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Article

URBAN service diversity and labor mobility—Analysis based on "meituan.com" big data and micro survey of floating population

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Abstract: In the context of the new era, people's pursuit of a better life is becoming more and more prominent. The diversity and welfare of urban services will become an important support for attracting labor and optimizing talent structure. This paper uses the "meituan.com" life service classification and the 2017 China floating population dynamic monitoring survey (CMDS) data to study the impact of urban service diversity on labor mobility. The results show that the diversity of urban services will significantly reduce the willingness of migrant population to move out. For every 1% increase in the diversity of service categories, the average probability of labor migration will be reduced by about 3.5% 23%; The impact of urban service diversity has group differences. Younger and highly skilled groups are more sensitive, and the marginal effect can reach 4.5% 62% and 4 03%. Considering the adjustment effect and regional heterogeneity, the expansion analysis further found that the level of urban informatization and marketization has a positive amplification effect on the diversity of service categories to attract and retain talents, especially in the eastern region and large cities with a population of more than 5 million. This study provides policy enlightenment for urban talent attraction and labor competition.

Keywords: diversity of urban services; labour mobility; urban convenience; regulatory effect

1. Introduction

As China's economy enters a new stage of high-quality development, under the social background of the coexistence of the decline of global demographic dividend and the release of regional demographic dividend, the competition for talents and labor force among cities has gradually become the focus of the new era. What cities rely on to attract and retain talents gives a new vision and perspective to the research of labor force allocation. In the process of promoting China's new urbanization, the fundamental feature of "people-centered" is becoming an important part of urban talent introduction and management policies, and the urban feature of meeting consumers' differentiated preferences and personalized needs will gradually become an important factor affecting labor mobility. As an important support for urban convenience and comfort, the production capacity, type and supply mode of urban services have created many ways to improve the welfare of local workers. Under the background of increasing the demand and diversification of labor force in cities, what role does it play in the increasingly competitive supply of talents and services? What kind of talents can urban service diversity attract and retain? Answering these questions has positive and rich practical significance.

In the process of the rapid development of China's new urbanization, the concept of "people-centered" is deepening day by day, the connotation of people's pursuit of a

better life is gradually extended, and the supply capacity and diversity of urban services have gradually become an important factor affecting workers' migration and housing decisions. In particular, the population entering and living in cities is showing the characteristics of youth and knowledge. The regional agglomeration characteristics formed by the pursuit of life richness and comfort are becoming more and more prominent. According to the data of the seventh national census published in May 2021, compared with the sixth national census in 2010, the number of people with college education per 100,000 people in China increased from 8930 to 15,467, and the number of people with high school education increased from 14,032 to 15,088. Population mobility is still active, and the residence and the location of the registered residence are quite common. In 2020, the number of households separated from households reached 493 billion people, accounting for about 35% of the total population, and showing a prominent characteristic of unbalanced regional distribution. The floating population continues to gather along the river, coastal areas and inland urban areas, especially the developed cities in the East and the core cities in the central and western regions, which have become the main destinations of population migration. In this context, whether the city can provide services matching the consumption preference and demand tendency of new floating people and create a high-quality living environment will become the core competitiveness of cities to attract talents in the future. The 14th five year plan for national economic and social development of the people's Republic of China and the outline of long-term objectives for 2035 clearly put forward that "create a modern and fashionable consumption scene and improve the quality of urban life", and "be good at enhancing the inclusiveness and bearing function of cities through scientific and technological empowerment and new development models". In the new development stage, how to attract and retain talents by providing comfortable conditions and comprehensive services suitable for living and working has become a new governance orientation. However, except that a few scholars have discussed from the aspects of house prices and public services [1–3], the existing research pays little attention to the impact of urban service diversity on labor mobility. In particular, combined with the reality of the Internet supply mode of urban services, the research on how urban service diversity affects labor mobility and migration decisions from the individual micro level needs to be expanded and supplemented. Using the big data of "meituan.com" and the dynamic monitoring data of China's floating population in 2017, this paper constructs the index of urban service diversity, studies its impact on individual labor mobility, and analyzes and discusses it in combination with the urban environment and regional characteristics.

Compared with the existing research, the innovation and marginal contribution of this paper are mainly reflected in three aspects. Firstly, this paper discusses the influencing factors of labor mobility decision-making from the perspective of urban service diversity, and extends the branch theory of labor mobility from the perspective of individual demand preference. Since Ravenstein, Heber and others first studied the migration and law of individual labor force from economic factors, the existing literature mainly focused on economic income and its influencing factors [2]. With the broad understanding of individual utility, non monetary benefits such as social network, family relations and environmental quality have attracted more and more attention [3]. The research perspective of labor migration motivation has gradually

extended to the level of individual utility preference in pursuit of living environment quality [4]. This paper further deepens the detailed discussion at the micro level from the perspective that the diversification of urban consumer goods meets individual welfare, and expands the branch context of the research. Second, use the network platform big data and personal micro survey data to match to carry out the experience analysis at the urban level, measure the diversity of urban services through the "meituan" platform big data, and match with the dynamic monitoring data of floating population, so as to promote the research samples and data of urban characteristics affecting labor mobility to a new level. Thirdly, from the perspective of comfort, the research combines urban service diversity and labor mobility, which provides a new idea close to the change of urban development concept for the city 's talent competition strategy.

The rest of the article is arranged as follows: The second part is literature review and research hypothesis; The third part is the data source, variable selection and descriptive statistics; The fourth part is the empirical design and basic regression results; The fifth part is heterogeneity test; The sixth part is the analysis of regulatory effect, and the last part is the conclusion and enlightenment.

