

## The impact of Internet on consumption: A local factors approach

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### ABSTRACT

The study is based on theoretical and empirical studies on the role of the internet in consumption and related factors. This paper synthesizes the channels through which the Internet influences consumption and analyzes the factors affecting this relationship. Methodology adopted for this research is an empirical approach. We estimate the model using panel data through Fixed Effect Model Estimations. The panel data is collected annually for 63 provinces in Vietnam. The data is sourced from the Statistical Yearbook and VCCI. The results obtained revealed the positive impact of the internet on consumption. The results indicate that the impact of the internet becomes stronger with the Mobile Internet. The paper finds that the internet plays a more significant role in urban areas compared to rural ones. It also shows that effective local governance positively influences the relationship between internet and consumption. The paper offers the first evidence that local factors, including the macroeconomic, institutional and social variables, are determinants of consumption in the context of Internet development.

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## 1. Introduction

The development of the Internet has been instrumental in driving consumer demand and transforming consumption patterns globally (Chen, Yang, & Hu, 2022). Research highlights four main categories of Internet usage that influence consumption through distinct mechanisms: social, entertainment, informational, and online shopping (Zhu et al., 2021). Of these, online shopping is the strongest predictor of credit consumption, operating indirectly through materialism and the combined effect of social comparison and materialism. Increased Internet penetration enhances communication between consumers and producers via social networks, reshaping consumption habits and distribution channels (Harris & Dennis, 2011; Heinonen, 2011). It broadens consumer choices by providing access to diverse platforms, facilitating information comparison, and offering fast, convenient digital payment options (Zhichao & Qian, 2020). Moreover, widespread Internet use gives businesses valuable insights into consumer behavior. The rise in e-commerce creates new opportunities for both buyers and sellers, with online marketing tools enabling even small enterprises to reach broader audiences and grow their market share.

Most previous studies have focused on how the Internet influences consumer behavior by shaping marketing stimulus, which in turn affects buyer characteristics and decision-making processes. In these studies, consumption has also examined the roles of external factors such as urban–rural classification, education, income levels, inflation, and unemployment. However, there is a lack of research analyzing the impact of environmental stimulus. Addressing this gap forms the core objective of the present study.

An in-depth analysis of the impact of the Internet on consumption in Vietnam offers valuable theoretical insights for boosting domestic demand and addressing consumption gaps in the country's evolving economic landscape. Such exploration could lead to new strategies for driving consumption growth.

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The innovation of this study lies in its focus on provincial consumption patterns, analyzing how Internet development has driven transactions for both consumers and firms. The development of the internet has increased consumers' access to goods and businesses' access to customers. Therefore, factors influencing the development of the internet will also impact consumption. In addition to assessing the impact of Internet development, the research also considers local factors, including economic and social influences, to provide a comprehensive understanding of changes in consumption. Furthermore, the study compares how the Internet influences consumption across regions with varying levels of development. The remainder of the paper is structured as follows. Section 2 provides literature review and discusses how it can affect consumption diversity. Section 3 describes the data and methodology. Section 4 discusses empirical results. Section 5 concludes the paper and lays out policy implications.

## 2. Literature review and hypothesis

The internet has impacted consumption both from the demand side and supply side perspective. Internet use can influence consumption diversity through multiple channels. Building on prior research on Internet usage (e.g., Ma, Ne et al., (2020), we examine and disentangle the key pathways through which it shapes consumption behavior.

### 2.1 Internet push up consumption through e-commerce platforms

The Internet is bridged between sellers and buyers through the development of e-commerce platforms. A range of articles have shown that the internet has created the digital platform for e-commerce, promoting household consumption (Li, Wu & Xiao, 2020; Chunfang, Yifeng & Suyun, 2022). Electronic commerce has significantly enhanced marketing, with businesses of all sizes embracing online platforms such as websites, blogs, Facebook, Twitter, and LinkedIn. These strategies effectively attract consumers by highlighting what they “need”, creating a sense of urgency and the belief that they will be unhappy or inferior if they fail to purchase certain products or necessities (Solomon, Askegaard & Hog, 2019). Traditional marketing has been subverted to a large extent due to the rapid development of the Internet that has changed people’s consumption patterns. The Internet celebrity with five characteristics including popularity, professionalism, interactivity, attractiveness, and credibility has significant positive effects on impulsive consumption behavior through consumer pleasure and evocative emotions (Zhichao & Qian, 2020). The effect of e-commerce on consumption also depends on the Internet usage level. The higher Internet intensity, Internet frequency and household Internet access ratio result in higher household consumption (Chunfang, Yifeng & Suyun, 2022). The researchers point out that Internet use will boost household consumption by serving as a source of information channels and enhancing interaction. The positive impact holds true for the consumption of different items such as food, clothing, communication, cultural and entertainment categories.

