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WET MARKET VENDOR PROFITS IN NANJING, CHINA: A SPATIAL ANALYSIS

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Abstract

Wet markets play an important role in urban food security in many Asian countries. Existing research pays more attention to the wet market food accessibility of urban residents and less on the business operations and profits of wet market vendors. Based on a survey of 1,119 small food enterprises in Nanjing, this study employs the spatial analytical method Geodetector to explore spatial variations in vendor profits in Nanjing. The study shows obvious spatial differentiation in the profits of wet market vendors across the city and draws several conclusions. Profitability is mainly related to the demographic features of vendors, their business expenses, and payment schemes. It is also related to broader socioeconomic factors at the district level, including local GDP, average income, urban infrastructure, and number of residential neighbourhoods. The characteristics of vendors and their businesses have a more significant relationship with business profit than district socio-economic factors. There is also a strong mutual enhancement effect among these factors. Almost all identified determinants of profitability are stronger in peri-urban than urban areas. Therefore, there is greater potential for increasing peri-urban vendors' profits by changing these variables.

Keywords

mall food vendors, determinants, spatial variation, food environment, food security

This is the 32nd discussion paper in a series published by the Hungry Cities Partnership (HCP), an international research project examining food security and inclusive growth in cities in the Global South. The five-year collaborative project aims to understand how cities in the Global South will manage the food security challenges arising from rapid urbanization and the transformation of urban food systems. The Partnership is funded by the Social Sciences and Humanities Research Council of Canada (SSHRC) and the International Development Research Centre (IDRC) through the International Partnerships for Sustainable Societies (IPaSS) Program. Additional support was provided by the Queen Elizabeth Diamond Jubilee Advanced Scholars Program.

Introduction

China's urbanization increased from 18% of the total population in 1978 to 58% in 2017 (NBS 2018), and is expected to exceed 70% by 2030 (State Council 2017). Food security is a central social and economic requirement for sustainable urban development in China (Si et al 2017). Diverse food sources, including both modern and traditional food outlets, play a pivotal role in determining levels of urban food security in Chinese cities. The urban food supply system includes supermarkets, wet market retailers, small food stores, and street vendors. Residents of Chinese cities tend to shop for processed and packaged food in supermarkets and for fresh produce, especially vegetables, in wet markets (Zhang and Pan 2013). Traditional marketing channels, particularly wet markets, dominate the retailing of vegetables and meat (Si et al 2018, Zhang and Pan 2013). Besides vegetables and meat, wet markets specialize in fruit, aquatic products (such as live fish and shrimp) and staple foods (such as rice and other grains and flours) (Zhong et al 2018).

In the early 2000s, the Chinese government launched a program, known as *nonggaichao*, to convert wet markets into supermarkets as part of urban renewal plans. However, the program failed because wet markets carry a variety of fresh foods at lower cost, providing a price advantage over supermarkets (Zhang and Pan 2013). With the failure of the *nonggaichao* campaign, supermarkets became less competitive than wet markets (Hu et al 2010, Zhang and Pan 2013). As a result, wet markets are playing an increasingly important role in China's urban food security (Si et al 2016). A previous Hungry Cities Partnership (HCP) study of Nanjing showed that the vast majority (93%) of households had accessed food from wet markets in the previous year. Among these patrons, 75% visited wet markets at least five days a week, indicating the high degree of accessibility of wet markets in the city (Si and Zhong 2018).

According to the Plan of Commercial Network in Nanjing (2015-2030) for Public Consultation, more than 200 new wet markets will be established in Nanjing by 2030 (NUPB 2017, Zhong et al 2018). This suggests government recognition of the important role of wet markets in maintaining urban food security. However, urban commercial network planning only takes into account demographic and economic indicators, ignoring the sustainability of the operations of the retailers. APA (2007) proposed that urban planners should understand the economic impacts and future potential of food retailing. Therefore, the profitability of wet market vendors is also an important factor to be considered in the inclusive growth of the urban food environment (Crush 2016).

Despite their important role, wet markets are still under-studied and insufficiently accounted for in food security policies. Existing studies have focused more on the quality and safety of food provided at the wet markets (Bougoure et al 2008, Chen et al 2015), consumer preference (Goldman et al 2002), and psychological satisfaction from wet market shopping (Maruyama and Wu 2014). Others have looked at price advantage (Cui 2011) and the diversity of fresh food (Si et al 2016). However, the nature of wet market businesses and the factors that affect their profitability have not been addressed. This paper therefore provides a novel perspective on wet market food retailers' operating conditions in Nanjing. The main objectives of the study are (a) to examine wet market vendors' operating conditions using data from the HCP food retailer survey of the city; (b) analyze the spatial distribution of wet market vendor profitability in the city; and (c) identify the various factors associated with vendor profits using a geographical detector model.

