



Faculty of Economics and Business

The Multifaceted Impact of Social Media on Economic Growth in China

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The Multifaceted Impact of Social Media on Economic Growth in China

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DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Malaysia Sarawak. Except where due acknowledgements have been made, the work is that of the author alone. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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ABSTRACT

This study investigates the relationship between social media usage and economic growth in China from 2017 to 2023, focusing on the role of key social media platforms such as WeChat, Weibo, Douyin, and BiliBili. This study uses an Autoregressive Distributed Lag (ARDL) method to examine time series data and investigate social media's effects on China's short-term and long-term GDP and control variables including Total Retail Sales of Consumer Goods (TRSCG) and Aggregate Financing to the Real Economy (AFRE). The research chooses ARDL because of its strength in dealing with limited sample sizes and adaptability in handling regressors with various integration orders, setting it apart from traditional cointegration tests. Furthermore, this study utilizes a bounds test method to identify enduring connections between the factors. This study examines the impact of social media on the economic growth of China as a whole, as well as that of major factors like TRSCG and AFRE. It examines the impact of social media platforms WeChat, Weibo, and Douyin, which have a negative impact, but BiliBili has a positive impact on economic development, utilizing identical fundamental economic metrics. Further research indicates that the existence of a long-term relationship between the variables is backed by the error correction term (ECT). These observations provide important suggestions for policymakers and businesses on incorporating social media into economic development plans.

Keywords: Social media, economic growth, GDP, ARDL, TRSCG, AFRE

Kesan Pelbagai Rupa Media Sosial terhadap Pertumbuhan Ekonomi di China

ABSTRAK

Kajian ini menyiasat hubungan antara penggunaan media sosial dan pertumbuhan ekonomi di China dari 2017 hingga 2023 dengan memberi tumpuan kepada peranan platform media sosial utama seperti WeChat, Weibo, Douyin, dan BiliBili. Kajian ini menggunakan kaedah Autoregressive Distributed Lag (ARDL) untuk menganalisis data siri masa serta mengkaji kesan media sosial terhadap Keluaran Dalam Negara Kasar (KDNK) China dalam jangka pendek dan jangka panjang. Selain itu, kajian ini turut mengambil kira pemboleh ubah kawalan seperti Jumlah Jualan Runcit Barangan Pengguna (Total Retail Sales of Consumer Goods, TRSCG) dan Pembiayaan Agregat kepada Ekonomi Sebenar (Aggregate Financing to the Real Economy, AFRE). Kaedah ARDL dipilih kerana keupayaannya untuk menangani saiz sampel yang terhad serta kebolehsesuaiannya dalam mengendalikan regresi dengan pelbagai tertib pengintegrasian. Hal ini menjadikannya lebih unggul berbanding ujian kointegrasi tradisional. Selain itu, kajian ini menggunakan kaedah ujian sempadan bagi mengenal pasti hubungan jangka panjang antara pemboleh ubah yang dikaji. Dapatan kajian menunjukkan bahawa platform media sosial seperti WeChat, Weibo, dan Douyin memberikan kesan negatif terhadap pertumbuhan ekonomi, manakala BiliBili memberikan kesan positif berdasarkan metrik ekonomi yang sama. Selain itu, kewujudan hubungan jangka panjang antara pemboleh ubah disokong oleh terma pembetulan ralat (Error Correction Term, ECT). Dapatan ini memberikan implikasi penting kepada pembuat dasar dan pihak industri dalam usaha mengintegrasikan media sosial ke dalam strategi pembangunan ekonomi yang lebih berkesan dan menyeluruh.

Kata kunci: Media sosial, pertumbuhan ekonomi, KDNK, ARDL, TRSCG, AFRE

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LIST OF ABBREVIATIONS

GDP	Gross Domestic Product
BRI	Belt and Road Initiative
ECT	Error Correction Term
CNNIC	China Internet Network Information Centre
TRSCG	Total Retail Sales of Consumer Goods
SNU	Social Network Users
VIF	Variance Inflation Factor
ADF	Augmented Dickey-Fuller
CUSUM	Cumulative Sum of Squares
AFRE	Aggregate Financing to the Real Economy
GDPR	General Data Protection Regulation
AIC	Akaike Information Criterion
SC	Schwarz Bayesian Criterion
RESET	Regression Equation Specification Error Test
OLS	Ordinary Least Squares
ARDL	Autoregressive Distributed Leg

