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<https://doi.org/10.1057/s41599-023-02531-y>

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Does learning ambidexterity affect the sense of urban integration among new-generation migrant workers in China? An empirical study based on career growth and environmental dynamism

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The urban integration of new-generation migrant workers is an important part of the process of new urbanization in China, and the acquisition of a sense of urban integration is one of the necessary signs of urban integration for new-generation migrant workers. Based on ambidexterity theory, we used a multiple regression analysis to study the mechanism underlying the effects of learning ambidexterity on the sense of urban integration of new-generation migrant workers. The empirical results showed that learning ambidexterity had significant and positive effects on both sense of urban integration and career growth; career growth had a partial mediating effect on the relationship between learning ambidexterity and sense of urban integration; environmental dynamism had a positive moderating effect on the relationship between exploratory learning and career growth; and environmental dynamism had a positive moderating effect on the relationship between exploitative learning and sense of urban integration. This study responds to previous research on the ambidexterity of migrant workers and further enriches the ambidexterity theory in research on migrant workers from the perspectives of career growth and urban integration. And in contrast to earlier studies, this research introduces environmental dynamism and establishes an analysis framework for migrant worker urban integration in a dynamic environment.

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Introduction

With the implementation of China's reform and opening-up policies, its non-agricultural industries have developed rapidly, and numerous rural residents have traveled to cities to engage in non-agricultural production and service provision (Wang and Xu, 2013; Chen, 2020; Liu et al., 2021). This has raised the profile of migrant workers in China. According to the National Bureau of Statistics of China, there were 288 million domestic migrant workers in China in 2018 (Chinese National Bureau of Statistics 2019). Among them, 27.5% had completed at least high school education, and 72.5% had not (Chinese National Bureau of Statistics 2019).

Among the population of Chinese migrant workers, new-generation migrant workers (i.e., those born after 1980) currently constitute the largest proportion of migrant workers in China, totaling 148,505,000 (Chinese National Bureau of Statistics 2019). Wang (2001) first defined this group as those born in the late 1970s and early 1980s. Chinese National Bureau of Statistics, in its 20134 report on migrant workers, explicitly defined new-generation migrant workers as those born in 1980 or later, a definition that has been widely adopted by the academic community in subsequent reports (Chinese National Bureau of Statistics 2014). From a conceptual perspective, similar to ordinary Chinese migrant workers, new-generation migrant workers belong to the labor force population in China who migrate from "rural" to "urban" (Li et al., 2019). In comparison to the general population of migrants, this group's migration exhibits typical characteristics of "rural-to-urban" spatial mobility (Yuan, 2020).

Due to significant cultural, economic, and psychological differences between rural and urban areas in China, in fact, the majority of migrant workers not only find it difficult to integrate into the city but also face the predicament of "urban exclusion" (Wang, 2016). However, despite the numerous difficulties in urban integration, compared to the older generation migrant workers, new-generation migrant workers generally prefer not to return to their hometowns and instead aspire to integrate into the urban environment (Zhao and Guo, 2015; Li et al., 2019). For them, achieving comprehensive integration into the urban space, encompassing career, culture, and economy, is a significant objective of their urban migration (Luo and Lu, 2013).

The core benchmark for the citizenization of new-generation migrant workers is urban integration (Wang and Zhang, 2017). Their degree of sense of urban integration indicates the mental characteristics of their personal and working lives in urban areas, and reflects their social identity and psychological integration into their urban environment (Wang and Zhang, 2017). Most migration studies are based on the theoretical construction and exploration of the "aspiration-ability" research framework (Bernard et al., 2022; Carling, 2002). According to traditional research, learning vocational skills helps them meet their daily livelihood needs in the city and serves as a precondition for their urban integration (Luo, 2012). However, due to rapid changes in the economic and sociocultural environment, the pace of industrial upgrading and transformation has accelerated, and the availability of job opportunities in cities has rapidly fluctuated.

This has had a significant impact on the vocational development and urban integration of migrant workers (Zheng and Zhang, 2021). In response to these environmental challenges, some new-generation migrant workers have proactively upgraded their skills and achieved career growth (Zheng and Zhang, 2021). However, more migrant workers have a sense of deprivation due to the difficulty in adapting to the urban environment, and the sense of urban integration is even more difficult to obtain (Picatoste et al., 2018). These phenomena have attracted the attention of scholars, who have indicated that new-generation

migrant workers should maintain both professionalism and agility in the learning and skills development process, and seek opportunities to adapt and integrate into the city in the face of environmental changes (Ma and Han, 2015).

Ambidexterity theory is an important paradigm of management theory. Early ambidexterity theory was used to explore the issues of professionalism, diversity, organizational stability, and adaptability in dynamic environments. However, as research progressed, some scholars began to apply this theory to individuals (Bonesso et al., 2014; Rogan and Mors, 2014; Volery et al., 2015; Peng et al., 2018), constituting a major research development (Zhu, 2008; Turner et al., 2013). Scholars believed that individuals facing environmental changes need to use existing knowledge and acquire new knowledge (Rothaermel and Deeds, 2004; Turner et al., 2013). Building on this foundation, Rui (2017) and Rui and Fang (2018) posited that learning ambidexterity can also be applied to research on agricultural populations such as farmers and rural migrants. Rui (2017) discovered that exploitative learning and exploratory learning significantly promote the urban development of migrant workers. As ambidexterity theory is highly compatible with the current situation of new-generation migrant workers in China, this study takes learning ambidexterity as its starting point and uses career growth and environmental dynamism variables to explore the influence of learning ambidexterity on these workers' sense of urban integration.

On the one hand, this study endeavors to answer the impact mechanism of learning ambidexterity on the urban integration of new-generation migrant workers under the influence of environmental dynamism. This will contribute to a deeper understanding of the relationship between learning ambidexterity, career development, and urban integration. On the other hand, this study also attempts to reveal the role of environmental dynamism in the impact mechanism of learning ambidexterity, providing a theoretical basis for effective decision-making in the learning and career development of the current new-generation migrant workers and further promoting their urban integration.

Background and literature review

The sense of urban integration of migrant workers belongs to the intersection of migration studies and psychology, and includes both domestic and transnational migrant workers as research areas. Most studies have focused on domestic migrant workers; few have paid attention to the sense of urban integration of transnational migrant workers. Studies have also mainly considered new-generation Chinese migrant workers as their research object.