Methodology

Nanjing has a population of 8.28 million and is the capital city of Jiangsu province. Located in the southwest of Jiangsu, Nanjing is about 300km from Shanghai. HCP studies show that Nanjing has a high level of household food security: the average HFIAS (Household Food Insecurity Access Score) was a very low 0.61, indicating that very few

households experience any of the usual symptoms of food insecurity (Si et al 2016). Wet markets are one of the major types of food retail in Nanjing and there were 351 of these in the city in 2017. The Nanjing municipality has 11 districts with variable population densities and economic strength. Table 1 shows the distribution of wet markets among the different districts of the city.

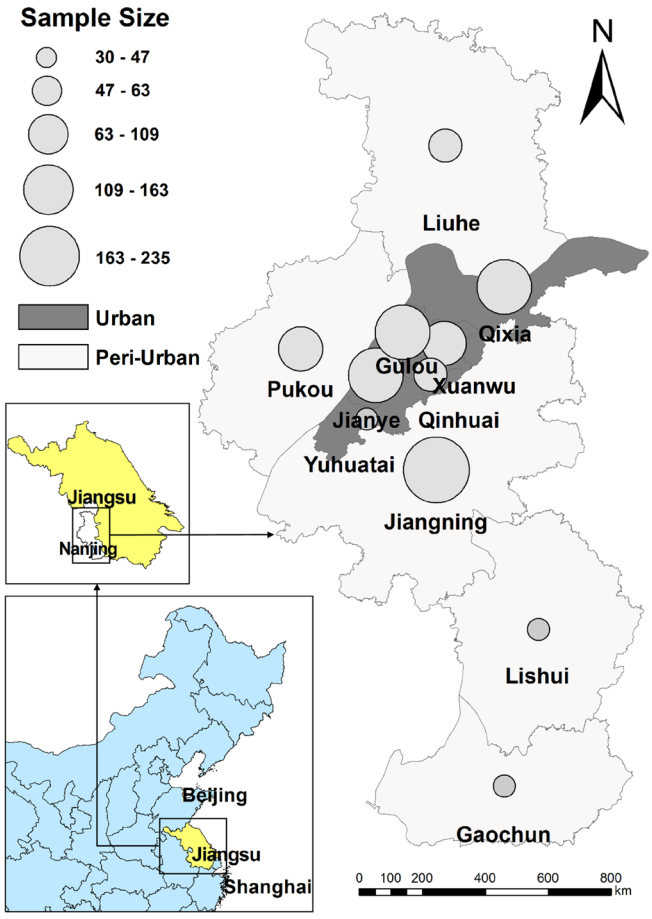
The Hungry Cities Partnership conducted a city-wide survey of 1,119 small food retailers in Nanjing in 2017, including wet market vendors, small food stores, and street vendors near wet markets (Figure 1). The wet markets surveyed were randomly sampled from all wet markets in Nanjing. In total, 42 wet markets in 11 districts were selected. Students from Nanjing University conducted a census of all vendors within and surrounding these markets. They sketched the layout of these wet markets and numbered the vendors within them. These vendors were then randomly sampled and the sample size was determined by the number of food vendors in each wet market. More food vendors were sampled from wet markets with larger number of vendors. An extensive survey was then administered using digital survey instruments on android tablets to these randomly selected vendors. Two rounds of survey were conducted. The first round used this random sampling approach and surveyed 864 vendors, including wet market vendors, small food shop owners and street vendors, in and within 50 metres of these randomly selected markets. The second round targeted youth vendors and surveyed 255 vendors who were 35 years old or younger. The data were then uploaded and synthesized on the online Ona database. After data review and cleaning, a total of 555 vendors provided data on their business profits, and 383 were wet market vendors.

TABLE 1: Population and Wet Market Distribution by District

Types	Districts	Population (million)	% of population	Area (km^2)	Density (people/km^2)	No. of wet markets
Urban*	Gulou	1.25	15.09	53.00	23,574	54
	Qinhuai	1.00	12.12	49.11	20,438	27
	Xuanwu	0.64	7.78	75.46	8,538	21
	Jianye	0.46	5.55	82.93	5,543	25
	Yuhuatai	0.44	5.27	132.39	3,296	27
	Qixia	0.69	8.37	395.44	1,753	38
Peri-urban	Pukou	0.77	9.30	910.49	846	37
	Jiangning	1.22	14.68	1,563.32	778	56
	Liuhe	0.94	11.41	1,470.99	642	37
	Gaochun	0.43	5.20	790.23	545	16
	Lishui	0.43	5.22	1,063.67	407	13
Total		8.28	100.00	6,587.03	1,257	351

* Urban districts are those with a population density of >1,500 people per sq km
Source: Statistics Yearbook of Nanjing, 2017

FIGURE 1: Location of Sampled Vendors in Nanjing



District-level socio-economic data was collected from the Nanjing Statistical Yearbook 2017 on factors such as GDP, disposable income per capita, and population of sampled districts. Metro station data was collected from the official website of Nanjing Metro at http://www.njmetro.com.cn/. Data on residential neighbourhoods and wet market location was collected from crawling Baidu map points of interest. The accessibility data used in the paper comes from a time/cost-based Nanjing wet market accessibility calculation (Tang 2018).