Additionally, e-commerce boosts household consumption due to a wider variety of merchants online, saving the travel costs (Brynjolfsson, Hu & Smith, 2003; Chen, Yang & Hu, 2022; Dolfen *et al.*, 2023). Using transaction -level data on credit and debit cards from Visa, Inc, between 2007 and 2017, Dolfen et al (2023) estimated that e-commerce reached 8 percent of consumption by 2017, yielding the equivalent of 1 percent boost to the household’s consumption. Another study of Banda and Kassam (2023) adopted the time series data from 1990 to 2021 shows a positive relationship between e-commerce marketing and real household consumption in the U.S. In particular, a one-unit improvement in e-commerce marketing results in a 0.72 percent point increase in real household consumption in the long run. Similarly, internet sales in China rose from scratch in 2000 to more than 400 million in 2015, surpassing the U.S. as the leading online market (Faber et al., 2018). Through the survey microdata across 100 villages in 3 provinces and 8 counties in China, the authors find that e-commerce platforms overcome the logistical barrier and reduce the retail consumption cost for rural households. The characteristics of e-commerce in terms of lowering search costs and spanning the transaction space have significantly boosted residential consumption.

### 2.2 Internet and payment

The development of Internet finance has a significant impact on upgrading residents’ consumption structure. According to different functional categories of Internet finance, the impact on residents’ consumption was Internet payment, Internet money fund investment, Internet lending, and Internet insurance. The consumers save time and money and feel secure when purchasing the goods and services on online platforms. Li et al. (2020) also points out that the Internet has created convenience for online shoppers such as digital payment and business insurance. Digital finance model is supported by information technology, it can help decrease the degree of information asymmetry, reduce transaction costs, improve availability of financial services and optimize resource allocation in the financial markets. Digital finance including online loans, mobile payment, Internet finance, Internet insurance and other kinds of innovative products impacts household consumption in various ways (Li, Wu & Xiao, 2020). Online credit makes it possible to match the financial demand side with the supply where the parties are geographically disparate. According to Li et al. (2020), consumption credit services relieve liquidity constraints, which can promote household consumption. The authors also indicate that rapidly developed digital payment platforms have greatly reduced the transaction and time costs of financial services, improved the efficiency of payment and transfer for household consumption.

Empirical studies point out that digital finance alters the consumption behavior through the introduction of various internet-based financing services. Wang et al., (2021) using the collected data from 571 college students in China has indicated that

the service and convenience factors from the Internet-based financing services encourage people to fulfill their advanced consumption demands.

Basnet and Donou-Adonsou (2016, 2018) acknowledged that the Internet has made shopping easier through e-commerce platforms, with online spending habits increasing due to the availability of credit as a means of payment. By employing different datasets and models, they found that Internet access had a positive effect on credit card balances and delinquencies; consumers with Internet access were prone to higher balances and delinquencies than those without access (Basnet & Donou-Adonsou, 2016, 2018; Donou-Adonsou & Basnet, 2019).

The Internet, apart from being solely a convenient means for online shopping, is now widely used for other purposes such as entertainment, socializing and information-seeking. Thoumrunroje (2018) focused on the effect of online socializing on credit consumption behavior and found that social networking activities significantly affected the overuse of online credit among American college students.

### *2.3 Internet creates the bonds between the consumers and manufacturers*

From the social Internet production perspective, practitioner level literature has been uniformly positive about the prospect of engaging consumers through social Internet usage. Many marketers see these technologies as a means of fostering stronger connections with their consumers (Hinsch & Sheldon, 2013). Firms engaged in the production and support of the social Internet should understand the full range of outcomes that accompany social Internet use if this connection comes with negative consequences. The better the information firms feed consumers, the higher the household consumption and the more the sales revenue and profitability a firm earns (Banda & Kassam, 2023). The Internet based eCRM system connects business with consumers, fostering customer loyalty, boosting sales and reducing cost for companies (Harrigan *et al.*, 2010). The introduction of the Internet has changed the transaction cost between firms including coordination costs and motivation costs (Garicano & Kaplan, 2001). The results suggest that coordination efficiencies could lead to significant process improvements and substantial marketplace benefits.

Internet access has expanded with the rise of mobile technology, allowing people to connect anytime and anywhere. Mobile Internet access proves more beneficial to household consumption than computer access. Vatsa, et al. (2023) use survey data in China to show that consumption diversity is positively associated with Mobile Internet use in rural areas. Mobile Internet represents a key milestone in the development of the Internet, greatly enhancing the online shopping experience. With mobile Internet, consumers can now shop anywhere and anytime using just their smartphones, without needing a fixed broadband connection.

### *2.4 The impact of the Internet on consumption depends on macroeconomic and local governance*

Empirical findings suggest that various factors—including household income, borrowing behavior, household size, urban versus rural residence, age of the financial decision-maker, and marital status—significantly influence residential household consumption (Chunfang, Yifeng, & Suyun, 2022). The study highlights that urban households are more sensitive to the Internet's influence on consumption compared to rural households. Moreover, households with female financial decision-makers are more likely to use the Internet, thereby experiencing a stronger boost in consumption. Other studies also confirm that the Internet's impact on household consumption varies across income levels and geographic regions. Higher-income households and those in densely populated areas tend to benefit more (Dolfen et al., 2023). Using data from 155 counties collected through the China Family Panel Studies between 2010 and 2016, Zhang, Li, and Xiao (2020) found that increased Internet penetration may contribute to rising consumption inequality, as measured by the Gini index. Additionally, higher levels of education and surpassing a certain threshold of Internet penetration can moderate the Internet's positive effect on consumption. On the other hand, a heterogeneity analysis showed that households with fewer assets, lower income, less financial literacy and in third- and fourth-tier cities experienced larger facilitating effects of digital finance on consumption compared to their counterparts (Li, Wu & Xiao, 2020).

