

# How Public Libraries Drive Economic Vitality in Surrounding Communities

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## How Public Libraries Drive Economic Vitality in Surrounding Communities

### Abstract

With the rapid evolution of contemporary society, libraries have undergone substantial expansion, moving beyond their traditional cultural roles and uses. Besides the prominent trend of commercialization—such as book sales—meeting room rentals, and partnerships with local companies, libraries exert often over-looked but remarkable effects on surrounding economic activities. With the goal of transcending the conventional role of libraries, this paper investigates the extent of libraries' impact on their surrounding property value and commercial developments. To conduct this research, a thorough analysis of datasets sourced from public libraries' websites has been undertaken. Additionally, original data on housing prices and distances has been meticulously collected through various software applications. The research hypothesizes a negative correlation between distance to libraries and house prices, as well as malls' revenue and number of restaurants. Additionally, an alternative hypothesis proposes that proximity to malls might positively impact library visitor flow rates. Through analysis of multiple datasets, consistent negative correlations are identified among malls' revenue, home prices, number of restaurants, and their distance from libraries. Moreover, a positive correlation is observed between the number of visitors at five different libraries and the quantity of malls within a five kilometer radius. In conclusion, the evidence demonstrates that public libraries have a positive impact on local economic development. Thus, this research suggests broader implications for understanding the economic impacts of libraries, allowing in-depth exploration in this aspect in future studies.

### Author Summary

The inspiration of my research stems from my volunteer work at the local community library, when I began contemplating the broader economic significance of libraries beyond their traditional role as reading places. Conducting original research and data analysis, I discovered that libraries indeed affect local businesses positively, including rising house prices, increasing mall revenue and enhanced performance of nearby restaurants.

### Introduction

Public libraries have long been considered as vital hubs of communal knowledge, serving as essential institutions that foster social culture development and promote educational literacy. This paper delves into the intricate relationship between public libraries and its economic influence on the surrounding urban environment. The hypothesis is that public libraries have a positive influence on property price and local business development. To test the hypothesis, data is gathered from websites and software, and subsequently analyzed. The paper plays an important role in demonstrating the economic importance of libraries and their potential substantial returns, enabling a more well-rounded understanding of public libraries, that they not only act as catalyst for culture development, but also contribute to the prosperity of surrounding communities.

### Literature Review

The paper draws inspiration from various studies exploring the impact of libraries on local businesses and home prices. For example, Gilpin et al. (2021) found that an increase in library investment does not cause a significant increase in home price. This outcome differs slightly from the initial hypothesis, and the distinction may be the result of several potential reasons. If house prices do not change, this implies that residents perceive the benefits brought by the increased investment of libraries to roughly balance out the new increased tax of financial burdens imposed to fund these improvements. Thus, under this situation, it is concluded that people do not value libraries enough to impact house prices. Also, the Gilpin study focuses on the impact of increased investment in already established libraries, emphasizing that the libraries are in existence and the increased investment is merely enhancing the original facilities. It is possible that people may not perceive increased investment in libraries

Since the benefits from the construction of a new library can be more clearly seen, it will be easier to evaluate whether the increased price of houses is caused by the construction of new libraries. However, since this paper centers on the influence of

the presence of libraries by comparing economic activity in areas near and far to establish libraries, it is plausible that other factors could contribute to the discrepancy in home prices in this case, such as local legislation and regional differences.

The paper also refers to MT. Auburn Associates (2022), which contrasts ten libraries' services that provide opportunities for business owners to foster their enterprises, such as access to technology and the internet. Nevertheless, this paper extends beyond the previous study by exploring libraries' other indirect influences. Specifically, it examines whether the mere presence of libraries has any correlation with property value and attraction of local business due to high visitors flow rate, and this unique focus allows the exploration of how libraries influence the overall economic landscape of the communities in previously indistinct ways.

## Methods

### Data Collection

#### - House price

For home price data, a Chinese app called "FangTianXia" was used to assess the real-time house prices and their precise locations. The app automatically categorizes homes by districts, and the first five homes in each were selected. For malls' revenue, data from WingShang news website on Google is used, which derives from the release of companies' annual report of their operation on their official websites. For distance data, an app called "GaoDe map" was used to accurately calculate the distance between five libraries and various homes and malls. The number of restaurants around the libraries were also found using the "nearby" function; however, since the app doesn't explicitly give the quantity of restaurants nearby, all the nearby restaurants that appear on the app are calculated manually.

#### - Malls

In addition, ideally malls that are the same except for their distance to libraries are compared. This ensures the comparability of the analysis, as reducing the variables between libraries enables to establish a causation relationship more easily. In the analysis, malls that have greater than 250 million in revenue and have been operational for at least five years are included. The revenue of 0.25 billion is used as a standard, as according to the news website, most of the well-established malls have revenues above 0.25 billion.

#### - Libraries

To select libraries for analysis, an initial compilation is made of all public libraries in ShenZhen, situated in the southeast part of China. Then, five relatively substantial public libraries are chosen, which are representative of four different districts to ensure the generalizability of results according to the data of the libraries' total areas and visitor flow rate that are sourced from the ShenZhen government's official website.

Library flow rate data was sourced from the authoritative website of ShenZhen government, this data undergoes rigorous scrutiny and meticulous screening. The government's strict supervision ensures the data is trustworthy and dependable.

#### - Limitations

However, the data also comes with certain limitations. For the revenue of malls, twenty-five malls that have relatively similar size from four different districts based on publicly available information on Google were originally listed. Unfortunately, revenue data for eight of these malls couldn't be obtained, and as a result, only seventeen malls were included. The omitted malls are distributed across five different districts, with LuoHu district experiencing the higher number of exclusions, totaling three malls.

Furthermore, the search considers a key criterion to be maximum distance 16km from libraries. The reason is based on this hypothesis: people who study in libraries often seek nearby malls for a quick lunch, dinner, or a brief respite from studying. Time is of the essence for them, and they prioritize efficiency. However, after excluding the four malls which are located more than 16km away, only 16 malls were left in dataset. The reduction of sample size may potentially impact the overall reliability of the research findings.

Also, there may be some confounding variables that are not included in the research but influence the result significantly. An example of a confounding variable in this case would be the mall distance to the city center. Coastal City, for example, is located at the heart of NanShan District and is close to the city center. It gains large benefits from high population density, countless surrounding communities, office buildings and accessible transportation. Thus, it will attract more people than HuiBang Center, which is located in a suburban area in BaoAn District. This disparity can result in notable differences in visitor flow rate.

### Map analysis

Here are two pictures for an overview of the locations of malls and libraries used.