CHAPTER 1

INTRODUCTION

1.0 Introduction

Imagine a nation where the digital pulse of social media shapes economic growth, this chapter explores how platforms like WeChat and Douyin drive China's unique economic transformation. Chapter 1 is organised as follows. Section 1.1 provides background information on the multifaceted impact of social media on economic growth in China, divided into three parts. Section 1.1.1 examines the economic situation in China, providing an overview of the country's growth and key economic indicators. Section 1.1.2 discusses social media use in China, focusing on trends and platforms. Section 1.1.3 explores the link between social media and economic growth, analysing the channels through which social media influences economic activities through the lens of endogenous growth theory. Section 1.2 details this study's problem statement, identifying the gaps in existing research and the specific issues this study addresses. Section 1.3 outlines the objectives of this study and specifies the key goals of this research. Section 1.4 highlights the study's significance and explains its contribution to academic research. Section 1.5 presents the organisation of this study summarising the structure and contents of each chapter.

1.1 Study Background

China's economy has experienced rapid development while its social media landscape has similarly seen swift growth (Ma, 2016). There is a close connection between these sectors, with social media becoming an integral aspect of Chinese society (Wang, 2016). Beyond serving as a platform for communication, social media is crucial in commerce, entertainment, and social activities. Despite certain constraints, social media

continues to shape public discourse. Understanding the development of social media provides insights into its role in shaping China's social and economic landscape.

1.1.1 China's Economic Background

China's economy is now the greatest in the world in terms of purchasing power equality (Subramanian, 2011). It is also the largest producer, merchandise trader, and holder of foreign exchange reserves. Before 1949, China faced severe poverty, war, and colonial exploitation, resulting in a stagnant economy relying on agriculture (Naughton, 2006). The Cultural Revolution (1966–1976) further disrupted economic progress by prioritising ideological goals over productivity (Naughton, 2018). From 1979 to 2018, the country achieved an average annual Gross Domestic Product (GDP) growth rate of 9.5%, making it the fastest-growing major economy in history (Kuyucu, 2020). This growth continued after 1991, when China emerged from a two-year economic depression, and it went on to become the largest producer, merchandise trader, and holder of foreign exchange reserves. This impressive transformation underscores China's shift from a stagnant agricultural economy to a global economic powerhouse.

China's average yearly growth rate was 12% between 1991 and 1995, 14.2% in 1993, and 13.5% in 1994 (Morrison, 2014). The flurry of stock exchanges, development zones, real estate projects, and investments that heated up the economy led to a rapid increase in the inflation rate. Retail prices for social items increased by 21.4% in 1994, reaching a high of 27% in October, 1994 (Ciochetto, 2005). To decrease inflation, the Chinese government has been enforcing austerity measures since the second half of 1993. Signs of a slowing economy were evident beginning in the middle of 1995, and the economy was put back on track for steady growth (Lardy & Subramanian, 2011). While the GDP growth rate levelled off at 10.5% in 1995, the retail price increase for social essentials dropped to 14.8%. In 1996,

as GDP growth stabilised at 9.6%, retail price increases were reduced to 6.1% (Ciochetto, 2005). The Chinese government declared that the “soft landing” responsibilities had been completed the same year. In the first half of 1997, the economic growth rate remained at around 9.5%. In 1997, the economy’s yearly growth rate dropped to 8.8%, the lowest in seven years (Huang, 1999).

China’s economy has faced remarkable challenges and growth over the last ten years. Growth is accompanied by challenges such as regional inequality, environmental degradation, and reliance on infrastructure projects (Naughton, 2018). China’s remarkable economic growth in the preceding decades, averaging more than 10% yearly, tapered off. However, China remained one of the leading economies with the fastest growth rate worldwide. An estimated 6.6% each year on average occurred between 2013 and 2021 (Yu et al., 2024). Its GDP continuously increased at rates many developed nations could only envy, even amid sporadic slowdowns. In recent decades, China has become a global economic leader, with its GDP rising to over \$17.52 trillion in 2023, marking its position as the world’s second-largest economy (Unvan & Iium, 2023).