The previous studies have shown the positive influence of the internet on consumption in different ways, in which most of them are analyzed from the household perspective. The Internet can boost the consumption from both consumers and enterprises (Hinsch & Sheldon, 2013; Banda & Kassam, 2023). This article will examine the impact of the internet on consumption in a comprehensive way, the research data on consumption and the internet will include data from both households and businesses.

Bulkeley and Kern (2006) discuss governing by enabling, which refers to the municipality's capacity to persuade and encourage using positive incentives such as subsidies, information campaigns or the facilitation of different types of initiatives. Another way to exercise authority is by acting as an inspection body for certain national regulations, such as internet infrastructure. Depending on the administrative context, local authorities can choose to be stringent in ensuring these regulations are enforced and, in doing so, can exercise a degree of agency. In terms of governing by enabling—that is, through positive incentives, information, and facilitation—provincial governance has many avenues for promoting sustainable consumption. Local authorities can also support different types of enterprise initiatives to use the internet, which can, in turn, boost consumption. They enable firms to adopt Internet applications in their operations, which in turn motivates them to

expand market share and increase sales revenue.

On the other hand, consumption is also influenced by environmental factors including macroeconomic variables including inflation, unemployment (Banda and Kassam, 2023) and also local authorities. According to (Chunfang, Yifeng & Suyun, 2022; Dolfen et al., 2023), the Internet’s impact on consumption is affected by geographical features and the level of development in different regions.

In this paper, the authors will analyze how local factors, including macroeconomics and social variables, affect the influence of the Internet on consumption through the case of Vietnam. While the other studies focus on the technological aspects of the Internet, such as digital platforms and digital finance, this article will examine its impact from an economic perspective (see details as Fig. 1).

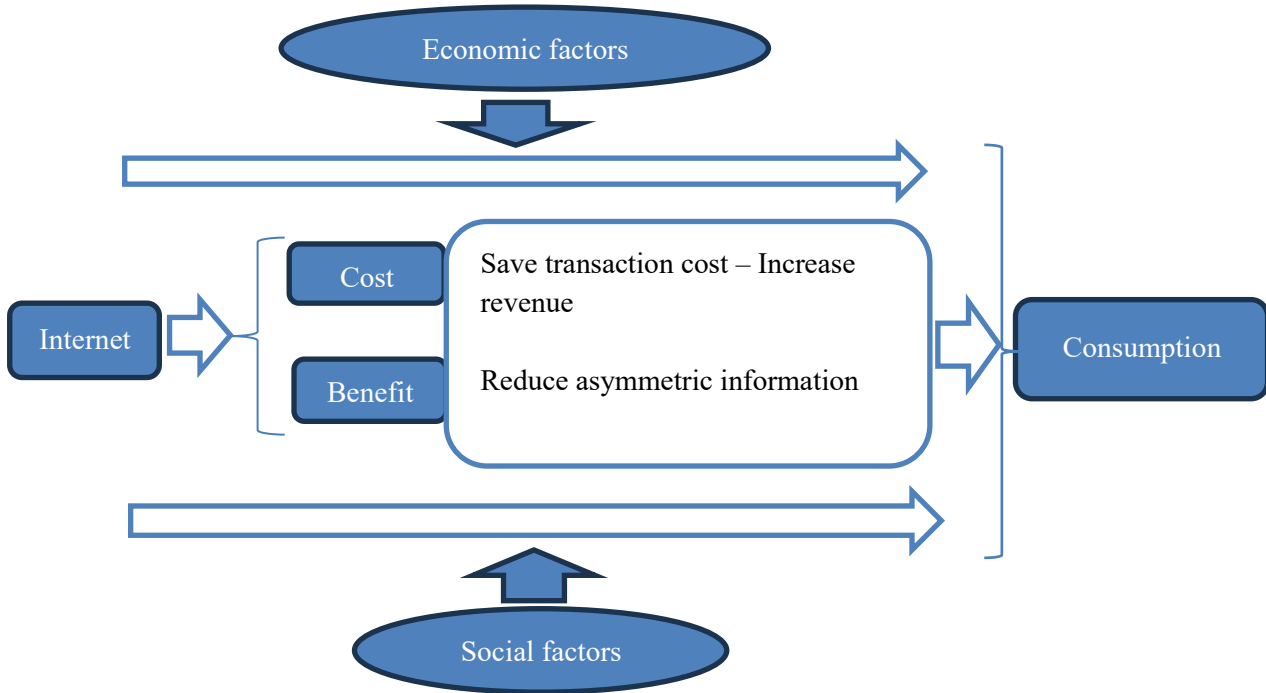


Fig. 1. The impact channels of the Internet on consumption

Based on the review above, the following key hypotheses guide our investigation into whether the Internet plays a role in promoting consumption:

- Hypothesis 1:** *Increased Internet penetration, as indicated by a rise in Internet subscriptions, positively affects consumption.*
- Hypothesis 2:** *The growth of mobile Internet, reflected in the adoption of higher generation networks, further boosts consumption.*
- Hypothesis 3:** *A strong public governance enhances the impact of Internet usage on consumption.*
- Hypothesis 4:** *The impact of the Internet on consumption is greater in more developed areas compared to less developed ones.*