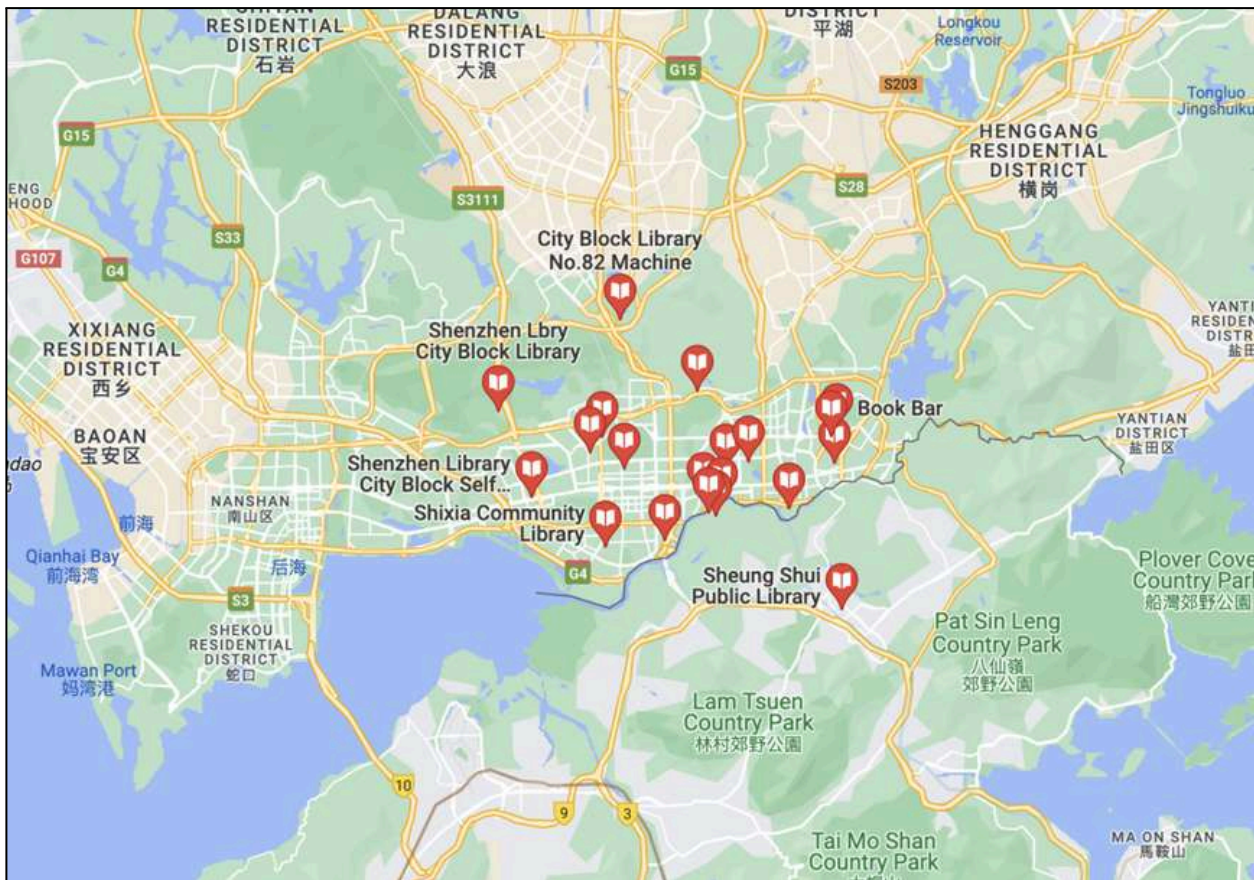


Fig 1. Distribution of libraries in ShenZhen

The distribution of libraries across ShenZhen appears to be relatively concentrated, with the majority of libraries clustered in close proximity to each other. However, there are two libraries, namely SheungShui Library and City Block Library No.82 Machine, that are situated in relatively isolated positions. Overall, the libraries are located near the city’s transportation network.

The choice of library locations is influenced by many factors. The proximity to roads enables patrons from different areas to access libraries by car or by bus, which enhances the accessibility and convenience, especially for students who prioritize efficiency. Furthermore, many libraries are situated in areas categorized as open land, which provides necessary space for facility construction.

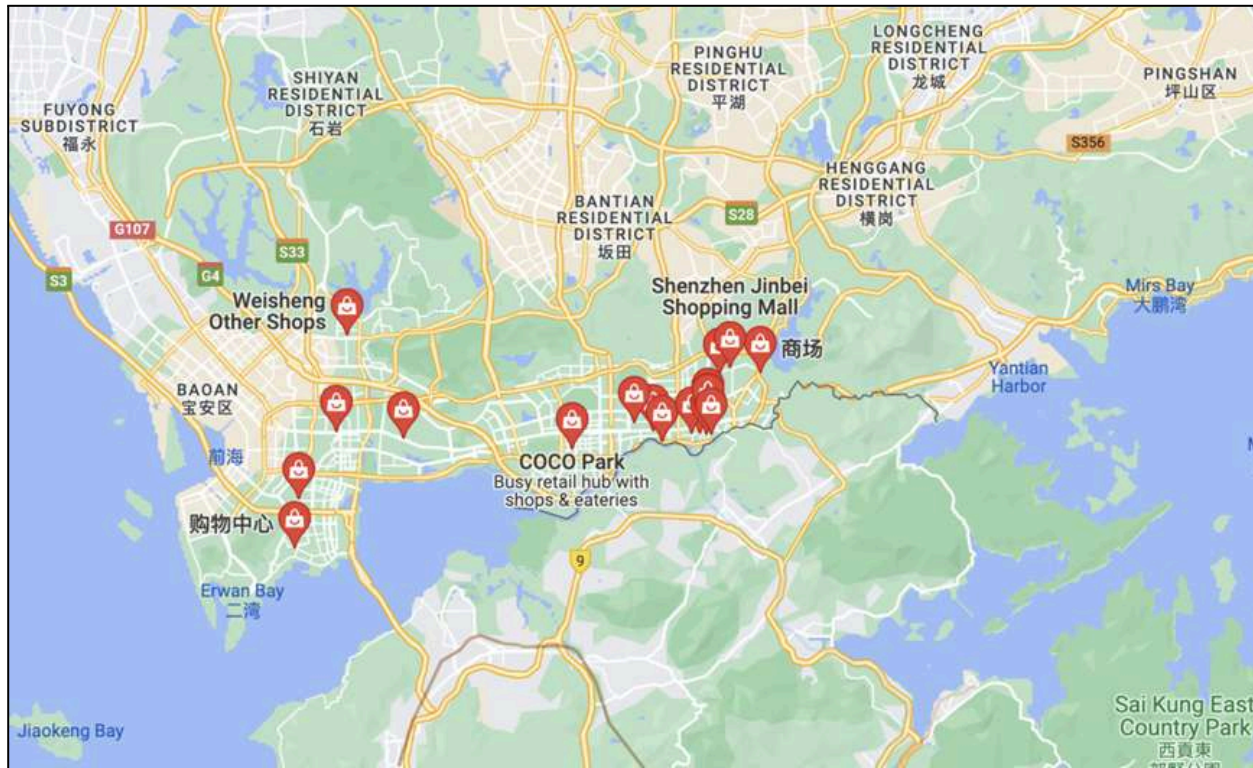


Fig2.