2. Literature review and research hypothesis

As an important regional system of human production and life, the special spatial form of highly concentrated economic elements naturally forms many characteristics of attracting labor force. From the perspective of workers' means of livelihood and sources of income, the economic arrangement of urban production links provides the front-end budget conditions to support consumers to obtain utility. Previous studies have shown that the inclusive employment opportunities, innovation and entrepreneurship environment and skill upgrading path of cities ensure the possibility of wage premium, and the basic state of obtaining high income in big cities has become an important driving force to attract workers [5,6]. From the perspective of consumers' welfare utility and goods source, the advantages of Urban Producer agglomeration, market proximity and scale effect make urban consumers enjoy more categories of manufactured goods supply, low price index of transportation cost saving and public products and services for collective consumption [5], It provides the basic support of back-end consumption demand for workers to pursue life happiness. Due to the limitations of the traditional framework in the field of manufacturing and the hierarchical analysis of labor income, there has been less attention to the services provided from the city, especially the market-oriented service categories to meet the diversified preferences of consumers. With the economic development and the change of industrial structure, the importance of urban localized service supply has been highlighted, the scope of related economic effects has expanded, and the corresponding research attention has continued to rise, gradually focusing on the impact of urban service provision on population attraction [7–9], Diamond and others further extended the research perspective to the differential welfare preferences that labor mobility depends on [4]. In recent years, the results of analysis combined with China's new urbanization have increased day by day, from urban house prices [1,3], air pollution and ecological environment [7,8], language and geographical distance

[8,9], settlement threshold [9] The public service of medical education [10–12] has been discussed, and a number of high-quality new achievements have emerged. However, the discussion on the impact of urban service supply and consumption convenience on labor mobility still needs to be expanded. At present, the literature directly discussing the diversity of urban services is the research of Li Bing [13], which is carried out from the perspective of changes in service categories caused by urban scale and population structure, and puts forward a very good research entry point. Unfortunately, it does not involve the analysis of how to affect labor mobility and decision-making. In view of this, this paper makes a systematic analysis and Discussion on the impact of urban service diversity on labor mobility with the help of the big data advantages of the network economy platform and the micro survey of China's floating population, so as to make up for the shortcomings of relevant research.

With the continuous promotion of China's new urbanization strategy, the fundamental feature of "people-centered" is returning to the key position of urban talent introduction and management policies. The urban characteristics that meet the differentiated preferences and personalized needs of consumers will gradually become an important driving factor affecting labor mobility. As an important support for urban convenience and comfort, the production capacity, type and supply mode of urban services have created many ways to improve the welfare of local workers.

First of all, the service categories provided by cities constitute the indispensable consumption demand of workers. Production and consumption often have a considerable degree of regional limitations, which determines the priority enjoyed by local residents. Urban services have become an important consideration for labor forces to choose their place of residence. A large number of studies represented by the "comfort theory" point out that in the middle and advanced stages of urbanization and industrialization, local consumer goods provided through the market mechanism constitute an important driving force for urban economic growth, determining labor mobility and improving labor's living willingness and durability [1,14]. For example, catering, film, haircut, medical treatment, training and other industries are closely related to people's life content, the diversity of urban services will become an important focus to attract and retain talents. At present, China has built a well-off society in an all-round way. People's pursuit of quality of life and the upgrading trend of enjoyment consumption are obvious. Quality, health, convenience and intelligence have become the hottest keywords in the new economic era. Urban convenience has increasingly become an important consideration for labor migration and residence. It can be predicted that the richer the types of services provided by the city, the more able it can meet the needs of residents, the stronger the attraction to the labor force and the motivation to live continuously, and the higher the possibility of workers choosing to stay in the city. Therefore, hypothesis 1 is put forward.

Hypothesis 1: The higher the diversity of urban services, the lower the possibility and willingness of workers to move out.

Second, urban services are an important source of improving the effectiveness of residents' comfort preferences. With the economic development and the improvement of income level, people's pursuit of a better life focuses more and more on the content that can stretch the body and mind and pleasant spirit. At present, the new generation of floating population represented by the "post-80s" and "post-90s" are becoming the

main group. Younger people pay more attention to the improvement of quality of life. The diversity of urban services will have a more and more obvious impact on the Migration Decision-making of young labor force. In addition, with the popularity of the Internet economic model, the types of urban services are transmitted to consumers through more transparent channels. Young groups accustomed to online shopping and information consumption are more inclined to cities that can provide more kinds of services. It is particularly noteworthy that in the current new stage of seeking high-level talents in cities, service diversity will also become an important way to screen labor forces with different skills. Highly skilled workers pay more attention to the efficiency improvement brought by professional division of labor. Diversified services can bring a higher degree of opportunity cost savings, which is conducive to workers to give full play to their advantages and ability to obtain high income and form a virtuous circle. The cognitive level of high skilled labor force and the tendency to pursue the quality of life are relatively more obvious. It is more dependent on urban professional and commercial life services. The higher the diversity of urban services, it will play a positive role in retaining more high skilled labor force. Therefore, hypothesis 2 is proposed.

Hypothesis 2: The impact of urban service diversity on labor mobility is heterogeneous, and the younger population and highly skilled labor force are more sensitive to service diversity.

Third, the diversity of urban services improves the efficiency of consumer choice matching and the ability to deal with uncertainty. The diversity of urban services not only reflects the degree of specialization of production division, but also gives consumers a wide choice space and planning menu, which greatly increases the probability of successful matching between demand and supply. At the same time, a wealth of alternative options will form a large buffer space in consumers' psychological accounts, reducing the risk of choice uncertainty and improving welfare satisfaction. The transaction convenience provided by the market-oriented mechanism of the city further enlarges the matching success rate of the diversity of services, and provides the local residents with a consumption scenario of "first come, first served". In addition, with the popularity of smart phones, mobile Internet and business apps in urban life, the channels for labor to obtain life comfort products and services are increasingly diversified. The business model represented by "online to office (oto) further reduces the obstacles for consumers to obtain non tradable products. The popularity of Internet and mobile e-commerce makes the impact of urban services on Residents' lives more direct. Especially in cities with higher degree of informatization and marketization, the regulatory effect of urban service diversity on labor mobility is more obvious, that is, the external environment of the city, especially the construction of informatization and marketization, has a positive regulatory effect on labor mobility. Based on the above analysis, we propose hypothesis 3.

Hypothesis 3: The urban external environment has a regulatory effect on the labor migration effect of service diversity. The higher the degree of urban informatization and marketization, the higher the dependence of labor mobility on urban service diversity.

3. Data source, variable selection and descriptive statistics

3.1. Data sources

Combined with the core theme of this paper, the first key problem we need to solve is to measure the diversity of labor mobility and urban services, which involves the data acquisition and processing of labor mobility and urban services at the micro individual level respectively.