In recent years, demographic shifts, including an ageing population, promoting innovation, and shifting to a consumption-driven economy, have received significant attention in China. Geopolitical concerns like the post-pandemic recovery and trade disputes with the US also impact China’s economic path (Naughton, 2006). Even though its economy is robust today, slowing growth suggests that it is maturing while facing challenges related to international uncertainty and structural changes (Naughton, 2018). Initially a low-cost manufacturing hub, China has transitioned into producing high-value, technology-driven goods facilitated by foreign investment and trade reforms initiated in the 1980s (Li, 2018).

China became the largest trading nation in the world due to its export strategy, which was characterised by quick industrialisation and integration into global supply chains. Projects like the BRI (Belt and Road Initiative) have increased China's power by improving trade connectivity throughout Asia, Africa, and Europe (Khmeleva, 2024). China's transition to high-tech exports and services demonstrates trade diversification, enabling it to withstand external shocks like the 2008 financial crisis better than many of its peers. However, regional differences still exist, with coastal provinces reaping a larger share of trade benefits related to prosperity than interior regions (Sun, 2010). Moreover, China has been less reliant on trade over time, aligning with its shift to domestic consumption to maintain economic growth.

China's economic development slowed after it joined the upper-middle-income group in 2010. The average yearly economic growth rate decreased from more than 6.7% in 2016 compared to over 10% during the previous three decades (Liu, 2020). Future economic growth will inevitably slow, but how much and to what extent will depend on how much reform, opening, and innovation-promoting policies are implemented (Yang, 2018). The influence of the previous boom is seen in China's average wealth per person, which more than doubled from 2006 to 2020 despite the country's slowing growth. China's growth rate dropped from 6.6% in 2017 to 2% in 2018, indicating an economic decline. In response, a growth rate target of "between 6 and 6.5%" was established for 2019, the first drop in two years from the previous goal of "about 6.5%" (Morrison, 2019). The rapid economic boom that began 40 years ago with the implementation of reform and opening-up measures is now finally slowing down. The need to change the pattern of economic development from quantity to quality makes structural reform the most essential political issue currently facing the country (Jiro, 2020).

China's traditional industrialisation route has been followed by economic reform and development. The manufacturing sector has emerged as the main driver of the expansion of other sectors, accelerating the development of the national economy while encouraging the adaptation, optimisation, and improvement of the industrial structure (Zhou, 2014). Thus, economic development has undergone a process of strengthening the domestic manufacturing sector. Consequently, this has led to the nation's overall industrialisation by significantly increasing export demand (due to a significant trade surplus) and investment demand (through domestic and foreign direct investment entry) (Zhou, 2014). The slowed growth in productivity is a significant obstacle that must be addressed for long-term sustainability (Kern et al., 2024). China's economic influence is likely to persist in the global economy, with a projected contribution of over 20% to global growth by 2029 (Qi, 2024).

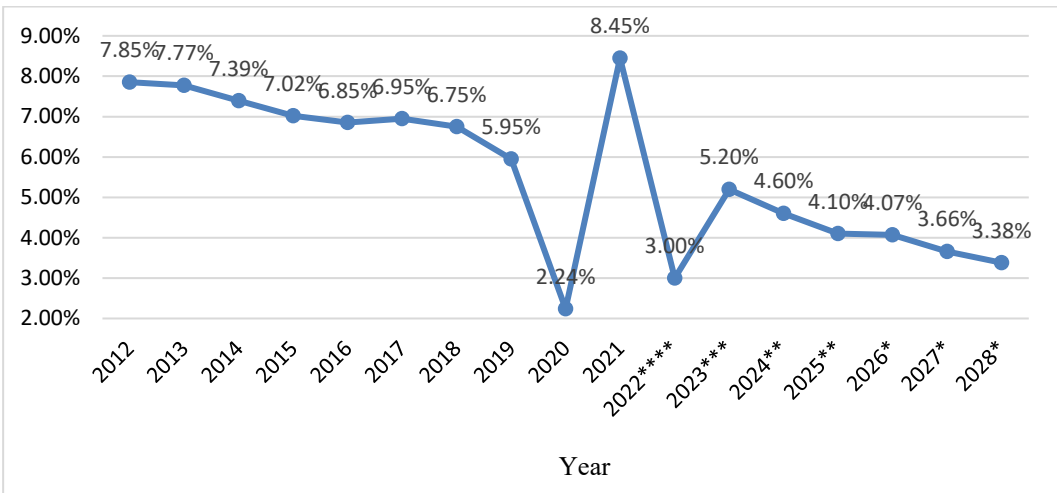
With the emergence of Chinese digital brands like Alibaba, Tencent, and Huawei, China has made technical advancements in innovation and emerged as a global leader in fields like artificial intelligence, renewable energy, and e-commerce; moreover, the government has made significant investments in R&D. China's BRI has kept growing, with the goal of improving connectivity and fostering economic cooperation across Asia, Africa, and Europe (Tambo et al., 2019). Much like a large portion of the world, China was severely affected by the COVID-19 pandemic, which originated in Wuhan. The government implemented strict lockdown measures to contain the virus, which had a major short-term economic impact (Liu, 2020). Economic growth has lifted hundreds of millions out of poverty and improved the lives of many more over the last half-century. Yet, it is increasingly evident that a development model based on economic progress alone is incomplete (Egan & Kim, 2023). A society that fails to address basic human needs, equip