Urban integration and skill learning of migrant workers. The urban integration of migrant workers represents a pivotal manifestation of social integration and has been closely associated with China's reform and opening-up (Han, 2014; Tian et al., 2018). In comparison to urban integration, social integration is a broader concept defined as the process whereby groups at risk of social exclusion are not isolated or alienated from society, but rather have access to extensive rights and opportunities for participation in social life (Alba and Nee, 1997; Collins, 2003). Typically, contemporary social integration encompasses not only the socio-economic participation and psychological and cultural assimilation of socially excluded internal groups affected by factors such as age, illness, race, and crime (Durkheim, 1951; Gordon, 1964; Hughes and Gove, 1981; Bauder, 2002; Rafnsson et al., 2020), but also the interaction and economic and cultural integration of external migrants with the established social fabric of the urban community after their migration to the destination (Schwarz,

1964; Goldlust and Richmond, 1974; Duffy, 1998; Alba and Nee, 2009; Tian et al., 2018). The urban integration of migrant workers falls within the latter category (Han, 2014).

In the academic community in China, the urban integration of rural migrant workers is also referred to as “urban social integration of rural migrant workers” (Hu, 2014), which is an important topic in migration and urban studies (Hu, 2014; Tian et al., 2018). This subject essentially explores the relationship between migrant workers and urban society, falling under the purview of spatial research on social integration (Hu, 2014; Yuan, 2020). Scholars argued that the urban integration of Chinese migrant workers, in the context of China’s reform and opening up, represents a distinctive form of social integration occurring during the large-scale rural-to-urban migration of surplus rural labor (Han, 2014; Tian et al., 2018). Considering the significant disparities in industry, economy, ideology, and social structure between urban and rural areas in China (Luo, 2012; Luo and Lu, 2013; Han, 2014), the urban integration of migrant workers encompasses not only traditional social integration but also economic, regional, and cultural integration resulting from urban-rural differentiation (Luo and Lu, 2013).

In examining the factors influencing the sense of urban integration of new-generation migrant workers in China, Liu and Chen (2015) and Li (2010) stated that found that migrant workers’ levels of human capital affect their willingness to settle into a city and ultimately determines their social integration. From a practical point of view, due to their limited priori-city knowledge and skills, new-generation migrant workers are often at a disadvantage in the labor market (Wang and Xu, 2013). They mainly find employment in labor-intensive industries and in low-level and front-line positions (Wen, 2015; Zhang and Liu, 2015). Jin and Chen (2017) pointed out that most new-generation migrant workers enter the labor market immediately after receiving simple primary education and without having systematically developed their employment skills.

In response to this challenge, some scholars have argued that migrant workers’ skill learning about urban employment can facilitate their progression in cities and is related to their willingness to stay there (Luo, 2012; Shi, 2014; Zhang and Liu, 2015). On this basis, Tian et al. (2016) found that as new-generation migrant workers become more urbanized, they need not only to learn employment skills, but also to continuously develop and upgrade their employment skills. Some scholars further expanded the research scope of skills learning to include language learning and training on information skills, which they argue also facilitate migrant workers’ urban development (Qin, 2014; Huang & Li, 2017).

Overall, constructing a theoretical framework for migrant workers’ sense of urban integration from the perspective of learning has theoretical and practical significance. However, gaps in the literature remain. On the one hand, past research focused on how learning affects migrant workers’ static goals such as employment and employment stability, but there is a lack of clarity on the pathway and mechanism through which learning affects their dynamic goals, such as career growth, urban integration, and sense of urban integration. On the other hand, research on the skills learning of new-generation migrant workers has not responded to such environmental changes. According to some scholars, a reliance on employment skills alone to secure sustainable employment and achieve urban integration is insufficient in increasingly dynamic environments (Comyn, 2018; Picatoste et al., 2018). Furthermore, it is unclear which learning mode is more conducive to citizenization goals, such as career growth, urban integration, and even sense of urban integration.

Learning ambidexterity and its impact. Ambidexterity theory opens up a theoretical window to address these research gaps.

The term ambidexterity is derived from Latin and refers to the ability to use both hands with equal facility. The concept emerged in management theory when scholars studying dynamic environments recommended different structures for organizations in such environments. These organizations were to be structured so that the parts that focused on different strategies would not conflict or interfere with each other; thus, such organizations were called ambidextrous organizations (Duncan, 1976). Duncan (1976) further applied the concept of ambidexterity to the study of organizational learning. He distinguished between exploitative and exploratory learning: exploitative learning occurs through the selection and reuse of existing management ability, local searches, and experiential improvement, whereas exploratory learning happens when existing concepts are changed (Duncan, 1976). Building on this distinction, March (1991) and Levinthal and March (1993) further clarified that exploratory learning is the search for new knowledge, whereas exploitative learning is the refinement of old knowledge.

Early research on ambidexterity theory focused on organizations and teams, studying the influence of ambidexterity on organizational strategy, performance, learning, and innovation (Kostopoulos and Bozionelos, 2011; Xu and Li, 2013; Wei et al., 2014). As research advanced, ambidexterity theory came to be applied to individuals. Bonesso et al. (2014) and Rogan and Mors (2014) studied ambidextrous cognition, ambidextrous behavior, and the ambidextrous capabilities of leaders and managers, respectively. Peng et al. (2018) and Volery et al. (2015) explored the behavioral model and implementation path, respectively, of ambidextrous competence, using entrepreneurs as their research objects. Kao and Chen (2016) applied ambidexterity theory to research on the behavior and performance of frontline employees in the service industry and to farmers and farming cooperatives. Rui (2017) and Rui and Fang (2018) introduced ambidexterity theory to the study of migrant workers to investigate their urban survival and entrepreneurship in cities, and found that learning ambidexterity is helpful for the urban development of migrant workers.

The above review shows how ambidexterity theory has been applied to the study of organizations, teams, and individuals. And some scholars have begun to focus on the mechanism of the impact of learning ambidexterity on the urban development of migrant workers. However, because the application of ambidexterity theory to the study of individuals is recent, some theoretical gaps remain. For example, ambidexterity theory has not yet been used to explain the sense of urban integration of new-generation migrant workers in a dynamic environment. Logically speaking, since learning ambidexterity is applicable to the study of the survival and development of migrant workers facing urban dynamic environments, as an extension of the previous research, we can also further expand the impact of learning ambidexterity to the research field of the career growth and urban integration of migrant workers.

This study was driven by two main questions. First, is it more important for them to strengthen their exploitative learning by focusing on their existing knowledge and skills, or to develop exploratory learning by paying closer attention to new areas of knowledge and skills? Second, in the face of dynamic challenges from the external environment, how do current new-generation migrant workers promote their sense of urban integration through learning ambidexterity? In view of these questions, this study used ambidexterity theory to analyze the pathway and mechanism through which learning ambidexterity affects the sense of urban integration of new-generation migrant workers.