Definition of Variables

The dependent variable used in the study was wet market vendor profits (in the form of answers to the question: "In the last month, what was the net profit you earned at this business?"). The primary independent variables potentially affecting wet market vendor profits were as follows:

- *Age:* the older the vendor, the more sales experience he or she has, but the ability to physically operate a business may decline with age. The impact of age is therefore uncertain.
- *Sex:* there were 22% more women retailers than men, but studies in other contexts suggest that women are more concentrated in the food sector (Grant 2013), so the impact of the sex of the operator on profitability is uncertain.
- *Education:* the higher the educational level of wet market vendors, the more able they are to operate and make decisions, so we hypothesize that the educational level of vendors has a positive effect on income and profits.
- *Diversity:* refers to the types of food sold by wet market vendors. The survey counted 21 types of food. The more types of food for sale, the better the vendors can meet their customers' needs and the more profit they can potentially make. However, carrying more food types could increase costs and risks, so the impact of diversity is uncertain.
- *Expenses:* major expenses include the cost of food bought for sale (91% of vendors in the previous month), rent (82%) and utilities (78%). Greater input costs are associated with more economic returns, but there are also invisible market risks such as fluctuations in market prices, so the impact of input expenses is uncertain.
- *Mobile payment:* the Ipsos (2017) report shows that 58% of fruit vendors in Chinese markets accept mobile payments. Mobile payment has become an important factor contributing to the prosperity of the retail industry. Therefore, we hypothesize that the impact of offering mobile payments is positive.
- *GDP:* GDP is an indicator of the level of regional economic development of the district, and GDP increases should have a positive impact on profits.
- *Income:* per capita disposable income in a district reflects the living standards of residents, and the

two are positively related, so the impact of this indicator is hypothesized as positive.

- *Metro:* infrastructure has proven to be an important factor influencing food security in a city (Frayne and McCordic 2015), and also affects the operations of wet market vendors (Zhang and Pan 2013). The number of metro stations per unit area is used to approximate the infrastructure of a district. Easy access to infrastructure such as the metro system will bring in more customers, so the impact of the metro system should be positive.

- *Accessibility:* accessibility is indicated by the time it takes to get to the market and is an important factor affecting consumers' access to food (Pothukuchi 2005). The higher the value, the longer it takes to get to the wet market, and the less likely the wet market vendor will be able to get customers, so the impact of accessibility here is negative.

- *Residential neighbourhoods:* the number of residential neighbourhoods in a district reflects the spatial concentration of the residential population. The more residential communities in a district, the more customers the wet markets in this district will have, so the impact of the number of residential communities is positive.

- *Location entropy:* refers to the ratio of the number of wet markets per capita in each district to the number of wet markets per capita in Nanjing (Tang 2018). A higher location entropy index in a district means an advantageous position compared to other districts. Therefore, we infer that the impact of the location entropy index is positive.

- *Distance:* refers to the distance between the vendor and the food supplier. Previous research shows that the typical food supplier of wet market vendors is wholesale markets (Zhang and Pan 2013). In general, the further away the vendor is from the city wholesale market, the higher the transport costs, so distance should have a negative impact on the profits of wet market vendors.

Table 2 summarizes the variables, indicating how each was quantified, whether the expected sign is negative or positive, and the mean and standard deviation of the vendors sampled.

TABLE 2: Statistical description of variables

Variables	Types	Names	Variable description (unit)	Expected sign	Mean	Std.
Dependent variable	Operation state	Profits	Profit you earned at this business in last month (yuan)		9250.25	17519.09
Vendor level	Characteristics	Age	Age of wet market vendor	+/-	41.21	10.64
		Gender	Gender of wet market vendor (male for 1, female for 0)	+/-	0.45	0.50
		Education	1-7 correspond to the level of education	+	2.99	1.12
	Strategies	Diversity	1-21 correspond to the types of food sold by vendor	+/-	2.39	1.90
		Expenses	Total business expenses in last month (yuan)	+	54729.12	266303.10
		Mobile payment	Whether to accept customer mobile payment (yes for 1, no for 0)	+	0.53	0.50
District level	Socioeconomic status	GDP	Gross domestic product (108yuan)	+	782.27	371.77
		Income	Disposable income per capita (yuan)	+	48902.73	3643.38
	Infrastructure	Metro	Number of metro stations per square kilometres	+	0.11	0.11
		Accessibility	The time cost accessibility value of the wet market (h)	–	2.92	3.1
	Customer size	Residential neighbourhoods	Number of residential neighbourhoods	+	633.18	240.33
	Locational conditions	Location	Ratio of wet market and population (%)	+	0.96	0.25
		Distance	distance to the wholesale market (kilometres)	–	24.72	16.23

Geographical Detector Model

The geographical detector model was used to examine the spatial distribution of wet market vendors' profits and their relationship with the explanatory variables. The model is a spatial variation analytical method first proposed by Wang et al (2010). The basic idea of the model is to test the association between the explanatory variables and the dependent variable through analyzing the consistency of their spatial distribution. If the explanatory variables are closely associated with the dependent variable, their spatial distributions tend to be similar.