The measurement of labor mobility in this paper adopts the data of China floating population dynamic monitoring survey (CMDS). Based on the principle of time traceability and meeting the research needs, we applied for the survey data in 2017. CMDS is a nationwide sampling survey organized by the China Health Commission, which collects data from floating population over 15 years old in non local areas (counties and cities) according to the principle of randomization. It covers 31 provinces (autonomous regions and municipalities directly under the central government) and the inflow areas with relatively concentrated floating population in Xinjiang Construction Corps, with nearly 200,000 respondents every year. The survey content involves the basic information of sample families and individuals. The data are authoritative and representative in terms of mobility scope and flow direction decision-making, work and social security, economic revenue and expenditure and housing, public services and family planning health. We selected the data of volume a (floating population questionnaire) in 2017, with a total of 169,989 samples. After cleaning the data of the sample on the answers to the questions of "mobility and residence intention" in the questionnaire, and matching it with the level data of cities above prefecture level (including) (hereinafter referred to as cities above prefecture level), we finally retained 126,083 valid samples. At the city level, 2016 data are selected, mainly from China Urban Statistical Yearbook 2017 and CEIC China economic network database.

The selection and division of urban services are generally classified from the tradable degree of cross regional services. With the progress of transportation and logistics technology and the innovation of product supply mode, the boundary and division basis of whether market-oriented goods are local or not are gradually blurred, and there is no unified scientific standard in academia. According to the convenience and regional characteristics of residents' access to supplies in urban areas, we refer to the ideas of Schiff [12], diamond [4] and Li Bing [13], and focus the scope of urban services on industries that provide services in the field of living needs for residents in urban areas, including accommodation and catering, entertainment and leisure, culture and sports, education and medical treatment, residents' daily services and other life services, That is, it corresponds to the life service industry we generally understand. For a long time, due to the uncertainty of industry division and statistical technology, there is a lack of accurate data of life services, and it is very difficult to obtain data at the urban level. However, in recent years, thanks to the popularity of oto life service platform and urban network sites, the data acquisition of life service classification at the urban level has become possible. We choose meituan.com, the largest living service platform in China, to measure the diversity of urban services. (1) "meituan.com" was founded in 2010 and has developed into the largest e-commerce platform for life services in China for many years. After the merger of "public comment" in 2015, its market share has accounted for more than 60% of the country for many years. Its

business areas cover more than 1000 cities in China, and the prefecture level city level has achieved full coverage. Therefore, the life service content provided by "meituan.com" is very representative for the diversity of urban services; (2) the urban services provided by meituan.com cover many fields closely related to residents' lives, including food, takeout, hotel, home stay, film, leisure and entertainment/KTV, life services, beauty/hairdressing/beauty, wedding photography and wedding banquet, kindergarten education in parent-child Park, sports fitness/fitness center, home decoration/building materials/home, learning and training/music training, medical health/PET/car There are nearly 20 categories such as bar/secret room escape, and each category is divided into several sub categories. Except that some categories are repeatedly divided, category statistics are relatively clear and convenient; (3) according to the database setting of "meituan.com" site, each city has a relatively independent field division, which can accurately match the product category and city accordingly. Although a small number of categories do not correspond to the city, the proportion is relatively low, which basically does not affect the data collection. At the same time, in order to better enhance the representativeness of the statistical categories and sub items to the diversity of urban services, the collected field categories are consistent with the existing life service industry division benchmarking, and the coverage of data sorting is expanded as much as possible. The quantitative indicators cover more than 100 secondary sub items of more than 10 categories, including food, leisure and entertainment, life services, etc.

According to the research design and the categories of data provided by meituan website, this paper counts the categories of urban services provided by urban sites above prefecture level in 2016. In order to avoid the deviation of data statistics and the mismatch of category accumulation, the hotel, home stay and air ticket/train ticket categories that prefer cross city consumption, film categories that lack subcategory division and takeout categories are removed in the process of data collection. In the process of statistics, it is mainly included in the secondary sub items under the categories listed under the urban site, and there are the number of corresponding business categories. Through the deletion and cleaning of invalid information such as repeated merchants and missing stores under the secondary sub items of the urban site, about 11.5% of the service data of cities above the prefecture level have been collected 620,000.

3.2. Selection of main variables

This paper mainly studies the mobility and living willingness of floating population from the perspective of the diversity of urban service supply, and examines whether the supply of urban comfort and convenience affects the mobility of labor force from the personal level. Therefore, the setting of dependent variable labor mobility mainly refers to the "mobility and residence intention" in the CMDS questionnaire about "do you intend to stay here in the future?" And "if you intend to stay here, how long do you expect yourself to stay here?" The answer option of the question is to construct the variable "move out decision", and assign the answer "yes" to the sample with more than 5 years as "0", that is, it means that the labor force does not flow and chooses to stay in the living city for a long time; Other options are

assigned "1", which means that the labor force has the choice to continue to flow and move out of the city [13].

The setting of the core explanatory variable of urban service diversity follows the above analysis and processing methods. Based on the data of the "meituan.com" platform, it mainly collects and counts the number of secondary sub items under each category of the home website under the urban site, accumulates and assigns the value to the variable. For example, the secondary sub items under the food category mainly include hot pot, buffet, snack, cake dessert, Cantonese food, vegetarian food, Taiwan/Hakka food and other dishes and meal categories (except for special items such as vouchers), while the secondary sub items under the leisure and entertainment/KTV category are bars, foot massage, bathing/steaming, entertainment and KTV, and the secondary sub items under the life service category mainly include moving Washing care, recycling, psychological counseling, housekeeping services and other daily services. Although the number of stores included in different secondary sub items of each city may have a great impact on the quality of service supply, considering that "meituan.com" itself belongs to the mode of platform stores, the number of platform statistics will be less than the number of stores actually owned by the city, that is, only if the city provides corresponding categories, it means that it has the ability of relevant service supply, so it does not affect the effectiveness of this variable index. In addition, there are several group items that can be further expanded in the secondary sub item classification of some large urban sites. For example, the secondary sub item of "business service" under the living service category of Beijing site also has 8 selection groups such as "lighting equipment leasing, joint office space, industrial and commercial registration agent, mini self-service storage, translation service, consulting service, financial accounting and lawyer service", while there is no drop-down classification under the secondary sub item of "business service" in some cities (of course, many cities do not have business service categories). In order to measure more objectively, we add up the drop-down list of the above type of secondary sub items as the number of the same level. In order to avoid that the regression of variables with simple statistics may lead to unreliable results, further screen the sub items under food categories with relatively complete data, and use the number of food stores as an alternative variable to confirm the robustness of the regression. At the same time, in order to make up for the possible regression result deviation of ignoring the multi-dimensional weights such as store scale and quality, we also use some city data of food chain stores to test the robustness, so as to enhance the basis and persuasion of the research.