citizens to improve their quality of life, protect the environment, and provide opportunities for many of its citizens is not succeeding (Imperative, 2019).

Pearson (2023) states that China's model of "state capitalism" has lifted millions of people out of poverty over the last four decades, adopting elements of a capitalistic laissez-faire economy. The Chinese government actively intervenes in financial markets to promote stability, potentially benefiting the overall economy while reducing poverty levels (Pearson et al., 2023). China's economy has experienced prolonged rapid growth, establishing itself as one of the largest economies globally. This rapid economic growth has been attributed to factors such as China's export-oriented industrialisation strategy, massive infrastructure development, and a large labour force that has provided a competitive advantage in manufacturing (Song, 2017). Based on empirical analysis from 1998 to 2019, China's economic growth is also influenced by factors like fixed asset investment, consumption, exports, and employment, positively contributing to economic development (Qi et al., 2022). A more recent study focusing on China's digital economy has revealed that social network analysis, based on input-output data from 2007 to 2017, indicates a spatial correlation that positively links social media information with business performance. This relationship highlights the importance of the quantity, quality, and timeliness of information, which can strengthen economic development by improving business outcomes (Mahliza, 2019). Collectively, these factors demonstrate how China's integrated economic strategies, both traditional and digital, have worked in concert to fuel its growth and global economic standing.

China's swift urbanisation has paralleled its remarkable economic expansion. Beginning in 1978, China has experienced an average annual real GDP growth rate of 9.43%,

significantly outpacing other Asian nations (Japan at 2.01%, South Korea at 6.04%, Singapore at 6.42%, India at 4.52%), surpassing the global average annual growth rate of real GDP during the same period (Hong et al., 2021). Studies suggest that urbanisation is a key factor behind the economic growth observed in Chinese cities (Bai et al., 2012). Based on World Bank data, economic activity in China increased in 2023; China’s growth was 5.2% in 2023 before the projected slowdown to 4.5% in 2024 (Rosen et al., 2023). Analysing the economic pathway of China’s economy, Figure 1.1 depicts the GDP growth rate of China from 2012 to 2023, with projections up to 2028. The figure shows a fluctuating trend, with a peak in 2021 and a general decline towards 2028.



Source: IMF (2023) and National Bureau of Statistics of China (2012-2021).

Figure 1.1: China's GDP Growth Rate (2012-2023) with Prediction until 2028

China’s economic landscape has undergone significant transformation over the past few decades. It has transitioned from a primarily manufacturing-based economy to one increasingly driven by consumer spending and financial activities (Zhang et al., 2023). The Total Retail Sales of Consumer Goods (TRSCG) and Aggregate Financing to the Real Economy (AFRE) are two critical indicators highlighting this change. Increased TRSCG

suggests a growing middle class with increased purchasing power, leading to a rise in domestic consumption. Research indicates that TRSCG is influenced by various factors, including urbanisation, increased income, and digitalisation (Pang et al., 2024). The rise of e-commerce platforms has further stimulated TRSCG by providing consumers greater access to goods and services. Shankar et al. (2021) suggest that technological integration in the retail sector has not only enhanced customer satisfaction but also increased market reach, consequently raising sales figures. Essential to China's economic structure, AFRE encompasses all funding support for tangible economic activities. It comprises bank loans, bonds, equity financing, and various other forms of funding. As highlighted by He and Wei (2023), a robust AFRE typically correlates with increased investment in infrastructure and development projects, which are essential for maintaining economic momentum. Researchers such as Castellano and Dubovec (2017) emphasize the need for regulatory reforms to ensure financial stability while sustaining economic growth.