Distribution of malls in ShenZhen

Mall distribution exhibits a different pattern than library distribution. When examining this distribution, two distinct patterns emerge. In the eastern part of the city, malls are more compact and tend to cluster in a specific area. This is primarily due to their location in the heart of FuTian district, which is one of the most prosperous and densely populated districts. Thus, location in the city center indicates a potential high demand, which boosts the construction of malls in this area. Additionally, the proximity to main roads offers customers convenient access to these malls. Conversely, in the West, the malls are more dispersed with no two malls adjacent to each other. This may be due to the distinct characteristics of the two districts. In BaoAn district, there is a greater availability of open land, making land more affordable. Thus, developers are inclined to construct larger malls in these areas to reduce costs and offer customers a better shopping experience

#### - Comparison of Malls and Libraries

When comparing the distribution of malls and libraries, it becomes evident that the overall distribution of all libraries is relatively scattered and lacks a discernible pattern. In contrast, malls exhibit a clear east-west distribution pattern, and certain malls are more concentrated than others.

However, the libraries and malls also share commonalities in their location strategies. They are both situated in inland areas, and their proximity to roads is a consistent feature. Several reasons could explain their locations. Firstly, inland areas typically have higher population densities, ensuring a potentially larger customer base. Additionally, inland areas offer favorable infrastructure conditions, such as solid ground and essential utilities like water and electricity. Moreover, the accessibility to land ensures convenient access for residents across different parts of the city.

#### - Limitation of Data

The data utilized in this research may also contain minor inaccuracies. For example, some of the malls may release fake revenue information to attract more investors. Furthermore, the “nearby” function on “GaoDe” Maps is not so accurate when detecting the restaurants that are one kilometer or more from the libraries. In this case, the function only detects restaurants within the malls, potentially excluding some of the small restaurants, introducing inaccuracy to this research.



Moreover, to test the hypothesis that the presence of malls influences the visitor flow rates of libraries, data concerning the number of visitors to each of the five libraries on an annual basis, and the number of malls present within the range of nearby 16km to the libraries is searched. This allows an examination of whether the presence of a mall increases the attraction of libraries.

Nonetheless, a significant limitation exists within this data-set. The libraries' annual reports provide data on total number of visitors, combining both main libraries and branch libraries in various locations. In the analysis, only the main branches of libraries from each district were selected, and this discrepancy could potentially introduce inaccuracies into the data. However, considering the large scale and central role of main libraries compared to branch libraries in most districts, it is reasonable to assume that the majority of flow rate is attributed to the main libraries. This assumption helps to mitigate this limitation, but it is essential to identify the potential for some inaccuracies in research findings.

### **Results**

Below are several graphs that display the correlations between malls' total revenue and distances from libraries, home prices and distance to libraries, and the number of restaurants in close proximity to libraries. The total flow of library visitors and number of malls nearby.

*- Malls' distance to libraries & malls' revenue in five districts*

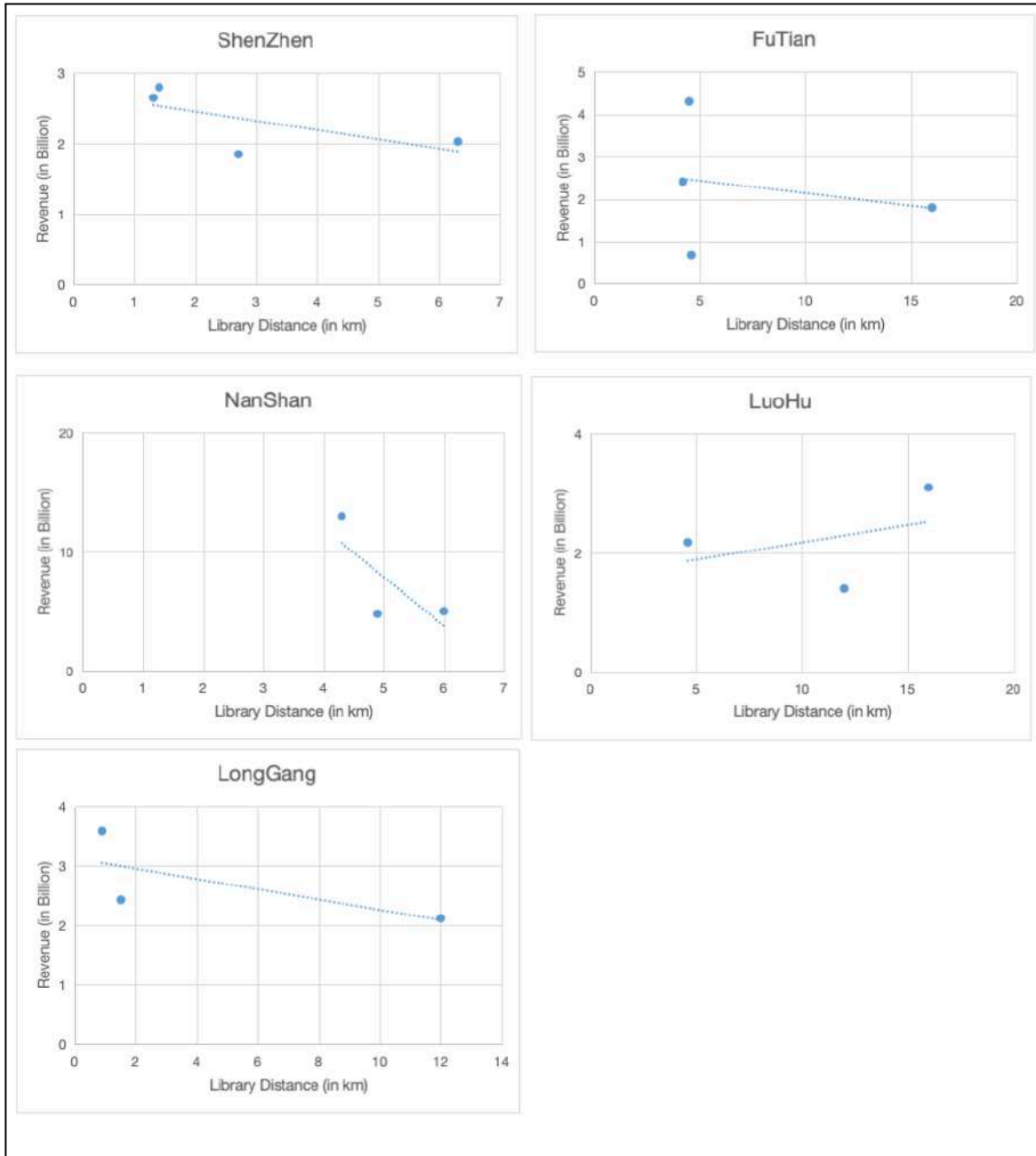


Fig3. Malls' revenue and their distance to libraries in five districts

A discernible pattern emerges when analyzing the relationship between mall revenue and distances from libraries. All libraries but the LuoHu library exhibit a negative correlation in this context. For ShenZhen, FuTian and LongGang Libraries, the correlation is relatively weak as seen by the gentle gradient of the graph. Conversely, for NanShan libraries, a steeper gradient indicates a more robust relationship. Although LuoHu library shows a weak positive correlation, the general trend is that most of the libraries align to the hypothesis.