Referring to the relevant literature on the migration and migration of labor, this paper also controls personal characteristics and city environment variables. The personal characteristics mainly consider gender, marriage, registered residence, skill level, family monthly income, family living together, family housing situation, etc. The setting of urban environmental variables is constructed by assigning 0 and 1 values from whether to enjoy basic education, medical security, social security and community services, which are directly related to individual migration decisions. In addition, referring to the practices of [14] and Zhou Yinggang [15], urban environment variables also consider urban level variables such as urban economy (GDP per capita), urban scale (population under municipal jurisdiction), urban informatization (number

of mobile phone households + number of Internet access households), urban marketization (GDP/expenditure within the financial budget) and urban openness (total amount of actually utilized foreign capital in that year/urban GDP).

3.3. Descriptive statistics

According to the urban service diversity data collected by the "meituan.com" city sites above prefecture level, **Figure 1** and **Figure 2** respectively show the top 20 cities with the highest frequency of service sub items and the top 20 cities with the highest urban service diversity in all cities. The circles and nodes in **Figure 1** respectively represent the frequency of service categories provided by Chinese cities and their corresponding project contents. Among the most service categories provided by cities, the top 20 are the most common and closely related needs of modern urban life, including hot pot, Sichuan and Hunan cuisine, barbecue, cake and dessert; Domestic service, home maintenance, washing and nursing, text and print advertising in the category of life service; Fitness center in sports and fitness category; Maternal and infant care, early childhood education, children's paradise and children's photography under the category of mother and child parent-child; Hairdressing, beauty and body care under beauty category; Bathing/steaming and bars under entertainment and leisure categories; Foreign language training in learning and training categories; Repair and maintenance under automobile category; Wedding photography under marriage category, etc. Although we have deleted repeated stores in the process of data collection, there is still the possibility of repeated measurement between sub items, but it basically reflects the content source of life comfort benefits that cities can provide.

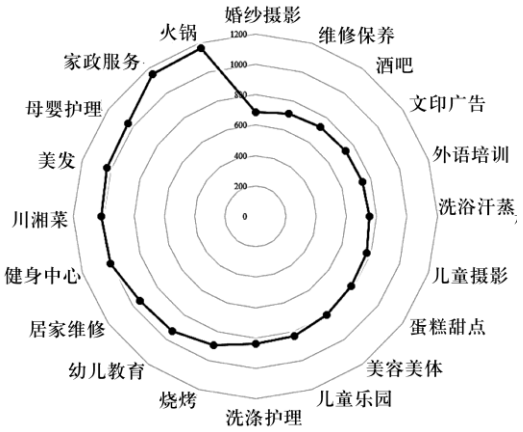

Figure 1. Top 20 sub items with the highest.
Frequency of urban services. Service categories
Data source: The author estimates.

The circle in **Figure 2** represents the number and location of urban services. Among the cities with the highest diversity of urban services, Shanghai, Beijing and Shenzhen occupy the top three, showing that these three cities are in the leading position in the supply capacity of living comfort and convenience. The following cities, such as Guangzhou, Hangzhou, Chengdu, Wuhan and Nanjing, have a large floating population and occupy the top position in the ranking of urban population attraction. To some extent, it shows that the diversity of urban services may be an important

source of urban attraction to population. In order to further confirm the above judgment, we fit the service diversity data of cities above prefecture level with the ranking list of urban population attraction in the Research Report on China's urban vitality in the first quarter of 2019 released by Baidu map, and the degree of fit between the two is as high as 88 91%, which not only confirms the reliability of the data in this paper, but also provides strong support for the next empirical test.

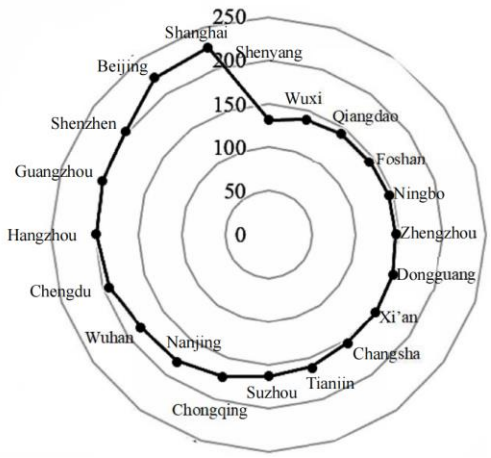

Figure 2. Top 20 cities in terms of urban.
Frequency of urban services. Service categories
Data source: The author estimates.

Table 1 gives the definitions and descriptive statistics of the main variables. The average value of urban service diversity is 103, that is, the average service categories provided by each city are more than 100, which shows the high convenience and comfort of urban life at this stage, but the standard deviation of this index reaches 69, indicating that there are still great differences between cities. From the perspective of personal data, nearly 12.5% of the total Among 610,000 valid samples, 66.6% chose to stay in the city for a long time 31%, of which 81 34% choose to live for more than 10 years and settle down, and the rest are long-term residence for 6 to 10 years; In the selection of less than 5 years and continuous flow of 47 Among 72% of the samples, 51.7% chose short-term residence and continuous mobility for less than 12 years 84%, of which 47 63% chose to continue outflow, accounting for about 24.5% of the total samples 72% . We also refer to Zhang Cui [14] to test the differences of labor mobility among different labor skills and age groups (young and middle-aged people under the age of 45 and middle-aged and elderly people over the age of 45) based on the median diversity of urban services. The results show that the average value of labor mobility in cities with high service diversity is significantly lower than that in cities with low service diversity; Among the same people who choose to move, the willingness of low skilled labor force and middle-aged and elderly population in cities with high service diversity to choose to move is relatively higher, and the difference between people in cities with low service diversity is relatively small. In addition, compared with the low skilled workers living in cities with lower service diversification, the high skilled workers living in cities with higher service diversification are more sensitive to the service category, and the middle-aged and young labor groups have a similar performance.

Table 1. Main variables and descriptive statistics.

