. This approach facilitates complementary development alongside conventional car rental and tourism transport.

6.2 Capacity Regulation and Dynamic Adjustment Mechanisms

Regulating transportation capacity is a central policy instrument for mitigating transitional shocks and maintaining passenger transport market stability. Following a “demonstration first, promotion later” approach, the commercial deployment of autonomous vehicles should proceed in phases post-pilot implementation of vehicle-road-cloud integration initiatives. Deployment should progress from simple to complex scenarios, from localized points to broader regions, and from small to large scale. Simultaneously, a robust classification-based admission system and dynamic adjustment mechanism should be established.

Admission Mechanisms: Priority should be given to semi-enclosed and low-speed scenarios, such as enclosed campuses, scenic areas, hub shuttles, and dedicated bus lanes. Approval processes should be streamlined to support normalized operations, with safety personnel on board during initial deployment. High-risk scenarios, such as urban core areas with complex traffic or highways, should be cautiously opened only after technology has achieved high maturity and extensive validation.

Dynamic Evaluation: Vehicle deployment should be integrated into macro-level urban transport capacity planning. Cities should regularly assess deployment plans and total limits based on road network configuration, travel demand, and traditional transport capacity. Dynamic evaluations and timely adjustments to capacity allocation are essential to prevent operational risks and ensure market stability.

6.3 A multi-level Workforce Transition and Employment Protection System

Employment displacement represents the most sensitive social risk associated with the commercialization of autonomous mobility services. Addressing this challenge requires a comprehensive governance framework encompassing talent cultivation, workforce transition, and social protection. Such a framework should not only facilitate the development of emerging occupations but also support displaced workers throughout the transition process.

Strengthening Talent Development for Emerging Industries.

The rapid expansion of autonomous mobility services is expected to generate substantial demand for skilled professionals in software engineering, vehicle testing, system integration, remote operation, and intelligent transportation management. To

address these emerging workforce requirements, educational institutions should accelerate the development of autonomous driving–related disciplines and training programs. Vocational colleges and application-oriented universities should establish specialized curricula in autonomous driving, intelligent connected vehicles, and mobility service operations. Newly recognized occupations, including intelligent connected vehicle testers, safety supervisors, and autonomous vehicle operation and maintenance technicians, should be systematically incorporated into educational and certification systems. Furthermore, industry–academia partnerships should be strengthened to promote joint talent development and improve the alignment between workforce supply and industrial demand.

Establishing Multiple Pathways for Workforce Transition.

Given the diverse demographic and skill characteristics of existing drivers, differentiated transition pathways should be designed to facilitate occupational mobility.

For professional drivers with relatively strong learning capacities, targeted training programs should be provided in areas such as autonomous vehicle system operation, remote supervision, emergency response, and fleet management. These workers could transition into occupations including safety supervisors, remote operators, and intelligent mobility service coordinators. Enterprises should be encouraged to prioritize experienced drivers when recruiting for such positions.

For traditional vehicle maintenance personnel, specialized retraining programs should be established to support transitions toward autonomous vehicle inspection, calibration, operation, and maintenance services. These occupations are expected to experience growing demand as autonomous vehicle fleets expand.

For older workers or individuals with limited technical adaptability, transition pathways may focus on customer-oriented service occupations, including remote customer support, travel assistance, tourism services, retail operations, and other service-sector positions associated with autonomous mobility ecosystems.

Strengthening Social Protection and Reemployment Support.

Despite the availability of retraining opportunities, a portion of the affected workforce may face substantial barriers to occupational transition due to age, educational background, or skill limitations. Consequently, social protection mechanisms should be strengthened to safeguard basic livelihoods during the transition period.

Governments should enhance unemployment insurance programs and improve access to reemployment services. Employment subsidy schemes may be introduced to encourage enterprises to recruit displaced drivers, dispatchers, and maintenance personnel. At the same time, industry associations, labor unions, and community organizations should provide career counseling, entrepreneurship support, and job-matching services for workers affected by technological displacement.

For workers facing particularly severe transition difficulties, supplementary measures—including public-interest employment programs, early retirement arrangements, and one-time compensation mechanisms—may be considered to reduce social vulnerability and maintain social stability throughout the transition process.