Theoretical frameworks and research hypotheses

The influence of learning ambidexterity on sense of urban integration. The sense of urban integration of new-generation

migrant workers is the sense of gradual process by which such migrants obtain an urban lifestyle, cultural resilience, citizenship qualifications, and rights. Chen (2016) and Zhu (2017) argued that the acquisition of the sense of urban integration of migrant workers is synchronized with their citizenization, which is jointly determined by the need for citizenization and the supply of citizenization opportunities. To achieve psychological urban integration, new-generation migrant workers must continuously develop their vocational skills (Chen and Ding, 2019).

However, from the perspective of the supply side of citizenization, most new-generation migrant workers enter the labor market in cities directly after receiving a simple junior high school education. They lack systematic vocational skills development, and tend to have lower incomes and relatively poor living and working environments, which causes their difficulties to develop a sense of urban integration from a psychological level. Faced with this reality, some scholars realized that "their poverty of personal development ability is the fundamental obstacle to the citizenization of migrant workers" (Shi, 2014:89), and vocational skills development of new-generation migrant workers through continuous learning is one of the important ways to ensure their urban integration (Zhang and Shi, 2006; Zhang, 2017).

Rui (2017) and Rui and Fang (2018) pointed out that learning ambidexterity is an important means for migrant workers to respond to the external dynamic environment and promote their survival in the city. Ambidexterity refers to the ability to balance exploitative and exploratory capacities (Duncan, 1976; Levinthal and March, 1993). In this study, learning ambidexterity refers specifically to an individual's capacity to engage in both exploitative and exploratory learning modes in occupational activities or situations. Exploitative learning refers to the extraction and refinement of existing technology and knowledge, and occurs when individuals deepen their existing knowledge, skills, and experience (March, 1991; Levinthal and March, 1993; Kostopoulos and Bozionelos, 2011; Xu and Li, 2013; Wei et al., 2014). Some rural migrant workers are dedicated to enhancing their existing occupational skills, continuously investing in their current job through exploitative learning (Zhang and Liu, 2015). Exploratory learning is the active search for new technologies and knowledge, and refers to individuals' exploration of entirely new fields and acquisition of new skills (March, 1991; Levinthal and March, 1993; Kostopoulos and Bozionelos, 2011; Xu and Li, 2013; Wei et al., 2014). The survey revealed that some new-generation migrant workers in traditional industries are attempting to acquire knowledge in a new field, such as Internet and programming technologies, with some of these individuals successfully achieving occupational transformation upon mastering new skills in these domains (Liu, 2022). 'Slash youth', or young individuals in China who possess a variety of skills and engage in diverse types of work (Lin, 2022), are now being joined by new-generation migrant workers aided by exploratory learning (Liu, 2022). Yuan (2020) contended that this transformation is of utmost significance, serving as a shortcut for migrant workers to attain urban identity construction and ultimately integrate into the urban society.

Regarding the specific influence of learning ambidexterity on sense of urban integration, exploitative learning promotes new-generation migrant workers' vertical accumulation of knowledge, skills, and experience in urban work and life, helping them to lay a solid vocational foundation for their improvement of sense of urban integration. With regard to exploratory learning, acquiring cross-industry and cross-post knowledge and skills allows these workers to cope with future industry and career uncertainty in the city, which also contributes to the acquisition of a sense of urban integration. Exploitative and exploratory learning each have their own advantages and can be adapted to the career changes and

development of new-generation migrant workers in urban life, greatly benefiting their sense of urban integration.

Hypothesis 1: Learning ambidexterity has a significant and positive effect on the sense of urban integration of new-generation migrant workers.

Hypothesis 1a: Exploitative learning has a significant and positive effect on the sense of urban integration of new-generation migrant workers.

Hypothesis 1b: Exploratory learning has a significant and positive effect on the sense of urban integration of new-generation migrant workers.

The influence of learning ambidexterity on career growth. The career growth of new-generation migrant workers is a process of continuous upward achievement of occupational goals, playing a role in promoting the realization of urban citizenization. To achieve occupational growth, migrant workers need to make continuous learning investments (Zhang, 2017; Luo and Seeberg, 2022). Exploitative learning is the ability to refine, reorganize, and upgrade knowledge and skills on the basis of existing knowledge and skills, which can promote the completion of existing work goals and tasks (March, 1991; Levinthal and March, 1993; Kostopoulos and Bozionelos, 2011; Xu and Li, 2013; Wei et al., 2014). It is the main ability used by new-generation migrant workers to complete tasks (March, 1991; Levinthal and March, 1993). From a practical perspective, most new-generation migrant workers have relatively low levels of knowledge and skills. Increasing investment in exploitative learning aligns with the knowledge and skills status of these workers. Exploitative learning helps them focus on specific job skills. The more they invest in exploitative learning, the more they can integrate and the more they can use and deepen their existing knowledge and skills. By enhancing their exploitative learning, new-generation migrant workers can compensate for the gaps in their formal education and qualifications through continuous practice in their own fields. The experience-based advantages that this affords them can ultimately promote their career growth.

Exploratory learning is the ability to collect and learn heterogeneous skills that are different from existing knowledge and skills (March, 1991; Levinthal and March, 1993; Kostopoulos and Bozionelos, 2011; Xu and Li, 2013; Wei et al., 2014). It reflects the ability to discover new fields and innovate. Due to the constraints of their original knowledge structure, the knowledge and skills of most new-generation migrant workers are singular. Exploratory learning allows them to continuously adjust and update their knowledge structure and modes of thought through open thinking. This in turn can improve their cross-post adaptability and broaden their opportunities for career growth. In dynamic environments, exploratory learning allows workers to adjust their knowledge and skills structure in a timely manner to alleviate the potential career risks caused by a singular knowledge and skill structure (Rui, 2017; Rui and Fang, 2018). In short, exploratory learning can strengthen new-generation migrant workers' search, learning, and internalization of new knowledge and skills to make them competent in future uncertain technological and economic environments and maximize their adaptation and extension of future-oriented knowledge and skills for their career growth.

Hypothesis 2: Learning ambidexterity has a significant and positive effect on the career growth of new-generation migrant workers.

Hypothesis 2a: Exploitative learning has a significant and positive effect on the career growth of new-generation migrant workers.

Hypothesis 2b: Exploratory learning has a significant and positive effect on the career growth of new-generation migrant workers.