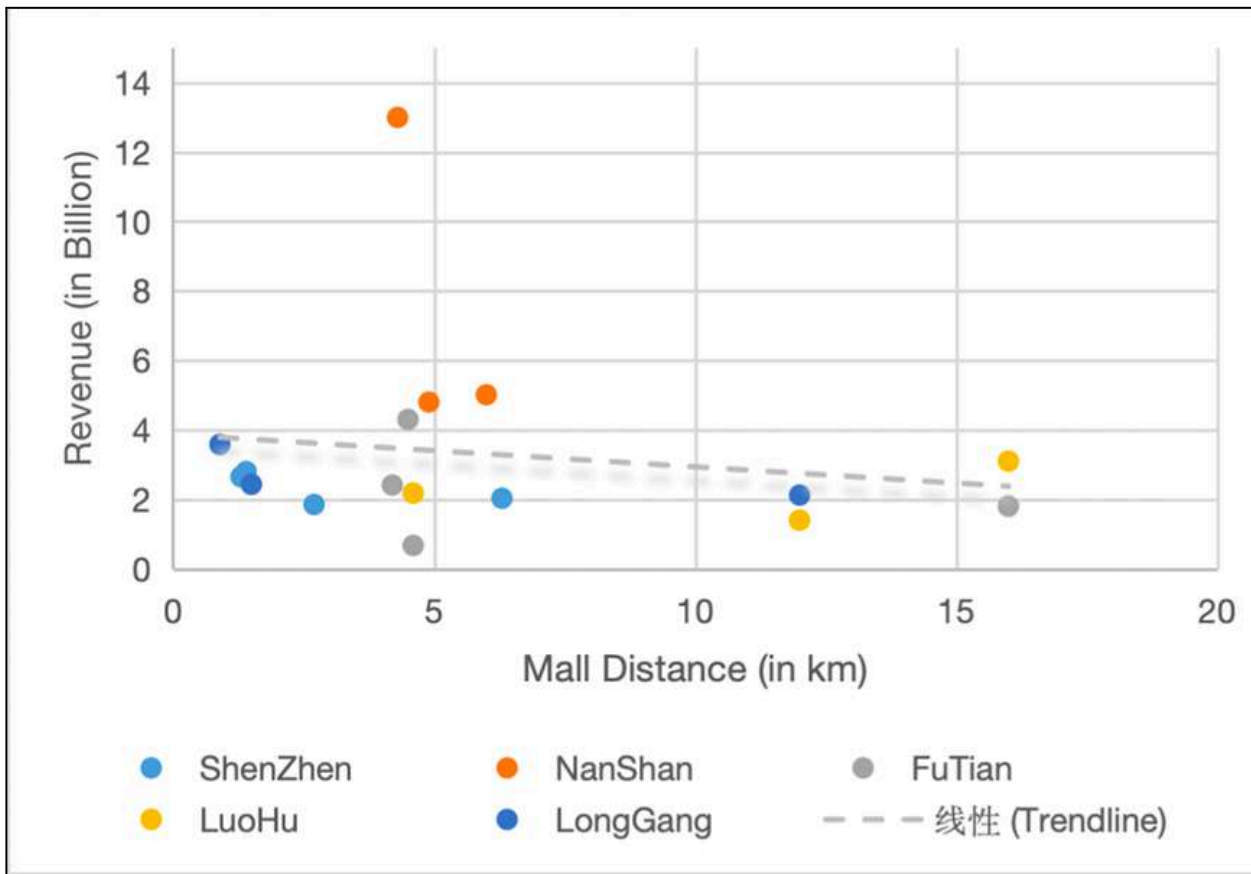


Fig4. A holistic view of malls' revenue and their distance to libraries

A holistic view of all five libraries reinforces the hypothesis, suggesting a generally weak correlation between mall distance and revenue. However, it is crucial to distinguish between correlation and causation. Many other confounding variables, including location, population base in the district, also different sizes of the malls could potentially influence the revenue of malls.

An outlier in this graph is excluded, Coastal city, which is located 3.7km from NanShan library and has a revenue of 425.8 billion. This may primarily be due to the immense size of Coastal City, also its central location in the most prosperous district. Due to this outlier data, the y-axis has been increased to more than 400 billion, which leads other data to concentrate about the same level at y-axis. Thus, a new graph without Coastal City is constructed in order to capture the pattern more clearly.