7 Conclusion and Discussion

7.1 Main Findings

This study examines the potential impacts of the commercialization of autonomous mobility services on transportation capacity and employment in China's passenger transport industry during the transition from pilot demonstration to large-scale deployment. By integrating policy document analysis, descriptive statistical analysis, and scenario analysis, the study provides a forward-looking assessment of both market transformation and labor market implications. The main findings can be summarized as follows.

First, the conditions necessary for the commercialization of autonomous mobility services are rapidly maturing. Technological advances, supportive regulatory frameworks, expanding market demand, and increasingly clear commercialization pathways collectively suggest that autonomous mobility services are likely to move from pilot programs to large-scale operations within the next five to ten years, becoming an important component of China's future passenger transport system.

Second, the commercialization of autonomous mobility services is expected to reshape the structure of passenger transport capacity in three major ways. It may accelerate the withdrawal of inefficient traditional transport capacity, increase market entry barriers and industrial concentration, and stimulate the emergence of new service models, including demand-responsive transit, integrated door-to-door mobility services, and mobile-space consumption scenarios.

Third, substantial employment impacts are likely to emerge during the commercialization process. Scenario analysis suggests that autonomous taxis alone could directly replace hundreds of thousands, and potentially millions, of driver positions over the next decade. Simultaneously, the industry is expected to generate demand for new technology-oriented occupations. Consequently, labor market adjustment challenges may increasingly manifest as a coexistence of employment displacement and skill shortages.

Fourth, proactive governance interventions are essential to managing the transition. Differentiated development policies, capacity regulation mechanisms, workforce transition programs, and social protection measures will play critical roles in balancing technological innovation with social stability.

7.2 Research Limitations

Several limitations should be acknowledged.

First, the employment substitution estimates presented in this study rely primarily on market forecasts published by industry research institutions. The actual commercialization trajectory of autonomous mobility services will be influenced by numerous uncertainties, including technological breakthroughs, regulatory developments, public acceptance, and unexpected external events. Consequently, the scenario analysis should be interpreted as indicative rather than predictive.

Second, the study focuses primarily on direct employment effects within the passenger transport sector. Indirect employment impacts across related industries—including

vehicle manufacturing, insurance, maintenance services, driver training, and digital platforms—are not incorporated into the analytical framework. As a result, the overall net employment effects of autonomous mobility services may differ from the estimates presented in this study.

Third, the governance strategies proposed in this paper are derived mainly from policy analysis and logical inference. Their effectiveness, implementation costs, and potential interactions have not been empirically evaluated through policy simulation or cost-benefit analysis. Further empirical validation is therefore required.

From a policy perspective, the findings suggest that technological innovation and social stability should not be treated as competing objectives. Instead, policymakers should pursue a balanced governance approach that simultaneously promotes innovation, maintains market stability, and protects vulnerable labor groups. The proposed governance framework may provide useful references for countries and regions preparing for large-scale deployment of autonomous mobility services.

7.3 Future Research Directions

Future research may be advanced in the following directions.

First, more refined employment impact assessments should be conducted through the development of micro-level datasets incorporating demographic, educational, occupational, and geographic characteristics of professional drivers. Advanced simulation techniques and computable general equilibrium models could provide more accurate estimates of labor market transitions under alternative policy scenarios.

Second, longitudinal case studies of cities pioneering autonomous mobility deployment should be undertaken to examine actual employment transitions, income changes, and workforce adaptation processes. Comparative analyses across different regulatory and market environments may further enhance understanding of effective governance practices.

Third, future studies should expand the analytical scope beyond employment displacement to include employment creation effects. Emerging occupations related to remote operations, fleet management, software services, data analysis, and in-vehicle value-added services warrant systematic examination to provide a more comprehensive assessment of net employment impacts.

Finally, policy simulation approaches should be employed to evaluate alternative combinations of regulatory measures, capacity management strategies, and workforce support programs. Such research could provide more robust evidence for designing effective governance frameworks for autonomous mobility transitions.

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Disclosure of Interests

The authors have no competing interests to declare that are relevant to the content of this article.

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