The mediating effect of career growth. Although some scholars in early research have focused on the impact of learning on urban integration (Luo and Seeberg, 2022), the focus is still on the perspective of skill improvement and adaptation to urban life through learning, and the role of occupational growth in this mechanism is not clear. Career growth refers to the development and improvement of individuals' employment skills, vocational knowledge and work experience, and is the product of the combined effects of multiple factors, such as individual endowment and work engagement (Weng et al., 2010). In the mechanism consisting of learning ambidexterity, career growth, and sense of urban integration, learning ambidexterity gives new-generation migrants the knowledge and skills to support their career growth, and the resulting personal growth leads to the positive output that is sense of urban integration (Zheng and Zhang, 2021). That is, learning promotes personal development, and personal development promotes sense of urban integration.

Huang and Li (2017) and Zuo and Sun (2017) suggested that new-generation migrant workers use a self-intervention strategy in their career growth, and that optimizing their capital investment can help them develop and accumulate skills, which in turn serve as the driving force underlying their career growth and urban integration, ultimately promoting their citizenization. Thus, in the citizenization process of new-generation migrant workers, career growth is not only the result of the influential mechanism of learning ambidexterity but also a transformation factor that promotes their positive expectations regarding their sense of urban integration and citizenization (Gong et al., 2011).

Based on the previous analysis, career growth serves as a key node in the learning ambidexterity-driven sense of urban integration mechanism. The learning ambidexterity of new-generation migrant workers provides knowledge and skills input for their career growth by enabling them to refine, deepen, search, and explore their knowledge and skills. Their sense of urban integration is then the positive output of their career growth. This demonstrates the bridging effect of career growth in the relationship between learning ambidexterity and sense of urban integration.

Hypothesis 3: Career growth has a significant and positive effect on the sense of urban integration of new-generation migrant workers.

Hypothesis 4: Career growth has a mediating effect on the relationship between learning ambidexterity and sense of urban integration among new-generation migrant workers.

Hypothesis 4a: Career growth has a mediating effect on the relationship between exploitative learning and sense of urban integration among new-generation migrant workers.

Hypothesis 4b: Career growth has a mediating effect on the relationship between exploratory learning and sense of urban integration among new-generation migrant workers.

The moderating effect of environmental dynamism. An environment is formed by individuals, groups, organizations, and other entities within a certain space, in addition to their networks, relationships, and interactions, and has a composite dimension that constitutes its dynamics and complexity (Lumpkin and Dess, 1996). For new-generation migrant workers, the environment they live in also has the same structural dimensions as the general environment described above. The dynamic nature of the environment reflects the variability of the directions and trends of its development (Tan and Litschert, 1994). Opportunities and risks coexist in a dynamically changing environment, alongside the new challenges continuously generated by the environment.

Especially in the current context of technological acceleration and industrial upgrading, the traditional pattern of "one post for

life" has been broken (Zheng and Zhang, 2021). The industrial changes and substitutions brought about by environmental dynamism provide opportunities and possibilities for occupational mobility and career choices for new-generation migrant workers (Chen, 2016; Huang and Li, 2017; Luo et al., 2020).

As mentioned above, exploitative learning is the deepening of existing domain knowledge and skills, whereas exploratory learning is the acquisition of new knowledge and skills (March, 1991; Levinthal and March, 1993; Kostopoulos and Bozionelos, 2011; Xu and Li, 2013; Wei et al., 2014). Despite the differences in the direction and transformation of knowledge and skills between these two modes of learning, the knowledge sources of both come from external technology and the market environment. Obtaining knowledge from different external sources is an important prerequisite for adapting to the environment (Tu et al., 2019). The dynamic external environment provides a source of knowledge for new-generation migrant workers to explore their vertical skills and develop their horizontal skills. The more dynamic the external environment is, the more it facilitates the learning ambidexterity of new-generation migrant workers, and the more opportunities it creates for them to work and live in the city, which is of great benefit to enhancing the sense of urban integration of migrant workers. In other words, environmental dynamism is a necessary environmental factor to promote the urban learning and growth of new-generation migrant workers. A static, stagnant, and immobile external environment is not conducive to the growth and confidence of new-generation migrant workers in cities.

Hypothesis 5: Environmental dynamism has a positive moderating effect on the relationship between learning ambidexterity and career growth among new-generation migrant workers.

Hypothesis 5a: Environmental dynamism has a positive moderating effect on the relationship between exploitative learning and career growth among new-generation migrant workers.

Hypothesis 5b: Environmental dynamism has a positive moderating effect on the relationship between exploratory learning and career growth among new-generation migrant workers.

Hypothesis 6: Environmental dynamism has a positive moderating effect on the relationship between learning ambidexterity and sense of urban integration among new-generation migrant workers.

Hypothesis 6a: Environmental dynamism has a positive moderating effect on the relationship between exploitative learning and sense of urban integration among new-generation migrant workers.

Hypothesis 6b: Environmental dynamism has a positive moderating effect on the relationship between exploratory learning and sense of urban integration among new-generation migrant workers.

In summary, the theoretical model constructed in this paper is shown in Fig. 1.

Materials and methods

Variable measurement. A 5-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), was used for the variable measurement.

The measurement items for each variable were drawn from domestic and foreign scales. Specifically, the variables for *learning ambidexterity* were measured using 6 items referring to the scale developed by Zhu (2008) and Zheng (2018), and measured based on the dimensions of exploitative learning and exploratory learning. According to Zheng (2018), the scale can be applied to

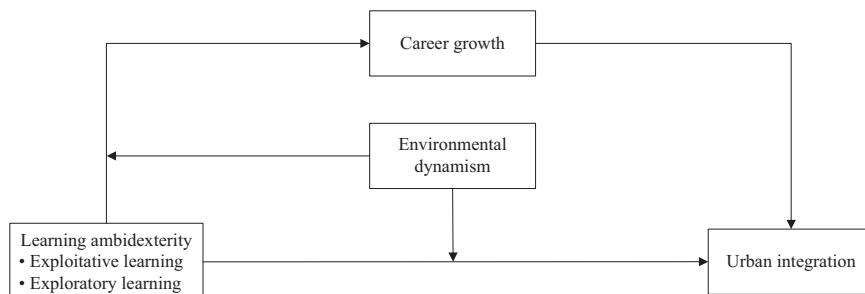


Fig. 1 Theoretical model.

the measurement of different subject levels of organizations, teams, and individuals. Among these, the exploratory learning items include, "I am proficient in integrating and applying acquired knowledge in the 'novel' technological domain to different contexts." "I am capable of effectively acquiring 'new' knowledge in technical fields through internal creation or external acquisition." and "I am capable of effectively disseminating and sharing 'new' knowledge in technical fields created or acquired within the organization." The exploitative learning items include, "I am proficient in integrating and applying acquired knowledge in the 'existing' technological domain to different contexts." "I am capable of effectively acquiring 'existing' knowledge in technical fields through internal creation or external acquisition." and "I am capable of effectively disseminating and sharing knowledge in 'existing' technical fields created or acquired within the organization."