### 3. Data and Methodology

In Vietnam, Internet subscribers include users of mobile phones, ADSL and fiber optic services. Initially, most Internet users were fixed-line subscribers. However, in the following years, the rapid expansion of mobile phone services, including 3G, 4G, and 5G networks, has significantly increased the number of Internet users through mobile channels. The chart reflecting the growth of Internet users in recent years illustrates the rapid advancement of Internet technology in Vietnam. The number of Internet users has steadily increased year by year, with a notable spike of 21.8% in 2018. That year, the percentage of Internet users rose from 58.14% to 70%. The launch of 4G networks with high-quality services in 2017 played a key role in this growth. Intense competition among service providers has also driven down prices, making Internet access more affordable. Since 2017, the coverage of 2G, 3G and 4G networks has reached over 99.5% of the population, with 4G coverage at 95%. The 4G network expanded rapidly, achieving 99.5% coverage by 2020. While the 5G network has been introduced and is widely used, 4G still remains the dominant network in terms of coverage. With the growth of the Internet and the expansion of the economy, the total turnover from retail consumer goods and services provided by production and business establishments has steadily increased each year. Internet services have facilitated transactions between producers and consumers. Businesses can reach a broader customer base through platforms like Facebook, Twitter, and You Tube, while consumers can purchase goods and

services anytime and anywhere as long as they have Internet access. Building on the theoretical framework and empirical research regarding the impact of the Internet on consumption, the study's analytical model is structured as follows:

$$\ln CONREV_{it} = \alpha_0 + \alpha_1 \cdot \ln lag1\_INTERNET_{it} + \alpha_2 \cdot INTERNET\_Y_{it} + \alpha_3 \cdot X_{it} + \alpha_4 \cdot Z_{it} + \varepsilon_{it} \quad (1)$$

In this model: The group of control variables ( $X_{it}$ ): represents the economic factors in province  $i$  at year  $t$ , including gross regional domestic product per capita and inflation rate. The variables  $Z_{it}$  reflect the impact of social factors (such as gender, labor force and urbanization rate) in province  $i$  at year  $t$ .

*Dependent variable (lnCON\_REV):* The consumption level in this article is measured by gross retail sales of goods and services at current prices, as published in the provinces' Statistical Yearbook. According to GSO, gross retail sales of goods and services represent total turnover generated from retailing consumer goods and services of production and business establishments. This includes turnover from retail sales of goods, accommodation and catering series, travel services and other services.

The literature review highlights the impact of Internet development from both the supplier and consumer perspective. While most previous studies focus on household consumption expenditure (Chunfang, Yifeng & Suyun, 2022; Banda & Kassam, 2023), our study examines sales from both sides. This variable captures changes in the total value of items actually transacted by sellers and buyers in the economy amid technological advancements. The data is reported in billions of Vietnamese dong, which fluctuate significantly, so the natural logarithm is applied to treat it as a linear variable.

*Explanatory variables (LN\_INTERNET):* While other studies analyze the Internet usage variable based on the time, frequency, and ratio of household Internet access (Chunfang, Yifeng and Suyun, 2022), this paper uses the number of Internet subscribers to capture the development of the Internet over time. Subscribers include both mobile and broadband users. Mobile internet service involves wireless data communication for mobile carriers through cellular technology, including 2G, 3G, 4G and the latest version 5G. Subscribers in this category are required to use telecommunications services with cellular registration from providers. On the other hand, broadband Internet is delivered through fiber optic cables, offering a stable and high-speed connection. Regardless of the service form, users can access all online utilities, including shopping, information searching, and communicating. In this research, the number of Internet subscribers for both services is collected annually from 2011 to 2022. There is typically a delay between when users register for Internet access and the actual purchase and sale of goods and services occur on digital platforms. Therefore, the research assumes a one-year lag and used the lagged variable of Internet subscribers. Like the consumption data, natural logarithms are applied to define it as the linear variable.