Variable	Variable description	Sample size	Average value	Standard deviation
Urban service diversity	Total number of secondary sub items under "meituan.com" life service category	126,083	103	69
Labor mobility	The labor force will not migrate and stay in the city for a long time = 0, otherwise = 1	126,083	0.3272	0.3914
Skill level	Education level converted to years	126,083	10.3913	4.0102
High skill variable	High school and above = 1, others = 0	126,083	0.1822	0.3614
Age	Survey year minus year of birth	126,083	36.6611	11.0742
Marriage	Marriage duration = 1, others = 0	123,571	0.7626	0.2538
Gender	Male = 1, female = 0	126,083	0.5157	0.5002
Registered residence nature	Non agricultural household registration = 1, others = 0	122,746	0.2129	0.3568
Family income	Average monthly income of the family in the past year, taken as logarithm	126,083	9.0324	0.6589
Live with family	Number of other family members living in the same household	124,692	3.1401	1.2002
Family housing	Self owned housing assignment = 1, others = 0	126,083	0.2807	0.4519
Urban informatization	Number of mobile phone households + number of Internet access households, take logarithm	123,179	6.3288	2.8526
Urban Marketization	GDP/expenditure within budget	123,179	8.0319	3.2973
Urban openness	Total amount of foreign capital actually utilized in the current year / urban GDP	122,375	0.0358	0.0281

4. Empirical design and basic regression results

4.1. Model setting and regression strategy

Focusing on the diversity of urban services and labor mobility, this paper mainly discusses the types of urban services from the individual level, and makes an empirical test on whether the labor force that has entered the city chooses to flow. According to the setting of main variables, this paper selects the linear probability regression equation for verification, and constructs a standard probit model to investigate the impact of urban service diversity on labor mobility. Specifically expressed as:

$$P(LMD_i = 1 \mid Diversity, X) = \Phi(X'\beta) = \Phi(\alpha + \beta_1 Diversity_i + \beta X + \varepsilon_i) \quad (1)$$

Where LMDi is the binary selection variable of labor mobility, and P(LMDi = 1) represents the probability of labor mobility, Φ The function conforms to the standard normal distribution, $Diversity_i$ is the variable of urban service diversity, and X represents the set of control variables such as personal characteristics and urban environmental characteristics, ε_i is the random error term.

In the process of regression of the coefficient of the independent variable of urban service diversity with labor mobility as the dependent variable, the key to the analysis of the results lies in how to solve the endogenous problems caused by variable omission and reverse causality. We mainly try to overcome it in two ways. First, in the process of basic regression and grouping regression, the control variables and cross terms are introduced independently at different levels, and the reliability of the

monitoring results is improved by observing the changes of the coefficients and significance of the main explanatory variables. The second is to use the instrumental variable method. A good instrumental variable needs to meet the requirements related to the main endogenous variables and irrelevant to the exogenous residual term [16]. Considering that this factor should be related to the diversity of urban services, but can not have a direct impact on labor mobility, the geographical distance between each city and the provincial capital city of the province is selected as a tool variable. The distance between the provincial capital and the city will not affect the development of the economy, but it will not affect the development of the economy, That is, it can be considered that it has no direct connection with the current flow of urban workers, and theoretically meets the requirements of instrumental variables.

4.2. Basic regression analysis

Table 2 shows the basic regression results of the impact of urban service diversity on labor mobility, mainly showing the regression coefficient and marginal effect under the joint action of urban service diversity and control variables. Among them, (1) and (2) are the regression coefficient results after introducing individual level and urban environmental control variables step by step, (3) and (4) are the coefficients and marginal effects of re regression after considering all control variables. The IV probit estimation results after introducing instrumental variables are shown in columns (5) and (6). It can be seen that whether the regression coefficients of individual level control variables, urban level control variables or the estimation results of all control variables are considered, it shows that urban service diversity has a significant inhibitory effect on labor mobility. This preliminary shows that compared with the labor force preparing to live locally for a long time, the diversity of urban services can attract the labor force and reduce the probability of making mobility decisions. The results show that the marginal effect of urban service diversity on labor mobility is 3.5% 23, which means that for every 1% increase in urban service diversity, the probability of workers planning to move out of the city will be reduced by 3.5% 23%. That is, after controlling the endogenous problems caused by individual and urban characteristics and missing variables, the higher the diversity of urban services, the lower the possibility of labor choice and mobility. The above findings not only verify the validity of hypothesis 1, but also reflect the attraction of urban service supply capacity and category increase to labor force. In the 2017 floating population monitoring survey, the proportion of labor force willing to move out of cities is about 30%, which will be expanded to the total floating population in China. For every 10% increase in urban service diversity, a total of about 7.5 million labor force will be retained. Combined with the changes of population structure at the present stage and the basic situation of labor agglomeration mode and talent competition among cities, although the growth of China's total population is slowing down under the influence of family planning policy, and the "population scale dividend" brought by fewer children and aging is weakened, there are still "population quality dividends" of labor mobility and allocation between urban and rural areas and industries and the improvement of overall education need to be fully developed, Developed cities and core cities will become the main positions for high-quality labor agglomeration

competition, and the comfort benefits brought by the diversity of urban services will become an important chip for talent attraction to a large extent. In particular, the central government is gradually implementing fertility promotion policies, including "liberalizing the three child limit", and proposed to "implement the national strategy to actively respond to aging", and population development is also moving towards a high-quality stage. It can be predicted that meeting the higher-level needs and preferences of workers will become an important focus of local government talent attraction policies for a long time in the future. Under the background that the "new generation" has become the main composition of the floating population, the diversification of urban services is the general trend.

The results of columns (5) and (6) not only show the impact of urban service diversity, but also show the differences of labor mobility between different genders. Compared with men, women are less willing to move; the more people living with their families, the higher the average monthly income, and the lower the probability of labor mobility; Married state, private housing and city registered residence have a significant inhibitory effect on labor mobility. In addition to community services, urban public services based on personal data have passed the significance test, which has a negative impact on labor mobility, highlighting the importance of children's education, medical insurance and social security in labor mobility. It is noteworthy that the coefficient and significance obtained by regression with age and skill level as control variables show an unclear influence relationship. Among them, in stepwise regression and full sample regression, the age coefficient is positive, but it does not pass the significance test. In IV probit regression, the coefficient is significant and positive at the level of 10%, and the results tend to the older the floating population, the higher the probability of migration; The coefficient of skill level passed the significance test of 10% in step-by-step regression and full sample regression, which shows that the higher the skill, the greater the possibility of mobility. However, the results after adding instrumental variables support the inference of hypothesis 2, that is, the higher the skill level, the more likely the labor force is to stay in the city.