The variables for *sense of urban integration* were measured using 15 items drawing from the sense of urban integration scale compiled by Luo and Lu (2013), reflecting the four dimensions of cultural integration, regional integration, economic integration, and social integration. Representative items are "I have lots of acquaintances in the local community who are predominantly local residents." "My economic earnings are situated within the middle to higher echelons of the local socioeconomic strata." "Beyond my regular expenses, remaining income or savings are primarily allocated towards local expenditure". Luo and Lu (2013) recommend assigning equal weights of 0.25 to each of these dimensions. This study calculated the comprehensive score of urban integration based on their weight recommendations and carried out measurements accordingly.

The variables for *career growth* were measured using 15 items drawing from the career growth scale developed by Weng et al. (2010). Representative items are "My promotion speed in the present organization is fast." "My salary is growing quickly in my present organization." and "Compared with my colleagues, my salary has grown more quickly".

The variables for *environmental dynamism* were measured using 6 items drawing from the environmental scale of Li and Liu (2012). Representative items are "Product or service in our industry updates quickly." "To predict the change of customer needs is difficult." and "The technology in our industry progresses quickly."

To increase the interpretability of the model, previous research recommendations to observe gender, age and education as control variables were also followed (Qian et al. 2016).

Questionnaire distribution and data collection. The definition of new-generation migrant workers from the National Migrant Worker Monitoring Survey Report 2019 of the National Bureau of Statistics and the universal definition criteria of Chinese

domestic scholars were used, and only migrant workers born after 1980 were recruited to complete this study's questionnaire.

Prior to the formal survey, pre-tests and pilot tests were conducted for the questionnaires. The pre-test mainly examined the accuracy and readability of the questionnaire items, and adjustments were made to the content of the questionnaire based on the corresponding feedback results after the pre-test. The pilot test was mainly used to identify practical problems in the implementation of the survey. After the pilot test, we subsequently conducted a large-scale formal survey.

The questionnaire for this study was distributed in September and October 2020. In specific investigations, stratified random sampling was used to choose the Jiangsu- and Zhejiang-based enterprises in which to study new-generation migrant workers. Jiangsu and Zhejiang are among the top four provinces in China's economy, and they are also the main migration destinations for migrant workers. In this study, Wuxi and Yancheng were chosen for investigation in Jiangsu province, while Hangzhou and Wenzhou were selected in Zhejiang province. These four cities exhibit significant disparities in terms of geographical location, resident population size, and industrial structure. For example, the per capita GDP of these four cities in 2022 ranged from 83,100 yuan to 198,400 yuan (Zhejiang Provincial Bureau of Statistics, 2023; Jiangsu Provincial Bureau of Statistics, 2023).

The research team first used teaching networks and social relations to contact local companies. After obtaining support from the companies' management departments, the research team then communicated directly with the companies' labor unions, human resources management departments or workshop management departments to obtain further company support and cooperation. Finally, before the study began, the research team informed the participants of the research purpose, motivated them to complete the questionnaire and explained how to answer the questionnaire. Ultimately, we conducted surveys in 15 companies in Jiangsu, distributing a total of 218 questionnaires, and in 13 companies in Zhejiang, distributing a total of 167 questionnaires. A grand total of 385 questionnaires were distributed across the two provinces. Among the 381 collected questionnaires, 365 were deemed valid after careful screening. There were 116 valid questionnaires from Wuxi, 90 from Yancheng, 91 from Hangzhou, and 68 from Wenzhou.

Data analysis and results

Descriptive statistical analysis. SPSS 20.0 was used to empirically test the conceptual model and research hypotheses. The following analysis procedures were undertaken:

- descriptive statistical analysis and correlation analysis for each variable
- reliability and validity analysis
- common method bias testing
- hypothesis testing via hierarchical regression analysis

Table 1 Sample characteristics (N = 365).

	Classification	n	Percentage		Classification	n	Percentage
Gender	Male	239	65.5	Monthly income (Yuan)	5000-6000	79	21.6
	Female	126	34.5		6000-7000	42	11.6
Age group (years)	16-20	41	11.2	Position	7000-8000	16	4.4
	21-25	92	25.2		8000-9000	6	1.6
	26-30	65	17.8		9000 or above	6	1.6
	31-35	63	17.3		Workers	203	55.6
	36-40	88	24.1		First-line management	123	33.8
	40-41	16	4.4		Middle management	29	7.9
Education level (highest level completed)	Below primary school	4	1.1	Working experience	Top management	10	2.7
	Primary school	52	14.2		Married	277	75.9
	Middle school	120	32.9		Unmarried	72	19.7
	High school	102	27.9		Divorced	16	4.4
	College	80	22.0		Below 1 year	16	4.4
	Above college	7	1.9		1-5	47	12.9
Monthly income (Yuan)	Below 2000	11	3.0		6-10	126	34.5
	2000-3000	40	11.0		11-15	101	27.7
	3000-4000	83	22.7		16-20	58	15.9
	4000-5000	82	22.5		Above 20	17	4.6
	Total	365	100%		Total	365	100%

Table 2 Means, standard deviations, and correlation matrix.

Variable	Mean	Standard deviation	Gender	Age	Education level	Learning ambidexterity	Career growth	Environmental dynamism	Sense of urban integration
Gender	1.655	0.476		1					
Age	3.310	1.464		0.217**	1				
Education level	3.611	1.070		-0.259**	-0.470**	1			
Learning ambidexterity	3.492	0.624		-0.037	0.017	0.025	(0.881)		
Career growth	3.321	0.614		-0.055	-0.058	0.090	0.506**	(0.737)	
Environmental dynamism	3.569	0.567		-0.013	0.014	-0.041	0.431**	0.557**	(0.757)
Sense of urban integration	3.472	0.497		0.092	0.238**	-0.059	0.498**	0.459**	0.406**
									(0.690)

The diagonal of the correlation coefficient is the arithmetic square root of the AVE (average variance extracted).