Compared to traditional regression models, the geographical detector model is capable of handling categorical independent variables without considering multicollinearity among the explanatory variables (Wang et al 2016, Wang et al 2012). In this study, the factors detector and the interaction detector were used to examine the spatial characteristics of wet market vendors' profits and the factors' interaction effect.

The factor detector model is as follows:

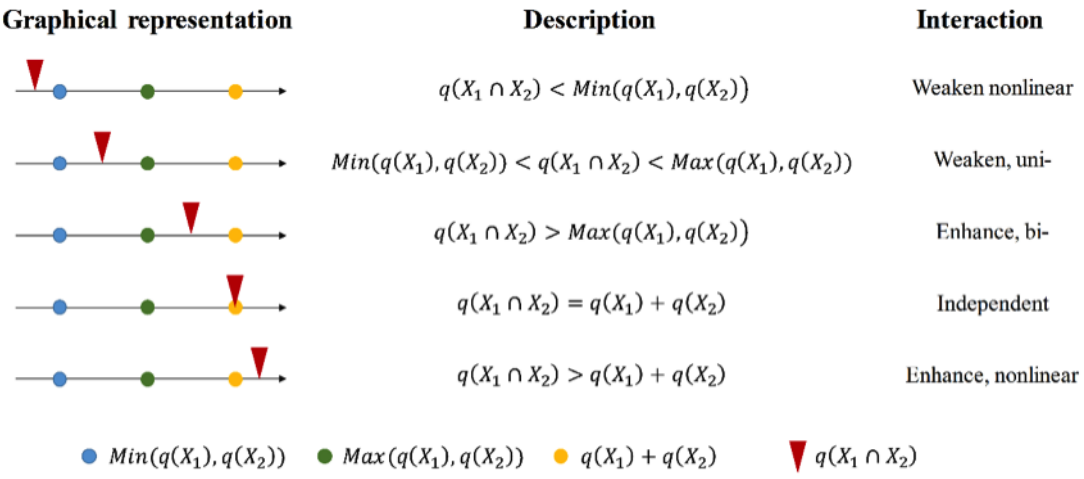
$$q = 1 - \frac{1}{N\sigma^2}\sum_{h=1}^{L} N_h\sigma_h^2$$

where q is the power of determinants, an index that is the same as effect intensity and ranges from 0 to 1. A q value of 0 means that little of the variance of the dependent variable is explained by the explanatory variables (where the total variance of the dependent variable is approaching the variance of the dependent variable in each subcategory of the explanatory variables, i.e. the dependent variable is likely to be randomly distributed in each subcategory of the explanatory variables). A q value of 1 indicates that the variance of the dependent variable can be completely explained by the explanatory variables, where the dependent variable tends to be the same without any variance within each subcategory of the explanatory variables. That is, the bigger the q value, the greater the effect of the explanatory variables. Compared with other spatial analysis methods, the q value of the Geodetector makes it easier to show the influence of independent variables on the dependent variable, and it is easier to compare.

N and σ^2 stand for the sample size of the study vendors and variance of wet market vendors' profits.

N_h and σ_h^2 refer to the sample size in each subcategory and its corresponding variance for wet market vendors' profits. The interaction detector reveals whether the factors interact or lead to effect independently. In other words, whether the interaction of factor X_1 and X_2 enhances or weakens impacts on effect Y, or a factor leads to effects independently. The possible interactions are illustrated in Figure 2.

FIGURE 2: Redefined Interaction Relationships

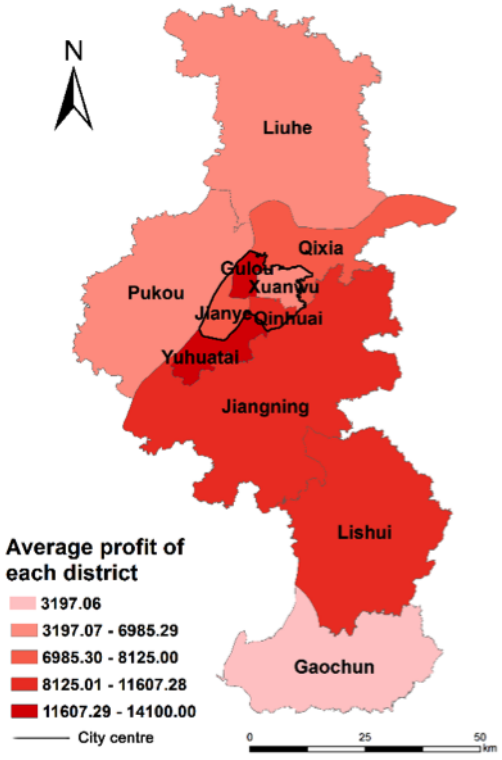


Source: http://www.geodetector.org/

Mapping Vendor Profitability

In order not to identify individual wet markets or vendors, the average profit of all wet market vendors in each district was first calculated. The average profit varied from district to district but areas with higher vendor profits were generally clustered in the city centre (Xuanwu being the main exception) (Figure 3).