Table 2. Basic regression results.

Variable	Probit Regression coefficient	Probit Regression coefficient	Probit Regression coefficient	Probit Marginal effect	Ivprobit Regression coefficient	Ivprobit Marginal effect
	(1)	(2)	(3)	(4)	(5)	(6)
Urban service diversity	−0.9260**	−1.2011***	−1.1843**	−2.6820**	−2.0514***	−3.2302***
	(−6.49)	(−8.61)	(−7.27)	(−7.27)	(−14.691)	(−14.691)
Age	0.3126		0.5240	1.6211	0.7362*	2.0144*
	(10.63)		(14.31)	(14.31)	(21.52)	(21.52)
Gender	0.1642**		0.2873**	0.9464**	0.5728**	1.8725**
	(19.53)		(28.57)	(28.57)	(31.66)	(31.66)
Marriage	−0.0621***		−0.1715**	−0.7664**	−0.2254***	−0.9043***
	(−1.16)		(−3.25)	(−3.25)	(−5.79)	(−5.79)
Household register	−0.2314**		−0.3048**	−1.0621**	−0.5425**	−2.1487**
	(−2.17)		(−2.98)	(−2.98)	(−4.73)	(−4.73)

Skill level	0.2647*		0.3174*	0.8972*	−0.1423**	−0.6073**
	(3.24)		(5.63)	(5.63)	(−4.19)	(−4.19)
Live with family	−1.4312***		−2.0875***	−5.2119***	−2.5331***	−5.7942***
	(−12.10)		(−17.13)	(−17.13)	(−20.11)	(−20.11)
Family housing	−0.0880**		−0.0932**	−0.2663**	−0.1064**	−0.3314**
	(−1.17)		(−1.33)	(−1.33)	(−1.56)	(−1.56)
Elementary education		−0.1973***	−0.2711***	−0.8732***	−0.3226***	−0.9452***
		(3.46)	(4.83)	(4.83)	(5.19)	(5.19)
Social security		0.0561**	0.0684***	0.1891***	0.0713***	0.2143***
		(2.67)	(3.82)	(3.82)	(4.33)	(4.33)
Medical security		−0.1624**	−0.2186**	−0.6243**	−0.3624**	−0.8864**
		(−5.42)	(−6.77)	(−6.77)	(−8.29)	(−8.29)
Community service		−0.3240	−0.4213	−2.5396	−0.5971	−3.0995
		(−2.78)	(−2.97)	(−2.97)	(−3.02)	(−3.02)
Urban control variables	No	No	Yes	Yes	Yes	Yes
Urban fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Wald test					5.7431***	5.7431***
Pseudo R2	0.2164	0.2164	0.3022	0.3022		
Sample size	123,179	122,375	122,375	122,375	122,375	122,375

Note: The values in brackets are t values, *, * *, * * *, which are significant at the levels of 10%, 5% and 1% respectively, the same below.

4.3. Robustness test

First, re select the robustness test of instrumental variables. The basic regression uses the geographical distance between the city and the provincial capital as the instrumental variable. Although endogeneity and reverse causality are treated to a certain extent, in order to more carefully confirm the results of the basic regression, we re select other indicators as the instrumental variable for robustness test. Referring to the idea of Li Bing [13], query and sort out the number of service enterprises in cities above prefecture level in the 2008 national economic census as a new instrumental variable for robust regression. The results show that after controlling the endogeneity of urban service categories, the regression coefficient and marginal effect of labor mobility are still significantly negatively correlated, and the inhibitory effect of urban service diversity on labor mobility remains stable. It is also found that young groups and highly skilled labor force have high dependence and sensitivity on urban service diversity. In order to further observe the age and skill level sensitivity effects of urban service diversity in the process of affecting labor mobility, and introduce age, skill level and their cross terms with urban service diversity, it can be seen from the results that the two-step robust regression has reached a consistent conclusion, and the coefficients of the cross terms have passed the significance test and show the age and skill level sensitivity similar to the basic regression, That is, the degree of urban service diversity affecting labor mobility is negatively correlated with age and positively correlated with skill level.

Second, change the sample range and robust regression of some control variables.

In order to eliminate the influence of overall sample selection deviation, the samples at the individual level are selected for robustness test. First, eliminate some mega cities for return. In order to further verify the reliability of the basic regression results, we removed the four mega cities of Beijing, Shanghai, Guangzhou and Shenzhen, and adjusted the scope of the original samples for robustness test. From the results, there is not much difference between the conclusion of the impact of urban service diversity on labor mobility and the basic regression. The difference is that the regression coefficient decreases, the significance decreases slightly, and age as a sensitive variable also shows a similar law, which shows that the sensitivity of labor mobility in non Mega cities to service diversity will decrease slightly, but the coefficient of skill level increases, To some extent, it reflects the skill bias of urban talent competition. Second, considering that the dynamic monitoring of China's floating population includes other special surveys and sample ranges, we turn to the data in volume C of the special survey instead of the original volume a sample for City matching. The survey is a special survey on key areas of population health carried out in Suzhou, Qingdao, Zhengzhou, Changsha, Guangzhou, Jiulongpo District of Chongqing, Xishuangbanna Prefecture and Urumqi. The problems of floating population are consistent with volume a, and cover cities of different types and regions, which is representative. The total number of samples of the questionnaire was 13,998, and 10,296 valid samples were retained after data cleaning. The results of IV probit regression show that the regression coefficient and significance corresponding to the key variables and their cross terms have not changed much, which further proves the robustness of the relevant conclusions.

Third, consider the robust regression of alternative indicators of store quantity, scale and quality. In order to present more abundant and reliable results, the data of food categories with relatively complete data of "meituan.com" are further used. After processing, an alternative index of urban service diversity is constructed, and a robust regression is made again. On the one hand, the idea of quantity aggregation is still continued. The number of food stores in each city is tested as an indicator of urban service diversity. The results show that the main conclusions are basically consistent except for the slight difference in the size and significance of individual coefficients. On the other hand, consider how to make up for the singleness of information presented only by the number of stores, take into account the factors of scale and quality, and choose the number of stores in urban chain operation as a compromise index for robust regression. From the results, it may be that the significance of the regression coefficient has decreased due to the elimination of many cities with missing indicators in the process of data cleaning, but the impact of urban service diversity on labor mobility is not much different from the basic regression results, and the conclusion is consistent.