**Table 1**  
Internet and Consumption Data by Region in Vietnam

| Year | The Red River |          | The Northern Midlands and Mountains |          | The North Central and Central Coast |          | The Central Highland |          | The Southeast |          | Mekong Delta |          | Municipalities |          |
|------|---------------|----------|-------------------------------------|----------|-------------------------------------|----------|----------------------|----------|---------------|----------|--------------|----------|----------------|----------|
|      | Consumption   | Internet | Consumption                         | Internet | Consumption                         | Internet | Consumption          | Internet | Consumption   | Internet | Consumption  | Internet | Consumption    | Internet |
| 2011 | 7.84          | 0.62     | 4.80                                | 16.56    | 12.76                               | 16.56    | 4.16                 | 16.56    | 10.43         | 16.56    | 15.59        | 16.56    | 44.42          | 16.56    |
| 2012 | 7.90          | 0.64     | 4.81                                | 16.56    | 13.12                               | 16.56    | 4.36                 | 16.56    | 10.84         | 16.56    | 15.78        | 16.56    | 43.20          | 16.56    |
| 2013 | 8.22          | 1.16     | 4.94                                | 16.47    | 13.78                               | 16.47    | 4.59                 | 16.47    | 10.64         | 16.47    | 16.28        | 16.47    | 41.54          | 16.47    |
| 2014 | 8.23          | 1.08     | 4.96                                | 16.49    | 14.01                               | 16.49    | 4.70                 | 16.49    | 10.80         | 16.49    | 16.65        | 16.49    | 40.65          | 16.49    |
| 2015 | 8.42          | 0.86     | 5.01                                | 16.52    | 14.32                               | 16.52    | 4.61                 | 16.52    | 11.16         | 16.52    | 16.47        | 16.52    | 40.02          | 16.52    |
| 2016 | 8.69          | 1.14     | 5.01                                | 16.48    | 14.27                               | 16.48    | 4.48                 | 16.48    | 11.04         | 16.48    | 16.68        | 16.48    | 39.84          | 16.48    |
| 2017 | 8.70          | 1.52     | 5.05                                | 16.41    | 14.40                               | 16.41    | 4.55                 | 16.41    | 11.16         | 16.41    | 16.86        | 16.41    | 39.28          | 16.41    |
| 2018 | 8.90          | 1.76     | 5.10                                | 16.37    | 14.34                               | 16.37    | 4.53                 | 16.37    | 11.14         | 16.37    | 16.84        | 16.37    | 39.14          | 16.37    |
| 2019 | 8.96          | 1.34     | 5.15                                | 16.44    | 14.40                               | 16.44    | 4.56                 | 16.44    | 11.17         | 16.44    | 16.95        | 16.44    | 38.82          | 16.44    |
| 2020 | 9.50          | 1.62     | 5.29                                | 16.40    | 13.79                               | 16.40    | 4.48                 | 16.40    | 11.63         | 16.40    | 17.31        | 16.40    | 38.00          | 16.40    |
| 2021 | 10.85         | 1.71     | 6.12                                | 16.38    | 14.79                               | 16.38    | 4.74                 | 16.38    | 11.76         | 16.38    | 16.99        | 16.38    | 34.75          | 16.38    |
| 2022 | 10.64         | 1.79     | 5.93                                | 16.37    | 15.28                               | 16.37    | 4.62                 | 16.37    | 11.91         | 16.37    | 17.12        | 16.37    | 34.50          | 16.37    |

Unit % :

Note: Data for the six regions exclude figures from the five municipalities.

Source: GSO Vietnam

*General control variables (local factors):* Building on previous studies of household consumption, this research incorporates both macroeconomic and social variables in addition to the primary explanatory variable (Chunfang, Yifeng and Suyun, 2022; Banda and Kassam, 2023). One of the most crucial factors influencing purchasing decisions is consumer income. To capture this, the gross regional domestic product per capita (GRDP\_PC) is used as an indicator of the people's purchasing power.

In which, GRDP refers to the gross regional domestic product for a given year, while POPU represents the average population in each locality for that respective year. GRDP\_PC is calculated at current prices, reflecting the current value of local income.

Another key economic factor influencing consumer purchasing power is price fluctuation, which is captured by the inflation rate (INFLATION). This is measured by the annual change in the average consumer price index (CPI). The CPI is a relative indicator (%) that reflects changes in the prices of consumer goods and services purchased by people over time.

Beyond macroeconomic factors, consumption is also shaped by social variables. Building on previous studies, this research analyzes the influence of factors such as gender, labor force participation and urbanization rate. The gender variable represents the ratio of male to females in each locality, with the ratio expressed as the number of males per 100 females. For labor, the study focuses on the working-age population, which represents a financially active group capable of making independent consumption decisions. The labor variable is measured as the ratio of working-age individuals to the total population. Additionally, urban areas often provide easier access to goods and services, which can increase consumer demand. As a result, the urban rate (URBAN) is included in the analysis. The data for URBAN are sourced from the Province's Statistical Yearbook. The study uses data from the General Statistics Office of Vietnam (GSO), a government agency responsible for statistical activities and providing socio-economic information to both domestic and international organizations, in compliance with the law. The panel data, which includes indicators related to the Internet, economy, and society, is collected annually for 63 provinces from 2011 to 2022. The data is sourced from the Statistical Yearbook, an annual publication by the Provincial General Statistics Department, which provides key information on the socio-economic dynamics and conditions of the entire country, as well as its regions and localities.

Provincial Competitiveness Index (PCI) is used as a proxy for local governance (Sy & Huyen, 2025). It is collected annually from VCCI's publication and serves as an official measure of institutional quality across Vietnam's localities. The details of variables, along with their explanations and descriptive statistics, are provided in Table 2 below.