FIGURE 3: Average Profit of Sampled Vendors in Districts of Nanjing



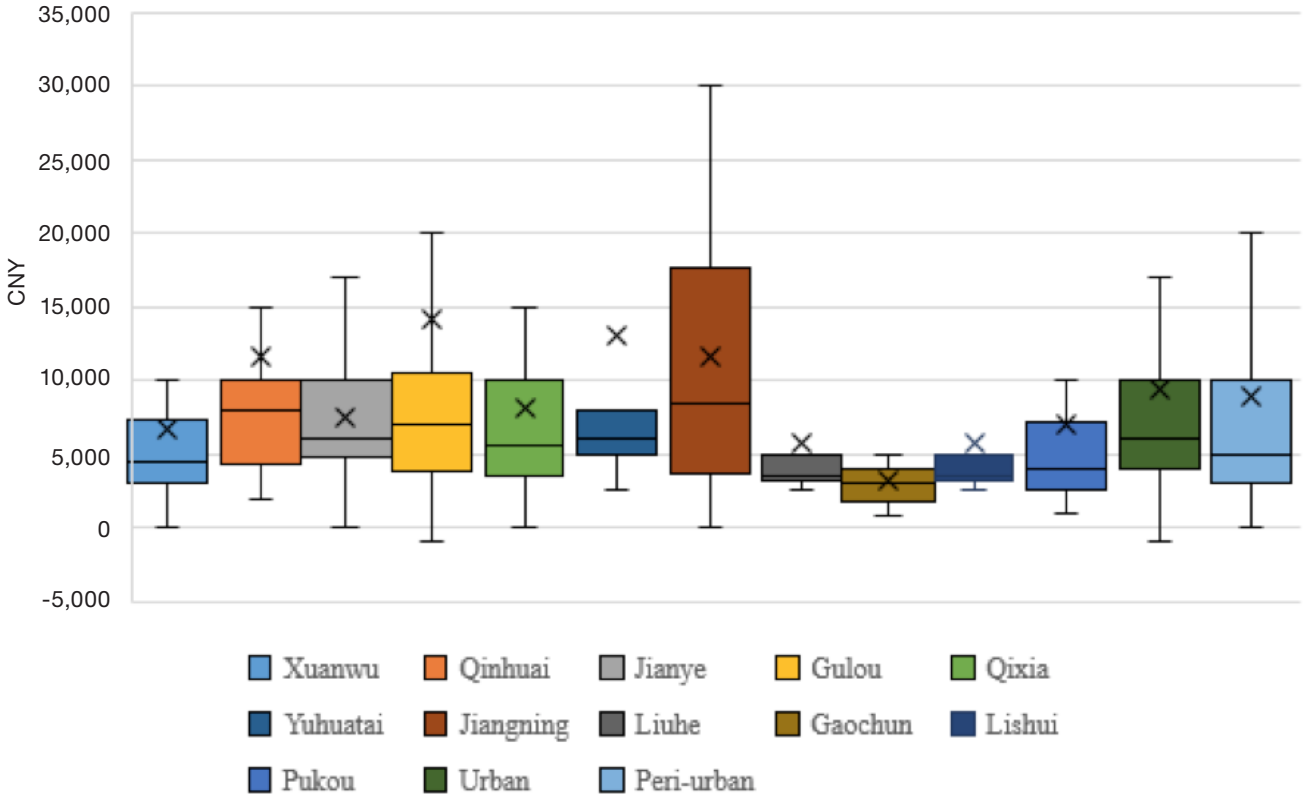
The average profit of the wet market vendors in each of the 11 districts is shown in Table 3, ranked from highest to lowest. The average profits of wet market vendors was higher in urban (9,412.35 CNY) than in peri-urban districts (8,942.01 CNY). However, some of the peri-urban districts (such as Jiangning and Lishui) have higher average profits than some urban districts. Figure 4 shows the range of profit in each district. The greatest range was in the peri-urban district of Jiangning, the largest district in Nanjing, with the third highest average profits overall.

TABLE 3: Statistical Analysis of Range of Profits by District

Area	District	Profits (CNY)
Urban	Gulou	14,100.00
Urban	Yuhuatai	13,090.91
Peri-urban	Jiangning	11,607.28
Urban	Qinhuai	11,550.00
Peri-urban	Lishui	10,640.00
Urban	Qixia	8,125.00
Urban	Jianye	7,413.33
Peri-urban	Pukou	6,985.29
Urban	Xuanwu	6,661.29
Peri-urban	Liuhe	5,750.00
Peri-urban	Gaochun	3,197.06

Table 4 shows the average value of the 13 independent variables, divided by core urban and peri-urban districts. Five of the variables – gender, food diversity, expenses, resident disposable income, and residential neighbourhoods – had values that were significantly larger in urban than in peri-urban areas, while the values of the other variables were significantly smaller in urban districts. In terms of the characteristics of vendors, those in urban districts are younger, the food they sell has more diversity, and they invest more. Peri-urban vendors, on the other hand, comprise more females, have higher education levels, and use mobile payments more often. From the perspective of district characteristics, the urban areas have higher disposable income per capita and a larger number of subway stations per unit area. There are more residential neighbourhoods and better location of wet markets in urban areas and residents have greater access to wet markets. However, the GDP of the peri-urban areas is higher, and the distance from the vendors to the wholesale markets is further.