1.1.2 Social Media Use in China

Social media has quite radically changed the global arena. It affects the way information is purveyed and digested (Bennett, 2012). In an ever-changing dynamic economic environment like China's, which now provides a drastically different digital ecosystem, social media channels are moving much beyond channels of social interaction. They are becoming the fabric for significant economic development. Before discussing this study's background, which focuses on China's social media, the global rise of social media must be provided for context.

The past two decades have witnessed a major transformation in communication paradigms, driven by the unprecedented rise of social media (Punjabi et al., 2024). Platforms

like Facebook, Twitter, and YouTube have transcended their intended aim of connecting friends and family (Van Dijck, 2013). They have become powerful tools for real-time information dissemination, changing the ways of distributing and receiving news, ideas, and experiences. This revolution is based on the democratisation of communication. Social media has enabled regular users to act as their own content makers and broadcasters. This is in contrast to television and newspapers, considered one-way media outlets (Ridwanullah & Bala, 2022). This implies that users today have the power to curate content, share, and remix at a fast rate and within reach of a world audience. This role was initially reserved for only a few in traditional media outlets. However, social media has completely changed how people interact with the outside world and obtain information. Beyond interpersonal interactions, it also significantly impacts how businesses interact with customers (Rapp et al., 2013; and Li et al., 2023).

Social media acts like an accelerator of horizontal relationships while overcoming distance, transmitting to citizens the feeling of being part of a global society (Cornelissen, 2023). However, given the fast spreading of “fake news” and misinformation, it is impossible to democratise such relationships. Social media has had a significant impact on human communication and the development of society; its disadvantages, most notably the spread of harmful content and information overload, are becoming increasingly evident (Wani et al., 2024). Social media has had detrimental effects on interpersonal relationships, social dynamics, and psychological health. Excessive use of social media can strain romantic relationships and produce emotional discomfort in couples by reducing offline contact and increasing conflicts, annoyance, and social comparison (Liang, 2024). Similarly, among college students, practices like “phubbing” and ignoring the outside world in favour of smartphones have been linked to poorer academic performance and higher levels of stress

and anxiety, upsetting the balance between mental health and social media use (Ma, 2024). Moreover, offensive comments on websites like Xiaohongshu can cause emotional distress (Pan, 2024). Negative social comparisons on social media exacerbate socioeconomic disparities and reduce life satisfaction, especially among low-income groups (Zhang, 2024). These issues became particularly noticeable during the COVID-19 pandemic when social media was a vital resource for spreading information about public health and a haven for false information and conspiracy theories (Li et al., 2023). These complexities highlight the necessity of improved platform regulation, media literacy, and content moderation to balance the advantages and disadvantages of social media.

Facebook remains the most popular social networking site worldwide, with a 94% coverage rate and leading in 157 of the 167 countries analysed (Fatehkia et al., 2018). It has approximately 3 billion users (Dimitri, 2023). With Instagram and WhatsApp added to its extended app ecosystem, Facebook's monthly reach has increased to 3.7 billion (Mehta, 2023).

China holds the distinction of having the largest number of social media users globally, with over 3 billion active users (Zhang et al., 2017). This staggering figure underscores the profound influence of social media in Chinese society. Among key players, WeChat has surpassed the limitations of traditional social media platforms, evolving into a comprehensive digital ecosystem (Xu, 2023). It supports instant messaging, mobile payments, online transactions, and access to various services, generating a seamless environment that blends socialising, business, and entertainment. Weibo, often referred to as "China's Twitter," similarly focuses on microblogging and real-time communication (Bolsover & Howard, 2019). It is a major platform for public discourse, information sharing,

and advocacy for social causes. The diversity and flexibility of China's social media ecosystem have not only reshaped daily life but also accelerated the development of a digital society (Wierer et al., 2021).

Despite government restrictions and content censorship, Weibo continues to promote user-generated content and online discussions, highlighting the potential and limitations of social media within China's complex political context (Yang, 2024). In addition to these dominant platforms, various specialised networks are also thriving. Douyin, the Chinese equivalent of TikTok, has captivated the younger generation with its short video format (Xian, 2022). Platforms like Bilibili has carved out a unique niche in China's digital landscape by combining entertainment with social commerce. Fuelled by a robust culture of user-generated content, Bilibili incorporates live streaming, video sharing, and interactive features to engage a young, tech-savvy audience. This has made Bilibili a significant force in driving e-sales, particularly through influencer marketing and fan-generated content. Its underlying community spans a wide range of interests, from niche topics to animation, gaming, and popular culture (Cao, 2023).