- *Home Price and Distance from libraries in five districts*

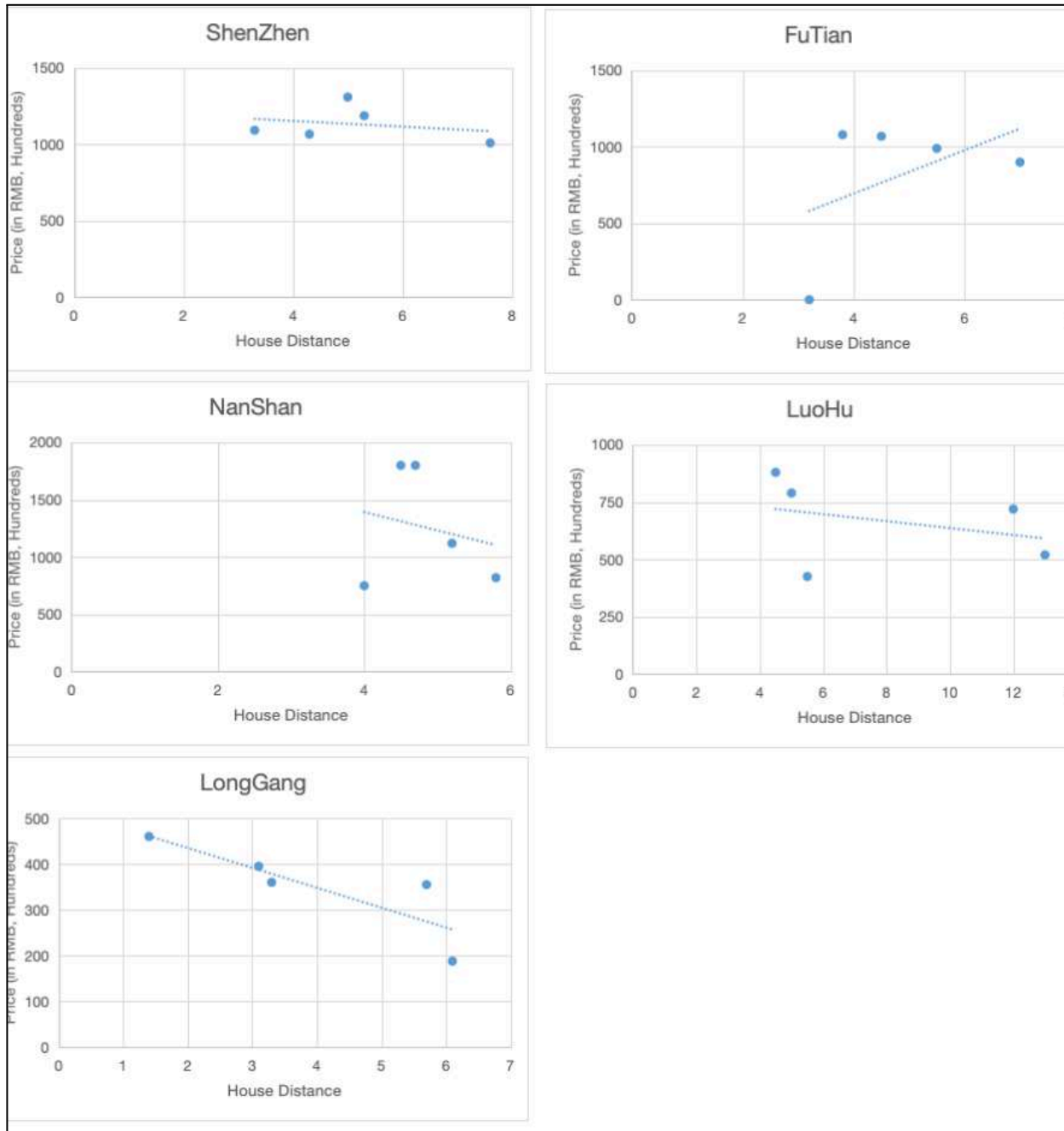


Fig5. Home price and distance from libraries in five districts

From the five graphs above, a pattern can be concluded: with the exception of FuTian library, all other four libraries reveal a negative correlation between home prices and distance from libraries. However, the relationship is not overtly strong, as LuoHu, NanShan and ShenZhen all exhibit a weak correlation, while LongGang exhibits a relatively stronger correlation. This suggests that, while proximity to libraries may have some influence on house price, other variables may also play significant roles in influencing house prices.



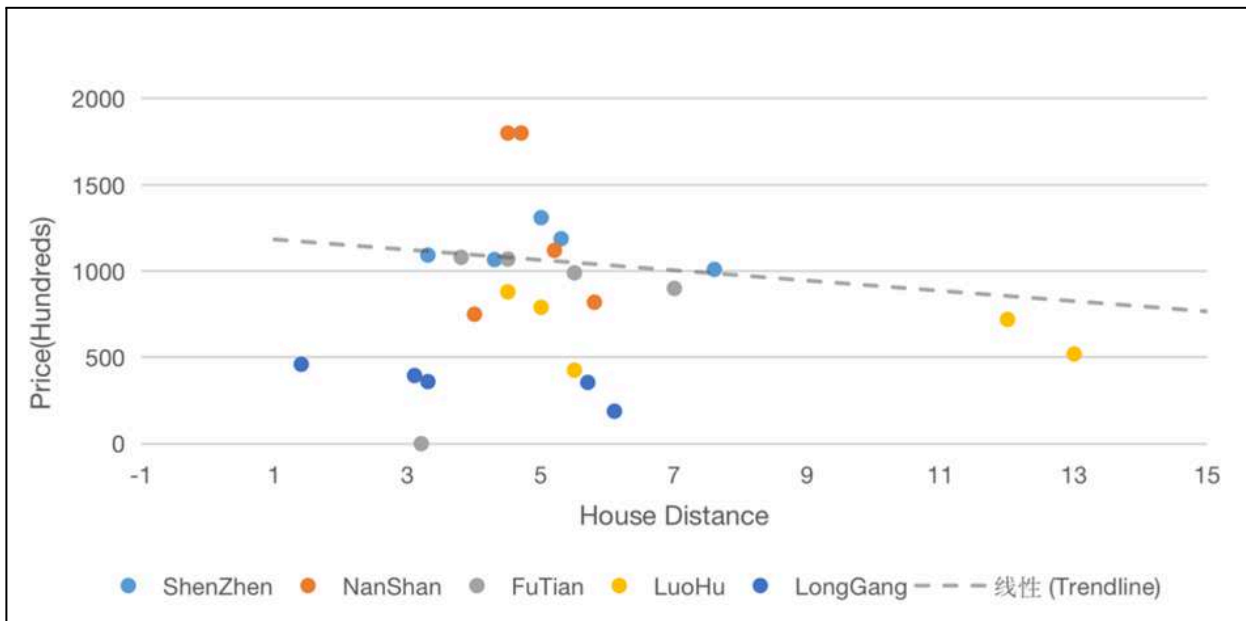


Fig6. A holistic view of home price and their distance from libraries

It is apparent that there is generally a negative correlation between price of homes and their distance from libraries, although the correlation is weak. This observation aligns with the hypothesis, indicating that houses situated in close proximity to libraries tend to have higher prices, while houses located farther away have lower prices.

However, it is essential to acknowledge that establishing a causation relationship remains challenging due to the presence of confounding variables. In this scenario, the house price is determined both by houses' distances to libraries and other confounding variables. The proximity to school is a potential confounding variable, as it exhibits a correlation with both house prices and the distance to libraries. This correlation arises because proximity to a library may contribute to higher house prices.

Furthermore, the proximity to schools is often intertwined with the distance to libraries, as these facilities are frequently located together. The condition of houses and size of houses may also be confounding variables. It correlates with house prices since larger and better-conditioned houses tend to command higher prices.

Additionally, the proximity to the library may be associated with larger and better-conditioned houses.