**Table 2**  
Descriptive statistics of variables

| Variable    | Explanation   | Mean     | Std.Edv | Min      | Max      |
|-------------|---|----------|---------|----------|----------|
| LN_CON_REV  | Log of gross retail sales of goods and services at current prices | 10.3828  | .8248   | 8.7515   | 11.8642  |
| LN_INTERNET | Logarithm of total Internet subscribers                           | 12.3135  | 1.4915  | 9.7817   | 14.7360  |
| URBAN       | The ratio of urban population to total population                 | .2789    | .1530   | .1203    | .6928    |
| MALE-FEMALE | The ratio of male to 100 females (%)                              | 99.5385  | 2.2937  | 95.7100  | 103.8000 |
| LABOUR_POPU | Rate of employed people compared to total population              | .5814    | .0414   | .4887    | .6504    |
| GRDP_PC     | Gross regional domestic products per capita                       | 47.9904  | 29.7552 | 15.5040  | 131.4283 |
| INFLATION   | Inflation rate  | 104.4884 | 4.1048  | 100.3100 | 117.2725 |
| PCI         | The Provincial Competitiveness Index                              | 61.2902  | 4.5641  | 45.1200  | 75.0860  |

Note: All variables are calculated by provincial data

#### 4. Results and discussion

We estimate the empirical model using panel data through FEM (Fixed Effect Model) and REM (Random Effect Model) estimations (Zhang, Li & Xiao, 2020; Chen, Yang & Hu, 2022; Chunfang, Yifeng & Suyun, 2022). FEM focuses on how predictor variables impact consumption within each specific province, acknowledging that each locality may have unique characteristics that influence the relationship between the predictors and dependent variables. On the other hand, REM treats individual-specific constants as randomly distributed across cross-sectional units. Given that the characteristics of provinces vary over time and across regions. The Hausman test is employed to determine which model, the Fixed Effects Model (FEM) or the Random Effects Model (REM) (Baltagi, 2010). The test results show  $\chi^2=23.7$  with the p-values of less than 0.05, indicating that FEM is the best fit for the data in all three estimations. Wald test results reveal the presence of heteroskedasticity in the models, with p-values of 0.000, which are less than 0.05. As a result, the authors proceed with the Fixed Effects Model (FEM) and apply a correction for the heteroskedasticity issue. Additionally, the Wooldridge test results show p-values of 0.000, indicating autocorrelation in all models. To address this, robust standard errors are used, adjusting for both heteroskedasticity and autocorrelation <sup>[1]</sup>. In general, all FEM correction estimations yield similar results to the initial FEM model, demonstrating the robustness of the model. Table 3 and 4 present the estimation results from the panel data model, including FEM and REM robustness check. The significance of most indicators in the robustness tests is validated at the 1% level.

<sup>[1]</sup> Details of the Hausman test, Wald tests, and Wooldridge test results are available upon request.

**Table 3**  
The effect of Internet on consumption considering economic variables

|               | 1 <sup>st</sup> estimation |                    | 2 <sup>nd</sup> estimation |                     |
|---------------|----------------------------|--------------------|----------------------------|---------------------|
|               | FEM                        | FEM – Robust check | FEM                        | FEM – Robust check  |
| LN_INTERNET   | 0.0731*** [8.97]           | 0.0560*** [7.16]   | 0.0821*** [9.74]           | 0.0708*** [8.98]    |
| INTERNET_YEAR | -0.0161*** [-8.81]         | -0.00285** [-2.15] |                            |                     |
| INTERNET_PCI  |                            |                    | -0.0066*** [-3.79]         | -0.0004 [-0.34]     |
| GRDP_PC       | 0.0033*** [6.67]           | 0.0093*** [16.70]  | 0.00412*** [7.88]          | 0.00768*** [14.77]  |
| INFLATION     | -0.0234*** [-13.97]        | -0.0116*** [-8.06] | -0.0235*** [-13.13]        | -0.0138*** [-9.47]  |
| PCI           | 0.0072*** [2.81]           | 0.0129*** [6.34]   | 0.0108*** [3.66]           | 0.0156*** [7.46]    |
| URBAN         |                            |                    | 0.395 [1.23]               | 1.628*** [17.67]    |
| MALE_FEMALE   |                            |                    | 0.0111 [1.15]              | -0.0656*** [-11.41] |
| LABOUR_POPU   |                            |                    | -0.501** [-2.20]           | 0.644*** [3.58]     |
| Constant      | 11.42*** [42.32]           | 9.715*** [45.18]   | 10.08*** [9.68]            | 15.30*** [24.67]    |
| Observations  | 694                        | 694                | 694                        | 694                 |
| R-sq          | 0.809                      |                    | 0.794                      |                     |

Note: The dependent variable is the natural log of lag internet subscribers .

t - statistics in parentheses, \* significant level p-value, \* p<0.1, \*\* p<0.05, \*\*\* p<0.01

The results of 1<sup>st</sup> estimation and 2<sup>nd</sup> estimation indicate that the increase of Internet subscribers has a positive impact on consumption, as evidenced by higher total sales revenue. This supports Hypothesis 1 and aligns with previous studies (Zhang, Li & Xiao, 2020; Chen, Yang & Hu, 2022; Chunfang, Yifeng & Suyun, 2022). The rapid expansion of Internet technology is linking various economic sectors and creating value chains that benefit both producers and consumers. The development of the Internet has dramatically altered consumer behavior, with online shopping becoming a popular and convenient tool for consumption. The Internet has greatly assisted – whether large or small – in establishing online stores through websites, blogs, Facebook, Youtube and other platforms. This has increased the accessibility of products to consumers, regardless of their location, leading to higher retail sales of goods and services across all provinces. Additionally, the 2<sup>nd</sup> estimation considers local factors such as macroeconomics and social variables, the effect of the Internet on consumption and its impact with the introduction of mobile Internet have been reaffirmed. The higher coefficient in the 2<sup>nd</sup> model also suggests that the added effect of social factors enhances the Internet's impact on consumption.