The impact of Chinese social media extends beyond national borders. China's digital diplomacy strategy leverages state-controlled and user-generated information on social media platforms to portray a curated picture of the country in the world arena (Casas, 2024). This method involves engaging overseas audiences and fighting unfavourable tales. However, the Chinese social media ecosystem is not without its complications. Rapid business growth and constant technological advancements are linked with the ever-present influence of political laws and censorship practices (Xu, 2023). The conflict between innovation and control impacts content generation and the user experience within Chinese social media. Understanding these processes is vital for a full study. This research addresses

the distinct characteristics and duties of major platforms, examining their impact on social interactions and evolving importance within China’s societal landscape.

In China, social media has become an indispensable part of daily life. Beyond serving as communication tools, social media platforms have evolved into essential channels for shopping, entertainment, and information sharing (Li, 2017). The landscape of social media in China has undergone significant transformation, developing into a dynamic, multifaceted ecosystem with unique features and wide-ranging impacts (Yang & Wang, 2021).

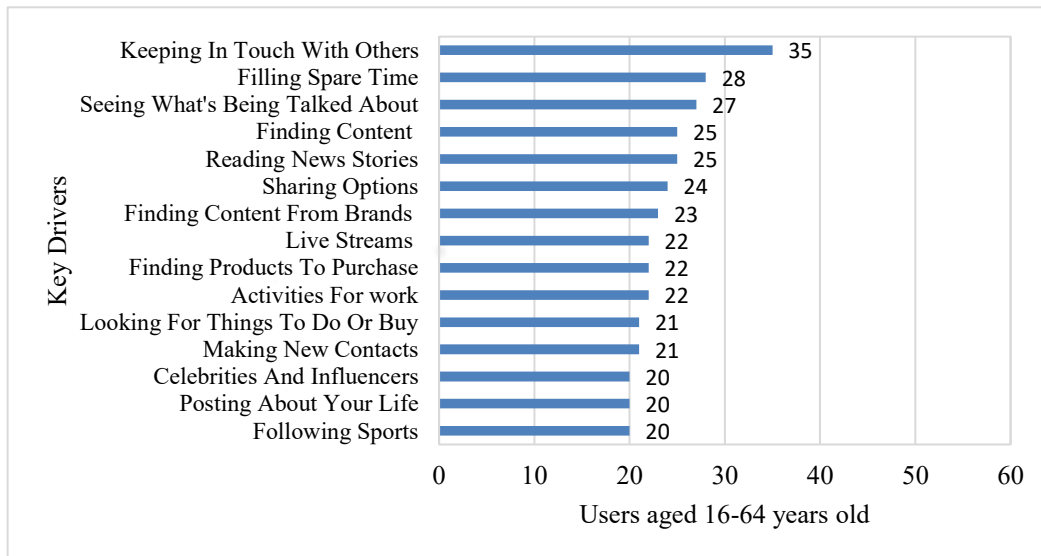
Table 1.1 shows that by January 2023, China had over one billion social media users, representing 72% of the population. Social media use continues to grow globally, with China leading the trend. Nearly all Internet users in China are active on social media, and the gender distribution is almost balanced. The table highlights the widespread and increasing influence of social media in China.

Table 1.1: China's Social Media Statistics in 2023

Data Point	Value	Context
Social Media Users in China, January 2023	1.03 billion	Equivalent to 72.0% of the total population
Social Media Use Trend	No discernible drop	Use continues to increase in almost all countries
Social Media Users (Aged 18+)	875.1 million	Equivalent to 77.2% of the population aged 18 and above
Internet Users Using social media	97.7%	Of China’s total internet user base in January 2023
Gender Distribution of Social Media Users	Female: 48.8%, Male: 51.2%	As of January 2023

Source: DataReportal (2023).

Figure 1.2 illustrates the multifaceted role of social media in China, not only for communication and leisure but also for information access, shopping, and professional activities. This suggests that social media significantly impacts consumer behaviour and economic trends. Many key drivers are illustrated to better understand why the number of social media users is increasing daily.