- *Number of Restaurants by Distance*

*ShenZhen Library*

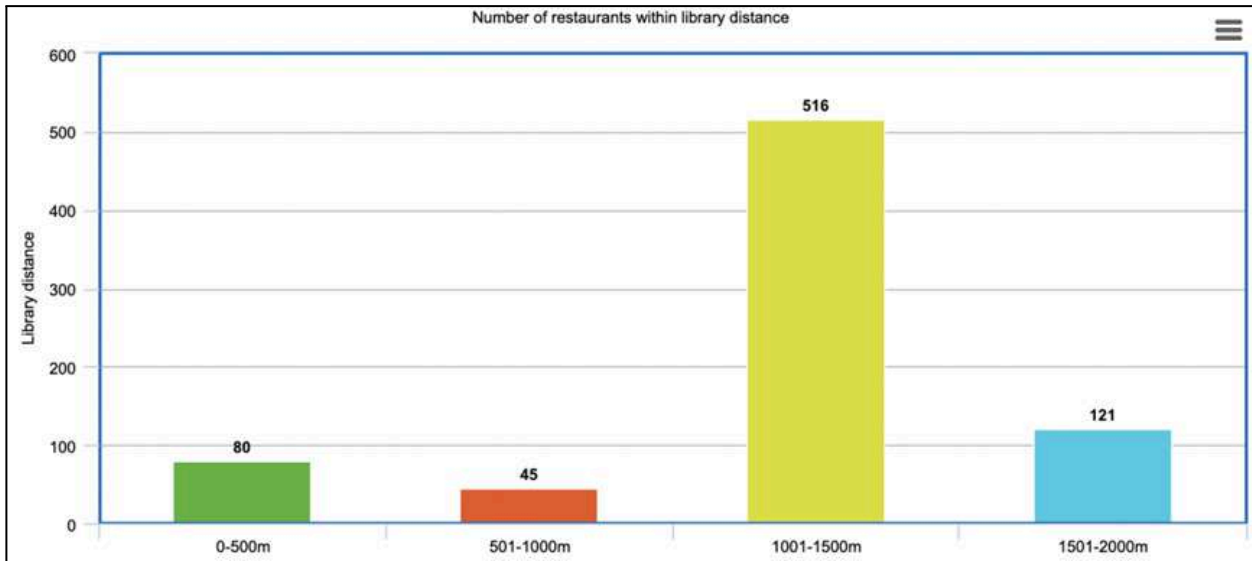


Fig7. Number of restaurants within library distance for ShenZhen Library

*NanShan Library*

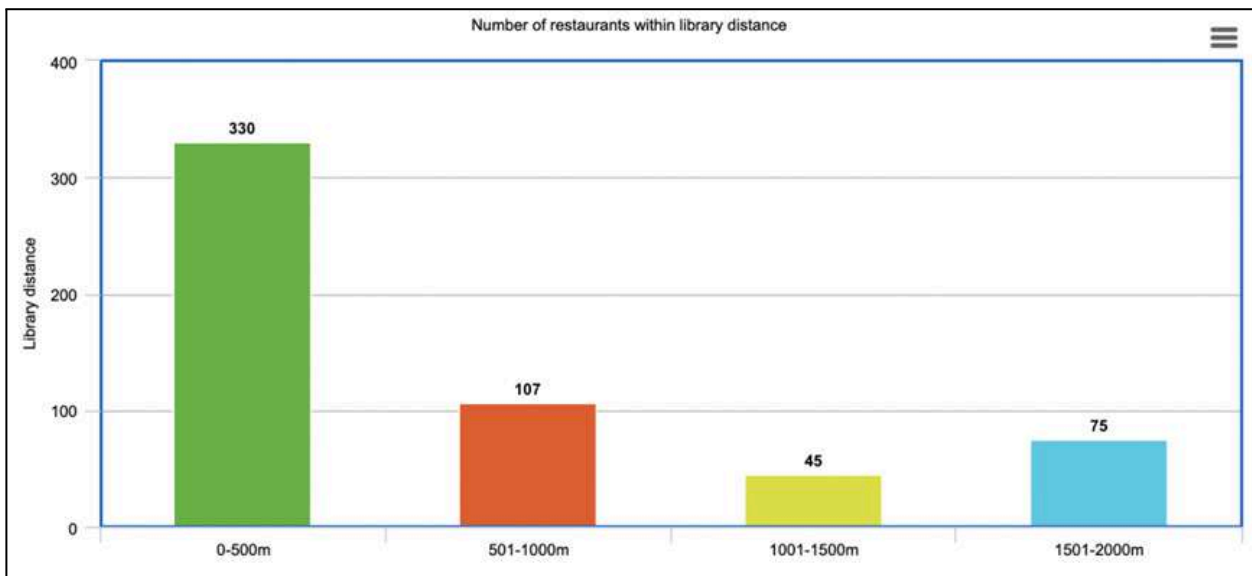


Fig8. Number of restaurants within library distance for NanShan Library

*FuTian Library*

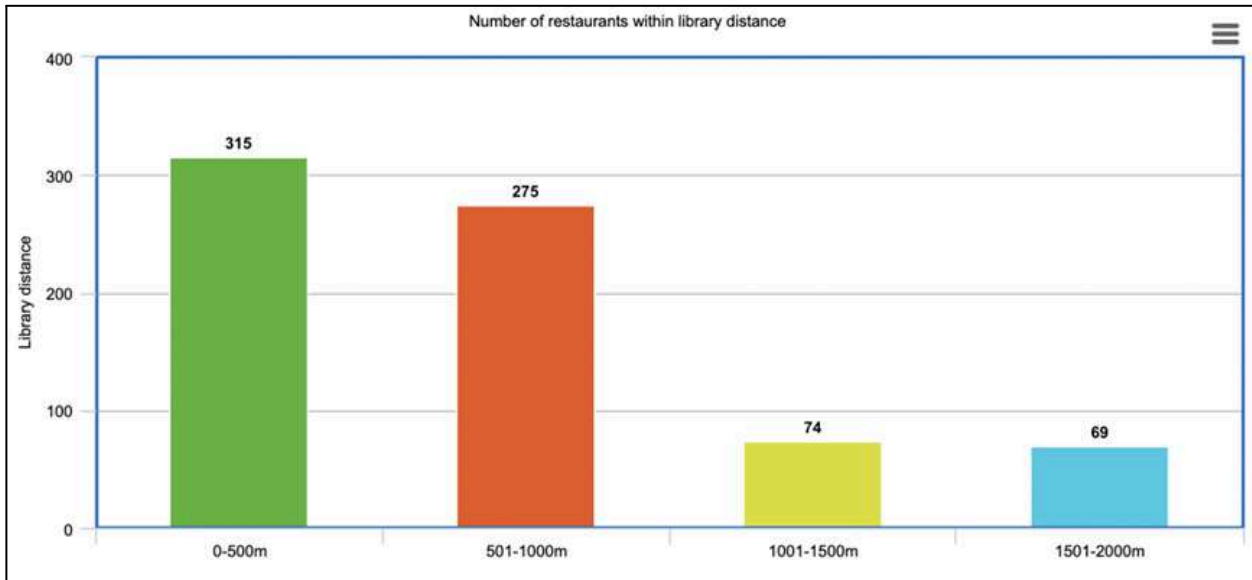


Fig9. Number of restaurants within library distance for FuTian Library

*LuoHu Library*

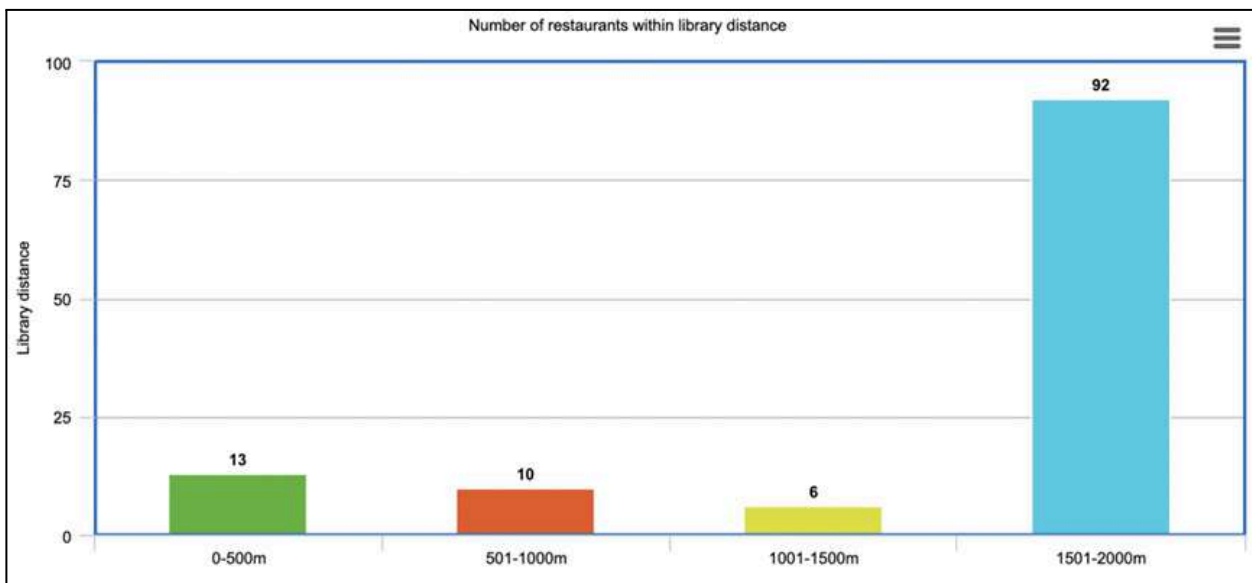


Fig10. Number of restaurants within library distance for LuoHuo Library

*LongGang Library*

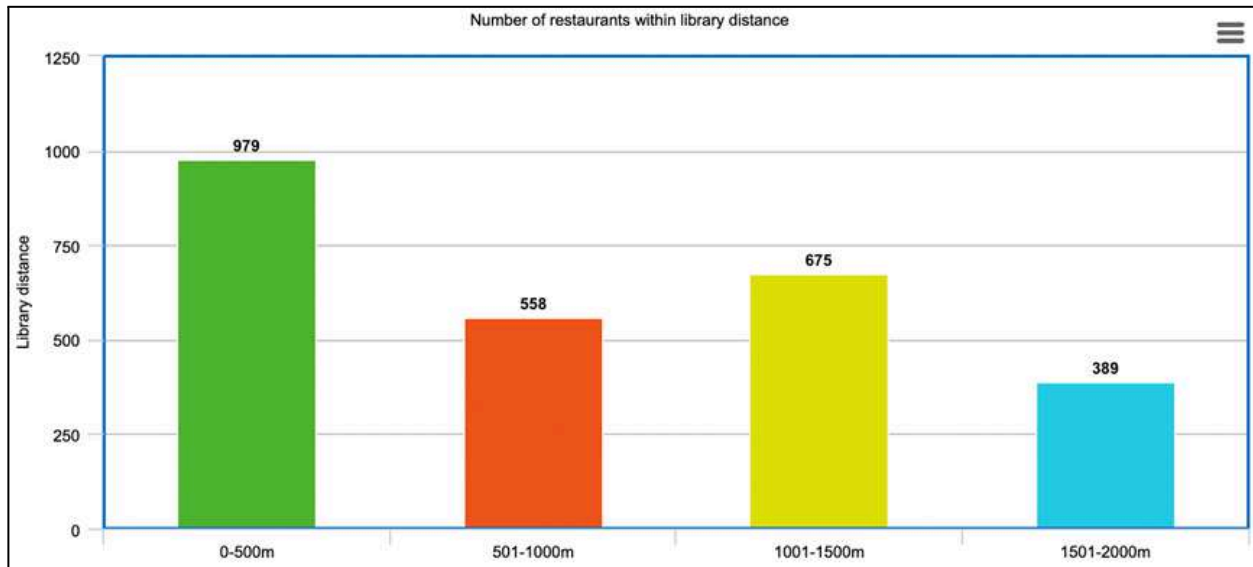


Fig11. Number of restaurants within library distance for LongGang Library

In contrast to the initial hypothesis, which suggests that the number of restaurants decreases as the distance to libraries increases, the analysis reveals varying correlations between the number of restaurants surrounding the five libraries.

ShenZhen and LuoHu libraries exhibit an increase in the total number of restaurants within the range of 0-500m to 1501-2000m. In contrast, NanShan, FuTian and LongGang libraries show a decrease in the number of restaurants within the range of 0-500m to 1501-2000m.

LuoHu library stands out as a special case among all the five libraries, with a very limited number of nearby restaurants within 0-1500m range but a sudden increase in the 1501-2000m range. This is primarily due to the location of LuoHu Library, as it is situated in a dispersed city planning layout with restaurants distantly scattered. Additionally, the library's suburban location contributes to low economic activity in its vicinity. With an increased distance from LuoHu library, there is a closer proximity to the city center, potentially leading to heightened economic activity and consequently, an increased number of restaurants.