Table 3. Sensitivity difference of urban service diversity: Grouping results of age and skill level.

	Young and middle-aged (1)	**Middle aged and elderly (2)**	**High skill (3)**	**Low skill (4)**
Urban service diversity	−4.6211**	−1.9732	−4.0269***	−2.4562***
	(−10.16)	(−5.32)	(−6.73)	(−5.42)
Urban service diversity × Age	0.0420**	0.0191*	0.0263**	0.0338**
	(1.06)	(2.18)	(1.49)	(1.58)
Age	2.1625**	3.1986**	1.0742*	3.0881*
	(1.67)	(3.26)	(5.67)	(3.66)
Urban service diversity × Skill level	−0.0624**	−0.0434**	−0.0227*	−0.0130*
	(−2.16)	(−1.37)	(−5.92)	(−8.47)
Skill level	−0.3091***	−0.8916***	−0.5738***	−0.7014***
	(8.93)	(7.65)	(4.52)	(9.77)
Control variable	Yes	Yes	Yes	Yes
Urban fixed effect	Yes	Yes	Yes	Yes
Sample size	73,219	49,156	50,174	72,201
Estimation method	IV-Probit	IV-Probit	IV-Probit	IV-Probit

5. Heterogeneity analysis

5.1. Sub sample regression considering differences in age and skill level

Based on the age hypothesis and the skill level of the sample, we further discuss the intersection of the age and the skill level of the sample. Firstly, the age is divided into middle-aged and young group and middle-aged and old group with 45 years old as the node, and the age cross item is added. From the results of columns (1) and (2) in **Table 3**, it can be found that for the labor force of different ages, their dependence and sensitivity to the diversity of urban services are quite different. The urban service coefficient of the middle-aged and elderly group is negative, which does not pass the significance test, and the cross term of age and urban services shows a significant (10% level) negative impact, indicating that for the middle-aged and elderly floating population, urban services are not the main factor to determine whether they are mobile or not, but under the same conditions, they still prefer cities with higher diversity of urban services. In comparison, both age and cross items of the young and middle-aged group passed the significance test at the level of 5%, and the coefficients were significantly negative. The results showed that the younger the floating population, the higher the diversity of urban services, the smaller the probability of migration in the city. The preliminary performance was that for every 1% increase in urban service categories, the probability of migration of young and middle-aged labor force decreased by 4.5% 62% . It can be seen that the diversity of urban services is an important consideration for the mobility and migration of young people. The results of columns (3) and (4) show the differences in the impact of urban service diversity on labor mobility with different skill levels, although the regression results are basically similar to the law of age group, that is, the mobility of highly skilled labor force is more sensitive to urban service diversity, while the sensitivity of low skilled labor force is relatively low, However, the regression results of the low skill group still

show the importance of urban service diversity in labor mobility. That is to say, whether for high skilled labor force or low skilled labor force, the comfort welfare brought by the diversity of urban services is very important, which shows the era background and development trend that the floating population pays attention to the quality of life and pursues happiness under the current development situation. So far, hypothesis 2 proposed above has also been proved.

Table 4. Grouping regression results of regional heterogeneity and city size.

	Eastern Region (1)	**Central and Western Regions (2)**	**Big city group (3)**	**Small and medium-sized city group (4)**
Urban service diversity	−4.0262***	−1.0854***	−3.0123***	−3.6019***
	(−12.16)	(−6.72)	(−8.09)	(−10.39)
Urban service diversity × Age	0.1071**	0.0430**	0.2384**	0.1085**
	(3.09)	(5.76)	(3.17)	(2.65)
Age	0.5262	2.2693**	1.2851*	2.0527*
	(10.72)	(23.87)	(8.76)	(13.82)
Urban service diversity × Skill level	−0.1822***	−0.0681***	−0.1074***	−0.0921***
	(−3.41)	(−1.37)	(−4.65)	(−3.31)
Skill level	−0.4124**	−0.2162**	−1.2490***	−0.3698***
	(−11.01)	(−6.43)	(−14.35)	(−9.57)
Control variable	Yes	Yes	Yes	Yes
Urban fixed effect	Yes	Yes	Yes	Yes
Sample size	68,732	53,643	60,579	61,796
Estimation method	IV-Probit	IV-Probit	IV-Probit	IV-Probit

5.2. Discussion on regional heterogeneity and city size grouping

Considering the possible regional and urban scale deviation in sample selection, in addition to grouping according to age and skill level, the differences between cities of different sizes in the eastern, central and western regions may also cause changes in the results. Columns (1) and (2) of **Table 4** show the regression results of IV probit method for the grouping of eastern and central and western regions respectively. It can be seen that the coefficients of urban service diversity have passed the significance test of 1% and show a negative correlation, which verifies the robustness of the basic regression results to a certain extent. It is noteworthy that labor mobility in the central and western regions is relatively less affected by urban service diversity, and labor mobility in the eastern region is more sensitive to urban service diversity. Combined with the cross items of age and skill level, the results further show that at this stage, the labor force with strong ability or younger age still chooses to flow to the eastern cities. Columns (3) and (4) show the regression results grouped according to the city size (divided into large city group and small and medium-sized city group with a population of 5 million as the node). It can be found that compared with the floating population in large cities, the labor mobility in small and medium-sized cities is more sensitive to urban service diversity, that is, the marginal effect of the growth of service

diversity in small and medium-sized cities on the floating population is greater. Combined with the regulatory effect of urban informatization and marketization, we have further enriched the sources of attraction of different types of urban heterogeneity to the labor force, reflecting the comfort welfare reflected by the diversity of urban services, which is becoming an important channel for big cities to extract the "demographic dividend" of small and medium-sized cities.