FIGURE 4: Range of Wet Market Vendor Profit by District



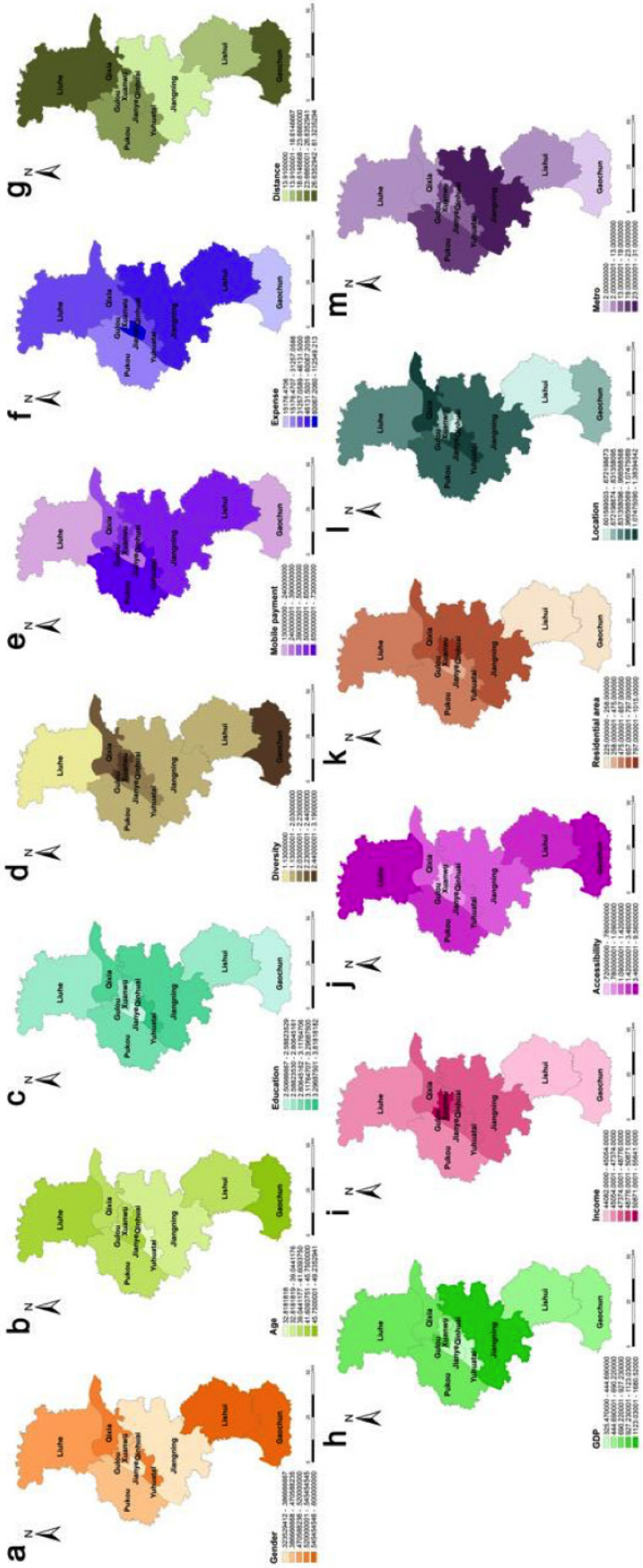
Note: In each box-plot, the top horizontal line represents the maximum value; the bottom horizontal line represents the minimum value; the upper border of the box represents the upper quartile; the lower border of the box represents the lower quartile; the middle line represents the median and the x represents the average value.

TABLE 4: Average Value of Explanatory Variables in Urban and Peri-Urban Districts

	Urban	Peri-urban
Vendor characteristics		
Age	41.16	41.30
Gender	0.47	0.42
Education	2.94	3.11
Diversity of products	2.56	2.08
Expenses	59,470.44	45,713.42
Mobile payment	0.51	0.57
District characteristics		
GDP	683.47	900.82
Income	51,124.50	46,236.60
Metro	0.19	0.01
Accessibility	1.08	5.13
Neighbourhoods	735.17	510.8
Distance	19.94	33.82
Location	1.02	0.90
Note: See Table 2 for units of measurement.		

A city-wide mapping of the variables shows significant spatial heterogeneity (Figure 5). Disposable income has a clear core-edge spatial structure (Figure 5i), and time-cost accessibility shows an obvious increase from the city centre to the periphery (Figure 5j). Other factors have no obvious spatial pattern. In order to further explore the relationship between these factors and vendor profits, additional spatial statistical analysis is therefore needed.