The number of restaurants within library distance equals to distance to libraries plus other confounding variables. Thus, in this context, the distance to city center emerges as a confounding variable, as it exhibits correlation with both the number of restaurants within library distance and the distance to libraries. Examining all the five libraries, a consistent pattern emerges, showing a uniform decrease in the number of restaurants from 0-500m to the 500-1000m range.

*Total*

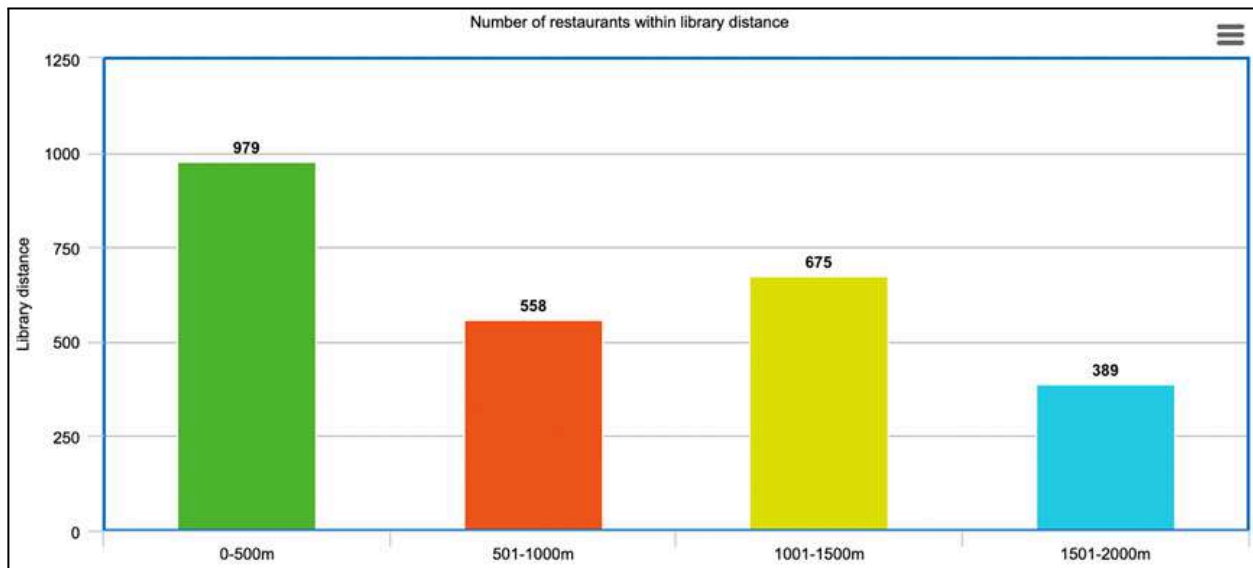


Fig12. Total number of restaurants within library distance

Examining the overall pattern in the data, a noticeable negative correlation exists between nearby range to libraries and the number of restaurants within the range, which confirms the hypothesis. The number of restaurants in 1501-2000m is about 2.5 times smaller than the number of restaurants in the range of 0-500m. Since there is an increase in number of restaurants from 501-1000m, and most of the restaurants are located within the libraries, this observation from our result prompts an interesting alternative hypothesis, which is that, libraries may serve as substitutes for malls, as both malls and libraries are considered to be places for leisure activities, especially on the weekend. As a result, if malls are constructed near the libraries, it is possible that the visitor flow rate may not be very high. To mitigate the competition, developers may choose to construct the malls in places that are farther away from libraries to attract a greater number of visitors.