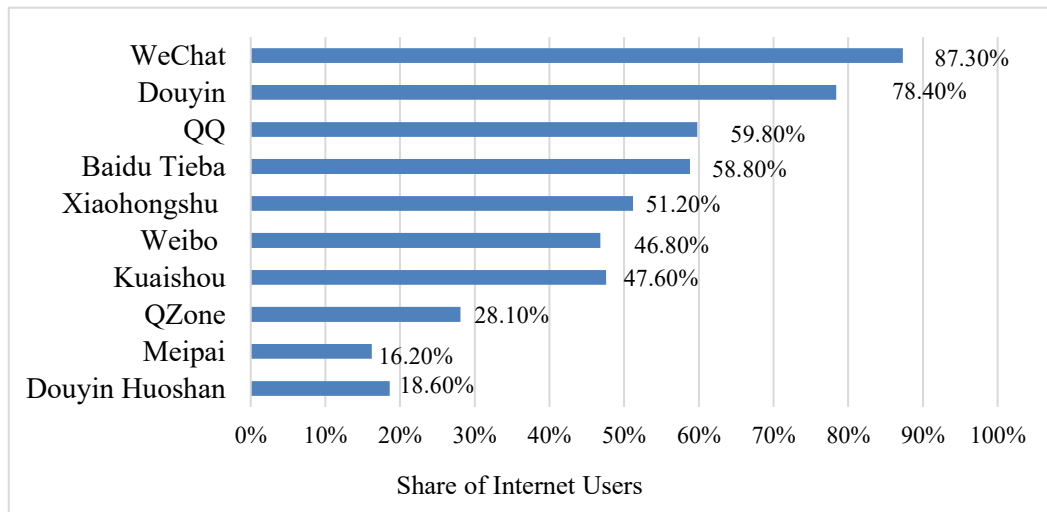


Source: Global Web Index (2019).

Figure 1.2: Key Drivers of Using Social Media in China

Figure 1.3 presents the percentage of Internet users in China who use various social media platforms monthly. WeChat leads with 87.3% as of the third quarter of 2023; Chinese users spend an average of 82 minutes or more a day within the app (Niu et al., 2020). WeChat and QQ, both developed by Tencent, dominate the messaging app space. WeChat is the most popular messaging app, with 77.00% penetration among Chinese users (Yu, 2022). It is a multifaceted platform with features like messaging, social media, and mobile payments. QQ follows with a 59% penetration rate. Douyin, the Chinese version of TikTok, leads as the most used social media platform, with a staggering 70.20% of social media users in China engaging on this platform. Baidu Tieba, Weibo, Xiaohongshu, and Kuaishou are among the

top platforms that follow. These platforms cater to various interests and activities, from video sharing and microblogging to e-commerce and content discovery.

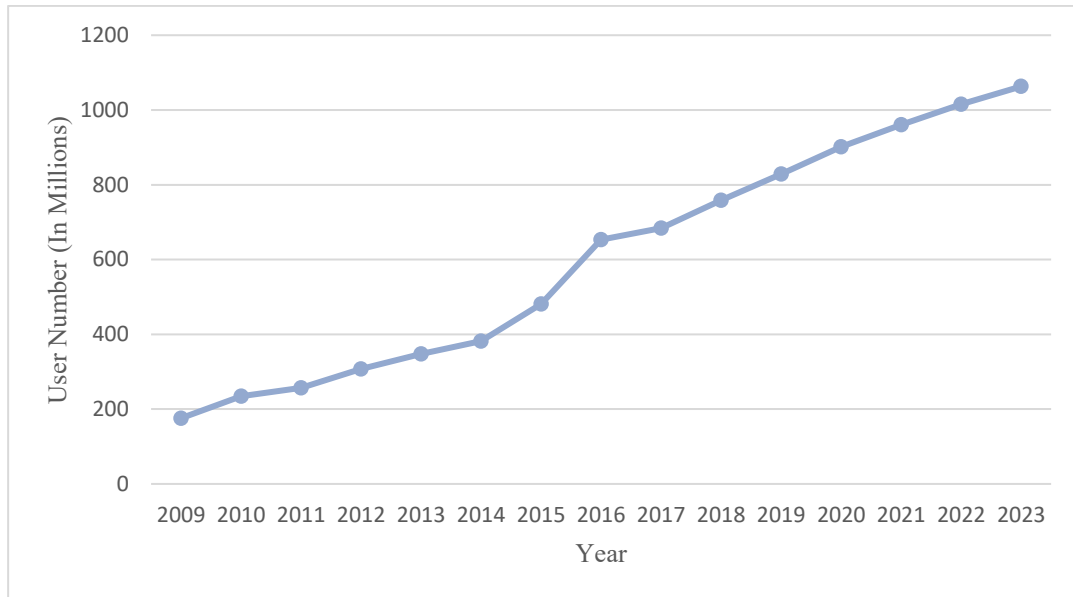


Source: GWI, China (2024).