**p < 0.01.

The descriptive statistics for this study are shown in Table 1. More male migrant workers than female migrant workers participated in the study. The distribution was relatively balanced across all ages. The majority of the participants had a monthly income of 3000–6000 yuan. In terms of educational attainment, most of them had completed junior high school or high school, and some had attained college-level or higher levels of education. The overall education level was better than that among older generation migrant workers. In terms of working experience, the majority of the participants have 6 to 15 years of work experience. The descriptive statistical analysis of gender, education level, marital status, and income is similar to the statistical results of relevant categories in the National Migrant Worker Monitoring Survey Report 2019 of the National Bureau of Statistics. Thus, the results of the study were expected to be representative.

The mean, standard deviation and correlation coefficients of each variable used in this study are shown in Table 2. The variables of learning ambidexterity, career growth, environmental dynamism, and urban integration were significantly correlated. The descriptive statistical analysis and correlation statistical analysis provided a good basis for the subsequent hypothesis testing.

Table 3 Reliability and validity results.

Variable	Items	CR	Cronbach's α	KMO
Learning ambidexterity	6	0.954	0.942	0.900
Exploitative learning	3	0.952	0.924	0.755
Exploratory learning	3	0.874	0.902	0.754
Career growth	15	0.947	0.958	0.946
Environmental dynamism	6	0.888	0.855	0.815
Sense of urban integration	15	0.930	0.872	0.865

CR composite reliability, KMO Kaiser-Meyer-Olkin value.

Reliability and validity analysis. To ensure the validity of the subsequent hypothesis testing, reliability and validity analyses of the scales were conducted. A reliability analysis was conducted to determine the stability and reliability of the scale.

Scholars posit that a Cronbach's alpha coefficient value of at least 0.7 is necessary for reliability, with a value of 0.8-0.9 representing an ideal level of high reliability (Nunnally, 1978). Fornell and Larcker (1981) suggest that the CR value should be above 0.8, indicating that the items can effectively measure latent variables with high reliability. As shown in Table 3, the

Table 4 Regression analysis results.

Variable	Sense of urban integration			Career development		Sense of urban integration			Career development		Sense of urban integration	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9			
Gender	0.056	0.074	-0.013	0.071	0.078*	-0.010	0.004	0.076*	0.080*			
Age	0.264***	0.242***	-0.040	0.271***	0.254***	-0.031	-0.029	0.247***	0.249***			
Education level	0.079	0.062	-0.056	0.044	0.046	0.083*	0.095**	0.078	0.089*			
Exploitative learning			0.226**	0.216**		0.161*	0.122*	0.133*	0.173*	0.139*		
Exploratory learning			0.293**	0.313***		0.199**	0.215**	0.173*	0.238**	0.248**		
Career growth				0.475***	0.300***							
Environmental dynamism						0.422***	0.398***	0.238***	0.225***			
Exploitative learning							-0.029			0.166*		
*Environmental dynamism								0.202**			-0.038	
Exploratory learning												
*Environmental dynamism												
F	8.131	31.987	25.786	36.165	35.696	41.268	34.622	32.701	26.238			
R ²	0.063	0.308	0.264	0.287	0.374	0.409	0.438	0.354	0.371			

* $p < 0.1$, ** $p < 0.01$, *** $p < 0.001$.

Cronbach's α values of the variables in each part of the study were greater than the standard value, and the composite reliability (CRs) was also greater than 0.80, which is better than the test standard of Fornell and Larcker (1981). These results indicate the high reliability and strong internal consistency of the questionnaire scale.

Validity analysis is used to verify the accuracy of a measurement tool or method to measure the required variables. In this study, Kaiser–Meyer–Olkin (KMO) and Bartlett sphericity tests were performed on the sample using SPSS 20.0. After measurement, the KMO value of the overall scale was .915 and the accompanying probability of the Bartlett sphericity test was 0.000. These results indicated the high construct validity of the scale and its factors, which also met and exceeded the test standards, relevant indicators, and reference standards (Table 3). Furthermore, the arithmetic square root of the AVE of each measurement item was greater than the corresponding correlation coefficient (Table 2), indicating the high discriminant validity of the variables of the scale.

Results

The results of the regression analysis are shown in Table 4. Model 1 measured the influence of the control variable on the dependent variable. Model 2 added the independent variable of learning ambidexterity to measure its influence on sense of urban integration.

For the influence of exploitative learning on sense of urban integration, $\beta = 0.226$, $p < 0.01$. For the influence of exploratory learning on sense of urban integration, $\beta = 0.293$, $p < 0.01$. Thus, Hypotheses 1, 1a, and 1b were supported.

Model 3 measured the effect of the independent variables on the mediating variable. For the influence of career growth on exploitative learning, $\beta = 0.216$, $p < 0.01$. For exploratory learning, $\beta = 0.313$, $p < 0.001$. Thus, Hypotheses 2, 2a, and 2b passed the significance test.

Model 4 measured the influence of the mediating variable on the dependent variable. For the influence of career growth on sense of urban integration, $\beta = 0.475$, $p < 0.001$, and is thus significant. Hypothesis 3 was supported.

Model 5 tested the mediating effect of career growth on the relationship between learning ambidexterity and sense of urban integration after adding the mediating variable of career growth. For the influence of exploitative learning on sense of urban

integration, $\beta = 0.161$, $p < 0.1$, and for the influence of exploratory learning on sense of urban integration, $\beta = 0.199$, $p < 0.01$; both fell below the influence coefficient in Model 2. The influence of career growth on sense of urban integration in the above model was tested for significance: $\beta = 0.300$, $p < 0.001$. Thus, these results indicated that career growth did have a mediating effect, albeit partial. Thus, Hypotheses 4, 4a, and 4b were supported.

Models 6 and 7 tested the moderating effects of environmental dynamism on the relationship between learning ambidexterity and career growth. Model 6 added the moderating variable of environmental dynamism based on Model 3. Here, $\beta = 0.422$, $p < 0.001$, passing the significance test. Model 7 added the product of environmental dynamism and learning ambidexterity based on Model 6. Furthermore, it interacted the dependent variable with the independent variables, with the moderating variable and with the product of the independent variables and moderating variable. For the product of exploratory learning and environmental dynamism, $\beta = 0.202$, $p < 0.01$. This indicated that environmental dynamism had a positive moderating effect on the relationship between exploratory learning and career growth. This means that the stronger the influence of environmental dynamism, the greater the impact of exploratory learning on career growth. Conversely, the weaker the influence of environmental dynamism, the weaker the impact of exploratory learning on career growth. Thus, Hypothesis 5b was supported. However, for the product of exploitative learning and environmental dynamism, $\beta = -0.029$, $p > 0.1$, which rejected Hypothesis 5a. Thus, Hypothesis 5 was partly supported.