While the initial hypothesis posted a correlation between the number of nearby restaurants and the proximity to libraries, it is crucial to recognize that the count of restaurants in proximity to libraries can be significantly shaped by city planning. Various factors such as urban design, government policies and zoning regulations play vital roles in determining the allocation of spaces for commercial establishments such as malls and restaurants. These factors operate as confounding variables, as they exhibit correlations with both the number of restaurants and the proximity to libraries. Thus, the original space for restaurants and malls may be allocated to other infrastructure, such as parks and subways if there are shifts in government policies or construction plans.

*Number of malls within 5km & annual number of visitors of libraries*

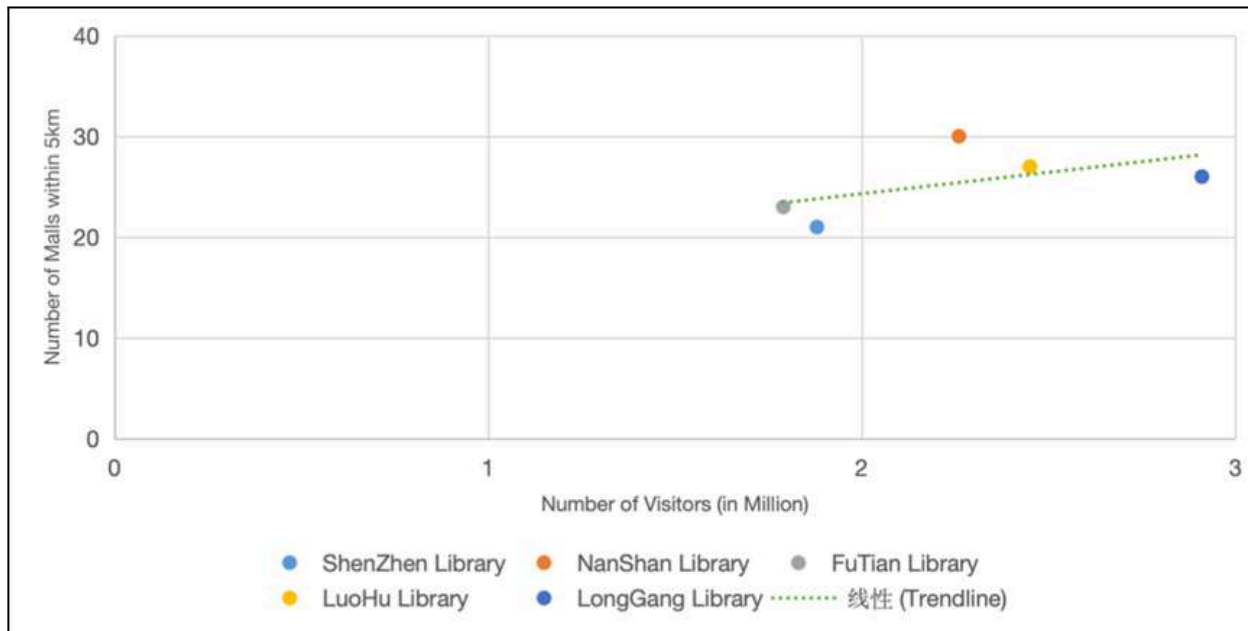


Fig13. Total number of malls with 5km and annual number of visitors of libraries

The graph provides support for the alternative hypothesis, which posits that the proximity to malls indeed attracts more visitors to libraries, as indicated by the positive gradient of best-fit line. However, establishing a causal relationship remains a complicated task, as the correlation is relatively weak.

Moreover, several other factors may also influence the number of visitors to libraries. One is the location of libraries, as mentioned previously in the data section. Additionally, the infrastructure and facilities within the libraries such as computer services may also affect the number of visitors. Level of community engagement, government policy and funding for libraries may also play a role in determining the attractiveness of libraries. However, it's important to note that these factors, while having a strong correlation with the visitor flow rate, may not qualify as confounding variables in the context of the correlation with the number of malls.

Government funding may be a confounding variable, if governments tend to fund entire areas, such that both libraries and malls receive funding.

To summarize, four sets of data are analyzed separately to test the hypothesis, and following results are reached. Firstly, there is a negative correlation between the malls' distance to libraries and their revenue. Secondly, there is also a negative correlation between homes' distance to libraries and their prices. Thirdly, there is an unexpected positive correlation between the malls' distance to libraries and the number of restaurants within said distance. Fourthly, there is a negative correlation between the number of visitors to each library and the number of malls within a 5km radius.

**Discussion**

This study aimed to delve into the economic impacts of libraries on its surrounding communities. After meticulous data collection and data analysis, the following conclusions are reached: The results affirm all the four hypotheses. However, all the correlations existed are not too strong to reach a very definitive and authentic conclusion. And although this research has provided an original and comprehensive analysis of the economic impacts of libraries on their surrounding communities, there is still plenty of room for improvement, as the evidence of the data is not conclusive.

For example, the data size is limited, which means that the data is not enough to construct a strong relationship, as a smaller number of samples is more subject to biases. Thus, in future endeavors, more data could be included. Increasing the data size, such as obtaining data for at least fifty houses in a district, will offer a more comprehensive analysis of the relationship, allowing for a more nuanced and directional evaluation. Additionally, broadening the scope to include various types of malls, such as both new and well-established malls, will provide the short term and long-term effects influenced by the presence of libraries.

The causal relationship between the libraries and their surrounding economies could also be investigated. To do so, data on economic activity measures could be collected, such as revenues of malls, both before and after the construction of libraries. This approach aims to provide insights into whether changes in economic activity can be attributed to the presence of libraries.

However, this method also has certain limitations, mainly that the construction of libraries is likely not random, but systematic. If that is the case, confounding variables could still impact the analysis. To address the challenges, the research method of a quasi-experiment can be introduced. A quasi-experiment is a type of research method that involves naturally-occurring randomness. In this quasi-experimental design, districts in which libraries were built and districts where libraries were planned but not ultimately constructed could be compared.

Districts in which libraries were ultimately not constructed can be the control group, while districts where a library was built act as the treated group. This approach enables us to approximate a controlled comparison, make more nuanced observations, and potentially measure the causal impact of libraries on surrounding communities.

Besides quantitative research, qualitative research such as questionnaires and surveys is also an alternative method to be employed. The questionnaires can be distributed to the residents living nearby. The survey could include questions such as: “Do you visit nearby malls after using the library?” or “To what extent do you believe libraries impact the local property price?” These kind of questions enable the paper to directly establish a clearer and more distinct link between libraries and the local economy, as residents could provide more valid, accurate and insightful responses.

### **Conclusion**

In conclusion, the comprehensive analysis across various data sets supports the notion that the presence of libraries may exert a positive impact on the surrounding economic activities, as evidenced by the house prices, malls’ revenues, and number of restaurants. This conforms to the original hypothesis, suggesting that libraries serve more as places for communal knowledge but also contribute significantly to the economic development of their surrounding areas.

Although the findings may be constrained by presence of confounding variables, the limited volume of data, the lack of causal relationship and the weak correlation, the paper still provides valuable insights into the economic importance of libraries, highlighting the diverse impacts they have and the potential opportunities they could offer for investment and commercial developments in the future.

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