6. Regulatory effect analysis

The comfort and convenience provided by the diversity of urban services need to be transmitted to consumers through corresponding channels and paths. Under the background of the era when smart phones, mobile payment and Internet platforms are increasingly embedded in people's life and consumption, the information construction and marketization degree of cities have gradually become the regulation channel connecting the diversity of urban services and labor flow. We introduce urban informatization, marketization and the intersection between the two and urban service diversity for further discussion. **Table 5** shows the regression results of the regulatory effects of urban informatization and marketization. Among them, column (1) considers urban informatization and urban marketization as general variables. After regression, it is found that both urban service diversity and newly added control variables show a negative correlation with labor outflow decision-making, and all pass the 10% significance test. While verifying the reliability of the basic regression conclusion again, they also reflect the independence of the impact of urban informatization and urban marketization to a certain extent. Columns (2) and (3) mainly discuss the regulatory role of urban informatization. We find that the results of cross term regression coefficient and marginal effect observed are significantly negative, indicating that informatization has a reinforcing effect on urban service diversity, which can further reduce the probability of labor mobility, and shows that the construction of urban mobile Internet and other information technologies will effectively enhance the availability of comfort benefits, So as to enhance the willingness of labor force to stay in the city. It is worth noting that the regulatory role of urban informatization is more prominent in low skilled groups, which shows that urban informatization has a more significant impact on ordinary labor force. The regression results of the adjustment effect of urban marketization are shown in columns (4) and (5) of **Table 5**. Marketization also shows the strengthening effect on the diversity of urban services. The high level of marketization provides a good living environment for service shops and enterprises related to life convenience, which will further enrich the channels for labor to live in cities and obtain corresponding products and services, so as to reduce the willingness and probability of labor mobility.

Table 5. Regression results of adjustment effects of urban informatization and marketization.

	Full sample (1)	Young and middle-aged (2)	Middle aged and elderly (3)	High skill (4)	Low skill (5)
Urban service diversity	−1.6582***	−2.6714**	−0.9269**	−3.9237***	−1.3522***
	(−8.26)	(−12.78)	(−9.12)	(−6.54)	(−4.26)
Urban service diversity × Urban informatization		−0.1062**	−0.0870**	−0.2351**	−0.3526**
		(4.83)	(2.68)	(4.98)	(6.88)
Urban informatization	−0.9376*	−1.7327**	−0.6479**	−1.8452	−2.0231***
	(3.64)	(5.21)	(2.99)	(5.66)	(15.52)
Urban service diversity × Urban Marketization		−0.1065***	−0.0266***	−0.0198*	−0.2084*
		(−3.67)	(−1.98)	(−2.76)	(−9.61)
Urban Marketization	−0.1053**	−0.0976*	−0.0624	−0.2814*	−0.1950*
	(3.16)	(4.54)	(1.13)	(6.33)	(4.61)
Control variable	Yes	Yes	Yes	Yes	Yes
Urban fixed effect	Yes	Yes	Yes	Yes	Yes
Sample size	122,375	73,219	49,156	50,174	72,201
Estimation method	IV-Probit	IV-Probit	IV-Probit	IV-Probit	IV-Probit

7. Conclusion and Enlightenment

From the perspective of the comfort and convenience provided by the diversity of urban services and the impact of labor mobility, this paper uses the big data of "meituan.com" combined with the personal micro data of China's floating population dynamic monitoring survey in 2017. After choosing the geographical distance between the city and the provincial capital as the instrumental variable to deal with the endogenous problem, the research results confirm the significant impact of urban service diversity on labor mobility. Specifically, for the floating population, for every 1% increase in urban service diversity, the probability that the labor force intends to move out of the city decreases by 3.5% 23% . That is, when the endogenous problems caused by individual and urban characteristics and missing variables are controlled, the higher the diversity of urban services, the lower the possibility of labor choice and mobility. The results of grouping and regression of samples according to age node and skill level further show the sensitive differences of different labor groups to urban service diversity. Compared with the middle-aged and elderly groups, the younger the population, the higher the diversity of services, the less likely it is to move out of cities. The initial performance is that for every 1% increase in urban service categories, the probability of middle-aged and young labor force moving out decreases by 4.5% 62%. In terms of the impact on groups with different skill levels, the comfort benefits brought by urban service diversity are very important for both high skilled labor force and low skilled labor force, but relatively speaking, high skilled labor force is more sensitive. Further expansion analysis found that the urban information construction and marketization level have a positive amplification effect on the diversity of urban services, attracting and retaining talents, that is, the construction of urban mobile Internet and other information technologies and the improvement of marketization level will further enrich the channels for labor to live in cities and obtain corresponding

products and services, so as to reduce the willingness and probability of labor mobility and migration. In addition, the results of regional differences show that the impact of urban service diversity on labor mobility in the central and western regions is smaller than that in the eastern region. At this stage, the labor force with strong ability or younger age still chooses to stay in the eastern cities; Compared with small and medium-sized cities, labor mobility in large cities is more sensitive to urban service diversity, which shows that the comfort welfare reflected by urban service diversity is becoming an important channel for large cities to extract the "demographic dividend" of small and medium-sized cities.

Under the background of increasingly fierce talent competition, this study provides policy enlightenment for the labor competition of attracting and retaining talents in cities. The Fifth Plenary Session of the 19th CPC Central Committee and the national 14th five year plan put forward "comprehensively improving the quality of cities", indicating that "we should accelerate the transformation of urban development mode", "promote new urban construction" and "build a livable city". Under this new direction, the city is facing great changes. Urban development should be more in line with personal welfare preferences, and provide more diversified comfort and convenience through market-oriented and information-based environment construction and policy guidance. Urban managers should fully grasp the opportunities of the era when mobile Internet technology is widely used, and activate new economic formats such as mobile payment, sharing economy and oto life services. The new generation and highly skilled talents will choose to "stay" rather than "move out". In March 2020, the CPC Central Committee and the State Council issued the opinions on building a more perfect system and mechanism for market-oriented allocation of factors, which clearly proposed to "further stimulate the creativity and market vitality of the whole society and build a more perfect system and mechanism for market-oriented allocation of factors". Urban managers and policy designers should proceed from reality and cultivate and develop market forms that are more in line with personal welfare preferences, Gradually improve the quality of urban labor factors by building a more diversified urban service supply system. In particular, in urban governance decision-making, it is necessary to carry out vertical and horizontal comparative analysis of urban population structure, spatial distribution and agglomeration characteristics in combination with the good data basis of the seventh census, study and judge the long-term trend of labor mobility, and build a comprehensive competitive advantage from the "two-way force" of supply side reform and demand side management of urban services.

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