Finally, Models 8 and 9 tested the moderating effect of environmental dynamism on the relationship between learning ambidexterity and sense of urban integration. Model 8 added the moderating variable of environmental dynamism based on Model 2. Here, $\beta = 0.238$, $p < 0.001$, indicating significant results. Model 9 added the product of environmental dynamism and learning ambidexterity based on Model 8 to test for moderating effects. For the product of exploitative learning and environmental dynamism in Model 9, $\beta = 0.166$, $p < 0.1$. This indicated that environmental dynamism had a positive moderating effect on the relationship between exploitative learning and sense of urban integration. This also means that the stronger the influence of environmental dynamism, the greater the impact of exploitative learning on urban integration. Conversely, the weaker the influence of environmental dynamism, the weaker the impact of exploitative learning on urban integration. Thus, Hypothesis 6a

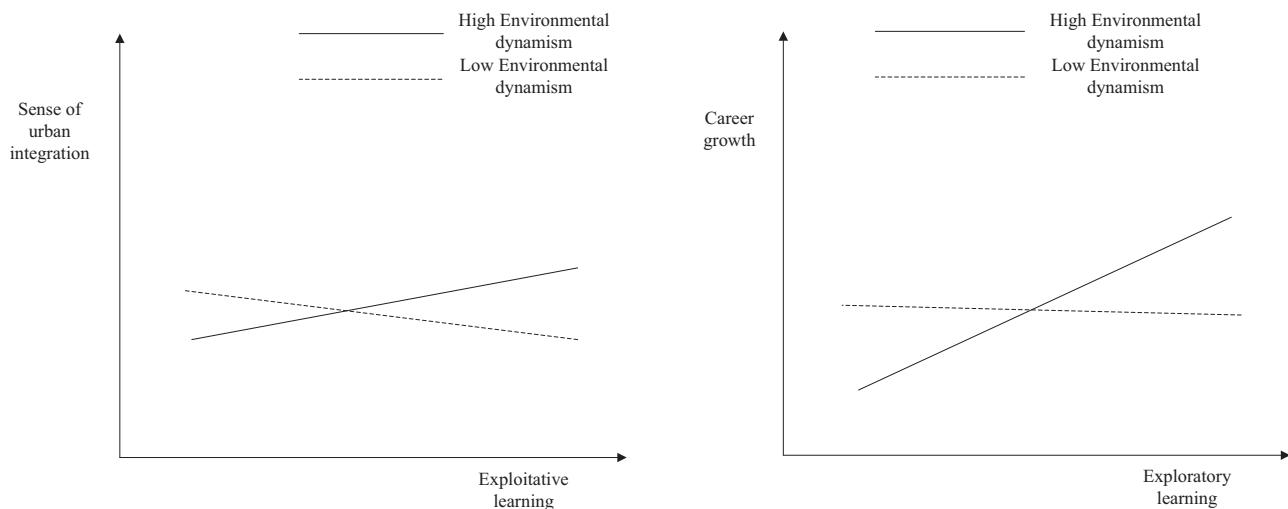


Fig. 2 Figure of moderating effect.

was supported. However, for the product of exploratory learning and environmental dynamism, $\beta = -0.038, p > 0.1$. This indicated that environmental dynamism did not have a moderating effect on the relationship between exploratory learning and sense of urban integration, and Hypothesis 6b was not supported. Thus, Hypothesis 6 was partly supported. The figure of moderating effect in this paper is shown in Fig. 2.

Conclusion and discussion

In terms of content, this study examined the influence of learning ambidexterity on the sense of urban integration of new-generation migrant workers, along with the mediating and moderating roles of career growth and environmental dynamism, respectively. The following conclusions are drawn.

First, learning ambidexterity has a significant and positive effect on the sense of urban integration of new-generation migrant workers. The stronger the learning ambidexterity of new-generation migrant workers, the more they can promote their sense of urban integration. Early studies found that learning ambidexterity has an impact on organizations, teams, and individuals (Bonesso et al., 2014; Rogan and Mors, 2014; Volery et al., 2015; Kao and Chen, 2016; Peng et al., 2018). This study further extends the research object to new-generation migrant workers, goes further than the previous study of learning ambidexterity for migrant workers on urban survival and entrepreneurship (Rui, 2017; Rui and Fang, 2018), and finds that learning ambidexterity also promotes their sense of urban integration. From a practical perspective, this conclusion places higher demands on their current and future learning modes of new-generation migrant workers. New-generation migrant workers are required to be able to focus professionally at work; to be good at refining, transforming and using their existing knowledge and skills; and to vertically accumulate further knowledge and skills (Wang et al., 2012). They must also be able to actively explore cross-industry and cross-post knowledge and skills and be prepared to deal with future industry and occupation uncertainties. The results also verify the significant and positive effect of learning ambidexterity on career growth for new-generation migrant workers, whose ambidextrous learning of knowledge and skills has a further positive effect on their career growth in the process of citizenization. The results indicate that exploratory learning in learning ambidexterity has a stronger role in promoting career growth and sense of urban integration than does exploitative learning. This

means that new-generation migrant workers who wish to enhance their employability should adopt skills learning based on the principle of “one expertise and multiple skills” rather than focusing on the development of only one skill.

Second, career growth plays a partial mediating role in the relationship between learning ambidexterity and the sense of integration of new-generation migrant workers. Some scholars recognized that the fundamental obstacle to the urbanization of migrant workers lies in their lower personal skills (Shi, 2014), indicating that learning is the key to dealing with this challenge (Shi, 2014). However, prior to this study, this viewpoint remained theoretical and was not yet supported by empirical research. The results of this study suggest that learning ambidexterity can affect the sense of urban integration of new-generation migrant workers via two pathways. On one hand, learning ambidexterity can directly influence the sense of urban integration of new-generation migrant workers as an important driving force. This once again confirms the importance of learning in the integration of new-generation migrant workers into urban areas (Zhang and Shi, 2006; Zhang, 2017). On the other hand, the learning input-output model is presented by the transformation from learning ambidexterity to sense of urban integration through career growth and learning ambidexterity, directly affecting the two transformation forms of urban integration. It demonstrates the close connection between career growth and learning, which is formed through the learning transformation and experience accumulation of new-generation migrant workers (Gong et al., 2011), and thus produces career growth outputs such as job promotion and income growth (Weng et al., 2010); while the career growth of new-generation migrant workers can provide material and psychological support and preparation for their urban integration. In this mechanism, career growth has become the key node connecting learning and urban integration.