FIGURE 5: Spatial variation of explanatory variables



Spatial Variations in Wet Market Vendor Profits

The geographical detector model was used to identify the level of impact and the interactions between the factors that affect wet market vendor profits in Nanjing. As noted above, average vendor profit is the dependent variable, while the independent variables include both mean vendor characteristics and socioeconomic data for each district. To meet the requirements of the geographical detector model, all continuous variables were first discretized by SPSS 23.0. However, because the geographical detector model only measures the effect magnitude of driving factors, Spearman Correlation Analysis was also employed to identify if the impact of a certain factor was positive or negative (or the direction of effect).

Table 5 shows the magnitude of the *q* value, significance level, and direction of effect for each variable. It suggests that with the exception of age and product diversity, all the detected variables have a significant relationship with the spatial distribution of wet market vendor profits. On average, however, vendor characteristics have stronger relationships with vendor profits than the socioeconomic character of the district in which the wet market is located (i.e. the *q* values of vendor characteristics are generally higher than that of district characteristics).

Vendor expenses have the most significant and positive relationship with profits, with a *q* value of 0.44. Although the association of gender with the profits of wet market vendors was positive, it is minimal, with a *q* value of 0.02. The *q* value for age is 0.26, and the direction negative, suggesting that the profitability of food vending is more likely to decline as the vendor gets older. Education level has a positive relationship with profits (*q* value of 0.14) as does accepting mobile payment (*q* value of 0.18), although the widespread adoption of mobile payment in food retailing improves profitability in general. The distance between wet market vendors and the wholesale market has a negative relationship with vendor profits (*q* value of 0.05). This is probably because the further away from the wholesale market a vendor is located, the higher the cost of transportation and the lower the profit margin.

TABLE 5: Relationship Between Profits and Independent Variables

	q statistic	p value	sign
Vendor characteristics			
Age	0.26	0.107	-
Gender	0.02***	0.005	+
Education	0.14***	0.000	+
Diversity of products	0.03	0.995	-
Expenses	0.44***	0.00	+
Mobile payment	0.18***	0.000	+
District characteristics			
GDP	0.07***	0.007	+
Income	0.07**	0.028	+
Metro	0.05**	0.042	+
Accessibility	0.06**	0.037	-
Neighbourhoods	0.07**	0.012	+
Distance	0.05**	0.024	-
Location	0.08***	0.005	+

Note: ***denotes significant at 1%-level, ** significant at 5%-level, and * significant at 10%-level

Some aspects of the socioeconomic profile of the district where the vendors are located appear to have a relationship with profitability. For example, district GDP, per capita disposable income, and the number of residential neighbourhoods, all with *q* values of 0.07, have a positive relationship with the profits of market vendors. Infrastructure (in the form of the number of metro stations per unit area) has a negative relationship, with a *q* value of 0.05. Accessibility also negatively influences the profits of wet market vendors, with a *q* value of 0.06. Both factors illustrate the importance of urban infrastructure for the operation of food markets.

The model not only detects the effect of a single variable but variable interactions on the dependent variable. Table 6 shows that the interactions between most explanatory variables exhibit nonlinear enhanced effects on wet market vendor profits, implying that interactive effects exceed the simple combined effects of separate variables. In particular, the interaction effect of age and expenses had the highest *q* value of 0.97, suggesting that

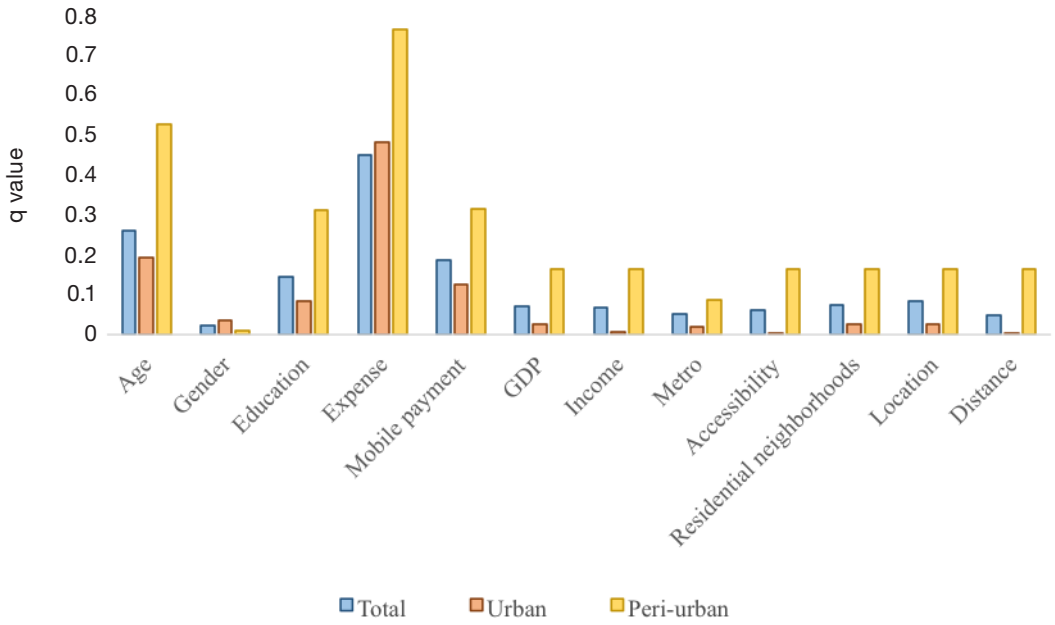
younger vendors who increase investments are most likely to increase their profits. Other interactions of note were between GDP and expenses (0.85), location and expenses (0.85), residential neighbourhoods and expenses (0.83), distance and expenses (0.82), metro and expenses (0.78), and per capita disposable income and expenses (0.76). Whether increased expenditures will actually lead to profit increases therefore depends upon at least two groups of factors: (a) local social and economic development, as reflected in GDP and per capita disposable income, and (b) location factors such as the number of residential neighbourhoods, location and accessibility of the wet market, and distance to the wholesale market.