There have been five stages of broadband communications, including 1G, 2G, 3G, 4G and the latest 5G. Among these, the 4<sup>th</sup> generation (4G) is considered the most preferred mobile network due to its superior service qualities, such as speed, reliability, customer satisfaction, security, privacy and cost-effectiveness (Nassuora, 2013; Sharma and Madan, 2020). With the spread of high-speed 3G networks and the introduction of the more advanced 4G, consumers' behaviors have undergone significant changes, leading to an increase in consumption (Fong & Wong, 2015). E-commerce has grown rapidly, driven by the explosive development of cellular network technology. In Vietnam, 4G was first introduced in 2016 and became widely available in 2017, which coincided with the launch of the country's largest e-commerce platform, Shopee, marking the beginning of the online shopping era. To evaluate the impact of mobile Internet on consumption, the article will compare two periods: before 2017 and from 2017 to the present, using the interaction variable *INTERNET\_YEAR*.

The results in the 1<sup>st</sup> estimations support Hypothesis 2, the influence of the Internet on consumption has become stronger compared to the period before 2017, when mobile Internet was still limited. The introduction of the 4G mobile network in 2017 brought significant benefits to users. The 4G network, with its reliable and stable network infrastructure, offers fast internet speeds and broad coverage in urban, suburban, and rural areas. Additionally, 4G technology is relatively cost-effective, as the cost of devices and data plans has become more affordable for users across various income levels.

In terms of the institutional environment, the 1<sup>st</sup> and 2<sup>nd</sup> estimations show that an improvement in the quality of local institutions, as measured by *PCI*, leads to positive changes in provincial consumption. A province scoring well on the *PCI* typically demonstrates: (1) low entry costs for business operation; (2) developed and high-quality business support services; and (3) a transparent and equitable business environment. A higher *PCI* score reflects the efforts of local governments to promote enterprises' investment and create a fair business environment. A favorable business environment creates conditions that allow firms to operate efficiently and expand their market (Cuong and Trang, 2025).

The second model evaluates the impact of Internet usage on consumption, incorporating differences in institutional quality. The interaction term, *INTERNET\_PCI*, captures the effect of Internet penetration by combining the number of Internet subscribers with a dummy variable representing regions with weaker institutional environments. This variable allows for an analysis of how the Internet's influence on local consumption varies across areas with differing levels of institutional quality. The results are statistically significant, suggesting that in regions with stronger institutional frameworks, Internet usage has a more positive effect on consumption, thereby supporting Hypothesis 3. However, the effect is not entirely robust, providing only partial evidence that a strong institutional environment amplifies the positive impact of Internet development on local consumption.

Regarding macroeconomic factors, in both 1<sup>st</sup> and 2<sup>nd</sup> estimations, localities with higher income (reflected in GDP per capita) show greater retail sales revenue. Conversely, the inflation rate indicates that rising prices negatively affect consumer consumption. These findings are in line with previous research by Chunfang, Yifeng and Suyun (2022). In provinces with higher GDP per capita, residents have greater purchasing power, enabling them to afford more goods and services. Higher income also allows individuals to access a wider range of Internet packages, increasing the probability of online shopping. On the other hand, price increases reduce purchasing power, leading to lower retail sales.

When it comes to social indicators, the 2<sup>nd</sup> estimation yields result like other studies. Male tend to make fewer purchases than females, which highlights a notable gender difference (Solano, Eaton and O'Leary, 2020; Chunfang, Yifeng and Suyun, 2022). Women are generally more inclined to shop, as it is often seen as their responsibility, and some women also turn to shopping to relieve stress. Additionally, provinces with a higher proportion of the labor force experience higher retail sales. This is because employed individuals typically have higher incomes and are more likely to be well-educated, allowing them to use the Internet for various activities, including online shopping. This is consistent with the study by Zhang, Li and Xiao (2020) on the role of education in Internet consumption, as well as findings of Dolfen et al. (2023) and Chunfang, Yifeng and Suyun (2022) regarding how income levels impact consumer behavior in the Internet network.

The estimated results also determine that a higher urbanization rate leads to a greater change in local consumption. Provinces with higher urbanization rates reflect improved Internet infrastructure and local social economic development, creating a favorable environment for boosting household consumption as well as local retail sales of goods and services. This finding is supported by the previous research of Chunfang, Yifeng and Suyun (2022). The 3<sup>rd</sup> model will further analyze the varying effects of the Internet on consumption across different regions.

Vietnam is divided into six main economic regions: the Northern Midlands and Mountainous, the Red River Delta, the Central Coastal, the Central Highlands, the Southeast and the Mekong Delta. Within these regions, five municipalities – Ha Noi, Ho Chi Minh city, Hai Phong, Da Nang and Can Tho, stand out as the most developed in terms of economics, education, urbanization and other factors. As shown in Table 1, these five municipalities account for most of the national consumption, whereas the distribution of Internet subscribers is relatively uniform across regions. The variable *INTERNET\_Region* represents interaction of the Internet with the remaining regions, excluding the five municipalities.