Third, this research adds dynamic environmental variables based on the analysis of the impact mechanism of learning ambidexterity for migrant workers on urban development in the early stages (Rui, 2017; Rui and Fang, 2018). It is found that dynamic environmental factors have significantly different effects on career growth and urban integration as external variables. Environmental dynamism has a complex influence on the formation of sense of urban integration and career growth. It positively moderates the relationship between exploratory learning and career growth for new-generation migrant workers, but does not moderate the relationship between exploitative learning and career growth. The dynamic mechanism through which

environmental dynamism affects migrant workers' career growth is quite the opposite. Environmental dynamism positively moderates the relationship between exploitative learning and the sense of urban integration of new-generation migrant workers, but does not moderate the relationship between exploratory learning and sense of urban integration. These results indicate that environmental dynamism works through different mechanisms to affect the career growth and sense of urban integration of new-generation migrant workers. Specifically, its mechanism differs depending on the learning mode (i.e., exploitative or exploratory learning) and the learning path (i.e., career growth or urban integration).

Although new-generation migrant workers' exploitative and exploratory learning can benefit from the opportunities and challenges brought about by environmental dynamism, exploratory learning in a dynamic environment more effectively helps them to acquire cross-post capabilities and achieve multi-directional career growth, eventually broadening their career growth paths. However, when faced with changes in the environment, exploitative learning does not significantly affect their career growth due to the limited sources of knowledge and skills. This is reflected in our empirical results.

Environmental dynamism has the opposite effect on the relationship between learning ambidexterity and sense of urban integration. Thus, although environmental dynamism can provide external opportunities and resource inputs (Zheng and Zhang, 2021), discontinuous knowledge and experiences do not benefit the sense of urban integration of new-generation migrant workers much. This also means that if urban integration is the goal, new-generation migrant workers must not exclude exploitative learning in a dynamic environment, but rather take full advantage of its benefits. It may seem at first glance that new-generation migrant workers who extend their stay in the city over a longer time and broader space are more likely to thrive due to their acquisition of knowledge and work experience in multiple industries. However, in reality, these workers find it more difficult to achieve the sense of urban integration, compared with those who focus on specific industries, specific positions, and specific skills (Liu and Chen, 2015).

Contribution and further directions

Contribution. Migrant urban integration is an important area in social integration studies. This study differentiates itself from the traditional perspectives on influencing factors (Goldlust and Richmond, 1974; Hughes and Gove, 1981; Tian et al., 2018; Rafnsson et al., 2020) and interactive integration research (Gordon, 1964; Bauder, 2002; Alba and Nee, 2009) within this field. Instead, it takes a novel perspective by adopting learning ambidexterity as its logical starting point. It delves into the mechanisms influencing the urban growth and development of migrant workers, thereby shedding light on their integration into the city. Additionally, this study incorporates external environmental variables into the analytical framework of the urban integration of new-generation migrant workers, further revealing the mechanisms through which they achieve their own growth and urban integration through learning ambidexterity in a dynamic environment.

First, based on previous research on the influence of learning ambidexterity on the survival and entrepreneurship of migrant workers in cities (Rui, 2017; Rui and Fang, 2018), this study proposes and validates the 'how to integrate into the city' issue from a learning ambidexterity perspective. This study reveals that learning ambidexterity can facilitate the career growth and urban integration of new-generation migrant workers. Furthermore, we found that exploratory learning has a better effect on promoting career growth and urban integration than exploitative learning. This suggests the need for a balanced approach to these two forms of

learning, with a relatively greater emphasis on exploratory learning. This study provides a learning model guide for migrant workers and a theoretical basis for the government to develop a lifelong career skills development model based on 'multiskilling'.

Secondly, the study finds that the impact of learning on the urban integration of migrant workers is related to the mechanism of career growth transformation. This implies the need to not only focus on the learning of migrant workers (Xu and Li, 2013; Luo, 2012; Zhang and Liu, 2015), but also pay attention to the transformation of their learning outcomes. Through the transformation of career growth factors such as income growth and promotion, learning ambidexterity can achieve more substantive urban integration effects.

Finally, and most importantly, this study incorporates dynamic environmental variables and reveals the mechanism by which learning ambidexterity affects the career growth and urban integration of new-generation migrant workers under the influence of dynamic environmental factors. This further improves the traditional "learning-urban integration" analytical framework. Traditional research on Chinese migrant workers is often based on a "stable" and "static" environmental background, with insufficient attention paid to the dynamic environmental factors and their impact on the urban survival and development of migrant workers. This study takes the dynamic environment as a new starting point and provides an analytical framework for the career growth and urban integration of migrant workers under dynamic environmental conditions.

Overall, this study highlights how to promote sense of urban integration from the perspective of new-generation migrant workers, and builds and validates on the theoretical "learning-growth-sense of urban integration" framework. This study further deepens the traditional "aspiration-competence" research framework (Bernard et al., 2022; Carling, 2002).

Further directions. This study has a number of limitations. Firstly, the main sample was from the Yangtze River Delta region, which has a high concentration of Chinese migrant workers. Whether the conclusions are applicable to other regions requires further verification. Secondly, the data collected in this study is subjective cross-sectional data, with a relatively limited sample size. In future research, we can further increase the sample size, while also striving to collect objective and longitudinal data to supplement analysis, in order to further enrich and refine the theoretical model. Finally, the current development of artificial intelligence has intensified the dynamic nature of the environment and has affected the labor-intensive industries in which new-generation migrant workers typically engage. Future research could investigate the impact of this new technology on the urban integration of new-generation migrant workers.

Data availability

Data supporting the results of this study are available in the supplementary files.

Received: 1 June 2023; Accepted: 13 December 2023;

Published online: 02 January 2024

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Acknowledgements

This study was funded by the Major Project of Philosophy and Social Science Research in Colleges and Universities of Jiangsu Province, Jiangsu Province, People's Republic of China. (2022sjzd082).

Author contributions

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

Competing interests

The author declares no competing interests.

Ethical approval

The questionnaire and methodology for this study were reviewed and approved by ethics committee of the management school of Wuxi Institute of Technology. The study does not involve the disclosure of personal data of the participants, thereby ensuring the absence of potential criminal or civil liability risks, as well as safeguarding the financial status, employability, and reputation of the subjects. All procedures conducted in this study involving human participants adhere to the principles of the Helsinki Declaration or equivalent ethical standards.

Informed consent

The researcher sought and obtained the consent of the participants to participate in the study. The participants provided their written informed consent to participate in this study. All information has been anonymized, and the submission does not include images that may identify any persons.

Additional information

Supplementary information The online version contains supplementary material available at <https://doi.org/10.1057/s41599-023-02531-y>.

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