The analysis also involved a comparison of the *q* values in urban and peri-urban regions. Most *q* values were higher in peri-urban districts (Figure 6). The highest *q* value was vendor expenses, which is 59% higher than in urban districts. The one exception is gender, where the relationship between male ownership on profits is stronger in urban than peri-urban areas. In the urban districts, accessibility – indicated by the time it takes to get to the market and the distance to the wholesale market – have little relationship with the profits of wet market vendors (*q* values of only 0.004 and 0.005 respectively). Although the average profit of wet market vendors is greater in urban than peri-urban areas, the effect of the impact factors is generally larger in peri-urban areas. In the peri-urban areas, the impacts of these factors on the profit of wet market vendors are more significant, which suggests that small food businesses in wet markets in peri-urban areas have the potential to become more profitable by adjusting the factors with policy instruments.

TABLE 6: Interaction of Factors Affecting Wet Market Vendor Profits

Variable	Gen.	Age	Edu.	Div.	Mob.	Exp.	GDP	Inc.	Acc.	Res.	Loc.	Met.	Dis.
Gen.	0.022												
Age	0.350	0.256											
Edu.	0.165	0.499	0.139										
Div.	0.065	0.521	0.247	0.032									
Mob.	0.215	0.353	0.272	0.217	0.183								
Exp.	0.552	**0.971**	0.744	0.691	0.659	0.442							
GDP	0.111	0.525	0.301	0.184	0.263	**0.847**	0.069						
Inc.	0.111	0.502	0.279	0.160	0.264	**0.761**	0.089	0.067					
Acc.	0.101	0.392	0.241	0.125	0.244	0.629	0.089	0.078	0.060				
Res.	0.124	0.536	0.283	0.173	0.275	**0.826**	0.089	0.089	0.089	0.075			
Loc.	0.125	0.543	0.322	0.198	0.275	**0.850**	0.084	0.089	0.089	0.089	0.082		
Met.	0.080	0.505	0.290	0.134	0.243	**0.780**	0.089	0.089	0.086	0.089	0.089	0.050	
Dis.	0.084	0.494	0.261	0.144	0.243	**0.818**	0.077	0.089	0.078	0.089	0.089	0.089	0.047

FIGURE 6: Comparison of Urban and Peri-Urban Factors Affecting Profits



Conclusion

The profitability of wet market vending in Nanjing demonstrates significant spatial variation. In general, vendors in urban districts make more profit than those in peri-urban districts. Overall, demographic factors (gender, age, education level) and business activities (including expenses and payment schemes) have a more significant relationship with profitability than the socioeconomic character of the districts where vendors are located. However, almost all the possible determinants of profitability have a stronger relationship with profit in peri-urban than in urban districts. As a result, there is greater potential for wet market vendors in peri-urban areas to increase profits through improving these factors.

Expenses are the single most important variable associated with the profits of market vendors. Whether a vendor offers mobile payment was also found to affect the profitability of wet market food retailing. The degree of acceptance of mobile payment by wet market vendors has a slightly higher impact on profits in peri-urban than urban areas. Urban infrastructure, such as the number of metro stations per unit area and food accessibility, also has a seemingly greater impact on profitability in peri-urban areas. However, because the impact of factors related to individual wet market vendors are more significant than socio-economic impact factors in general, the profitable development of both urban and peri-urban food businesses depends more on wet market vendors themselves.

The findings of the study have the following policy implications: (1) government could provide a more enabling environment for wet market vendors, especially those in peri-urban districts, through subsiding rents and vendor expenditures; (2) when planning the distribution of wet markets throughout the city, planners need to consider the location, infrastructure, and consumer audience. In general, the distribution of wet markets should be related to the number of residential neighbourhoods in an area; (3) government needs to strengthen the construction of infrastructure, especially in peri-urban areas, to complement urban food planning and increase food accessibility; and (4) market managers need to train wet market vendors on business strategies to improve their competitiveness.

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