**Table 4**  
The effect of the internet on consumption by regions

|                 | FEM                    | FEM – Robust checkness |
|-----------------|------------------------|------------------------|
| LN_INTERNET     | -0.0250<br>[-1.40]     | 0.0836***<br>[9.41]    |
| INTERNET_Region | 0.122***<br>[6.91]     | -0.0217***<br>[-3.92]  |
| GRDP_PC         | 0.0052***<br>[9.75]    | 0.0079***<br>[14.87]   |
| INFLATION       | -0.0214***<br>[-12.42] | -0.0138***<br>[-9.69]  |
| PCI             | 0.0168***<br>[7.56]    | 0.0153***<br>[8.70]    |
| URBAN           | 0.0887<br>[0.28]       | 1.451***<br>[13.40]    |
| MALE-FEMALE     | 0.0031<br>[0.32]       | -0.0471***<br>[-7.87]  |
| LABOUR_POPU     | -0.494**<br>[-2.23]    | 0.814***<br>[4.51]     |
| Constant        | 10.23***<br>[10.20]    | 13.52***<br>[21.58]    |
| Observations    | 694                    | 694                    |
| R-sq            | 0.804                  |                        |

Note: The dependent variable is the natural log of lag internet subscribers.

t - statistics in parentheses, \* significant level p-value, \* p<0.1, \*\* p<0.05, \*\*\* p<0.01

Table 4 highlights the Internet's influence on consumption patterns across various localities, supporting Hypothesis 4. The five municipalities—Hanoi, Ho Chi Minh City, Da Nang, Hai Phong, and Can Tho—serve as major shopping hubs in Vietnam. Residents in these cities generally have higher incomes, better education, and more extensive Internet access, all of which contribute to a greater propensity for online shopping due to its convenience. Additionally, the concentration of businesses in these areas helps lower transportation costs and shorten delivery times. Time constraints and traffic congestion also make shopping in physical stores less appealing. These factors collectively drive the popularity of online shopping in major urban centers, resulting in a stronger impact of the Internet on consumption compared to other regions.

## 5. Conclusion and policy recommendations

The article analyses Internet penetration through the number of Internet subscribers and the growth of mobile Internet to explore the impact of Internet development on consumption. The findings indicate that Internet technology has a significant and positive effect on gross retail sales of goods and services. This suggests that Internet development, with multifunctional capabilities, plays a crucial role in supporting consumption by connecting sellers and buyers, facilitating information exchange, and shifting consumption habits. Our paper offers the first evidence that local factors, including the macroeconomic and social variables, are crucial determinants of consumption in the context of Internet development. While GDP per capita and institutional quality show a positive effect on consumption, inflation rate negatively influences. Notably, a strong institutional environment amplifies the impact of Internet development on local consumption, despite some ambiguous results. In terms of social factors, localities with a higher proportion of employed individuals tend to see greater levels of goods consumption compared to areas with lower employment rates. This article also emphasizes the differences between fixed (wired) broadband Internet and mobile Internet. The result reveals that the introduction of the 4G network has notably transformed the way consumers purchase goods and services, demonstrating a clear correlation between consumption growth and the advances in Internet technology.

The study has highlighted the differing effects of the Internet in rural and urban areas. Consumption patterns in the five municipalities with higher urbanization rates are more significantly influenced by the Internet than those in other provinces. This suggests that residents in these cities generally have higher incomes and better access to Internet services, making it easier for them to engage in online shopping compared to individuals in less developed regions. An increase of consumption is a crucial driver of aggregate demand in a country. Recommended policies to foster internet development in developing nations, with a focus on countries like Vietnam.

First, further development of the mobile Internet is key to meeting the growing demand for consumption. This includes the adoption of next-generation wireless networks, such as 6G. While 5G is currently advancing rapidly and offers notable advantages over 4G, particularly in high-speed data networks, multimedia, the Internet of Things (IoT), and security, 6G promises to further enhance the consumer experience. With its more advanced features, 6G will improve mobile network capabilities and wireless transmission, offering a more satisfying shopping experience for consumers and creating substantial growth in consumption in the future.

Second, the government should implement policies that promote Internet expansion in rural and remote areas. In these underserved regions, Internet access is limited, and residents often spend significant time and money traveling to stores for goods and services. Additionally, low incomes and poor transportation infrastructure in remote areas restrict household purchasing power, affecting economic well-being (Ma *et al.*, 2020). Expanding Internet access in these areas would be a vital step in promoting economic development. Preferential policies supporting Internet infrastructure, such as subsidies or reduced subscription fees, could make it easier for residents in underserved areas to access Internet services.

Third, macroeconomic policies focused on economic growth and inflation control are essential determinants of household consumption (Banda and Kassam, 2023). Regular fiscal and monetary policies can have a positive impact on living standards and boost consumption. These policies should especially target disadvantaged regions, aiming to reduce the gap between the urban and rural areas. Institutional quality needs to be further enhanced to create a favorable environment for enterprises to adopt Internet applications, thereby helping them increase sales revenue. Additionally, the social policies aimed at improving the labor force – such as support for employment and education- can enhance residents' income levels, increasing their purchasing power and, consequently, their ability to consume.

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