Figure 1.3: Engagement with Leading Social Media Platforms in China, 2023

Globally popular social media platforms such as Facebook, Instagram, and LinkedIn do not enjoy significant popularity or accessibility in China. The latest data from January 2023 indicates that the growth rate of Facebook users in China stands at 0.82%, bringing the total to approximately 3.22 million users. Similarly, Instagram has seen a growth rate of 0.84%, with its user base in China reaching around 2.8 million. LinkedIn, showing a slightly higher growth rate of 1.02 times, has approximately 5.92 million users in China as of the latest January 2023 statistics (Statista).

Figure 1.4 illustrates the overall user growth of Chinese social media from 2017 to 2023, showing a rapid increase from over 1.03 billion in 2017 to nearly 1.22 billion.

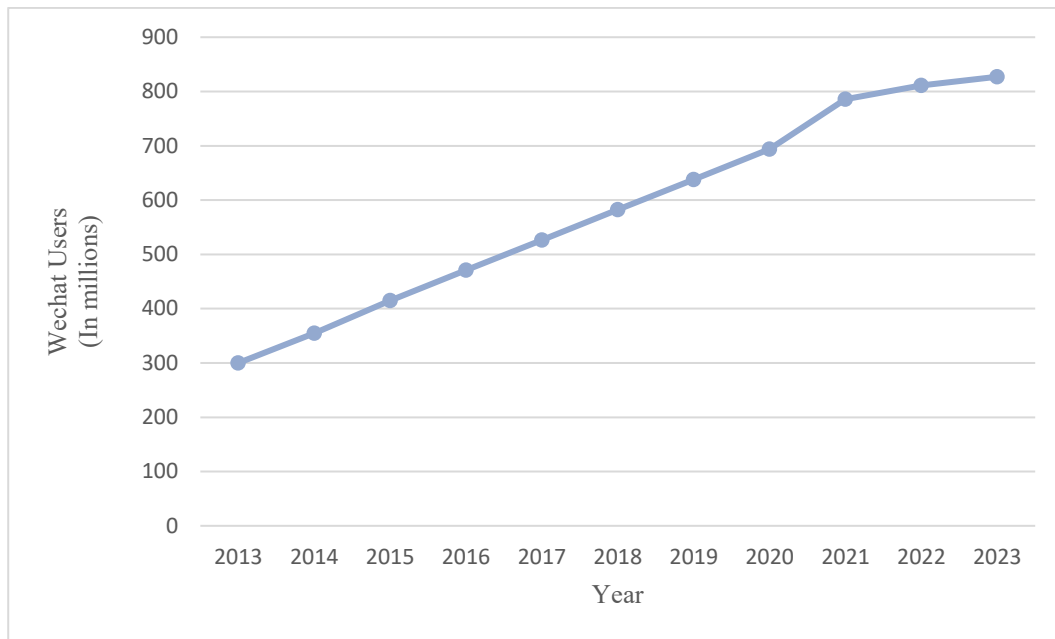


Source: DataReportal (2024).

Figure 1.4: Social Media Active User Growth in China, 2009-2023

Figures 1.5–1.8 illustrate the user growth of several leading Chinese social media platforms, including WeChat, Weibo, Douyin, and BiliBili. It is evident that these platforms emerged at different times, each attracting a significant user base with its unique features. Further explanations of each platform will be provided later.

A free application launched by Tencent on January 21, 2011, WeChat offers instant messaging services for smart devices (Chen et al., 2018). It facilitates cross-carrier and cross-platform communication, enabling users to swiftly send voice messages, videos, images, and text over the Internet without incurring significant network data usage. WeChat provides a range of services, including the sharing of multimedia content and location-based social features like Shake, Drift Bottle, Moments, Official Accounts, and Voice Notes.



Source: DataReportal (2024).

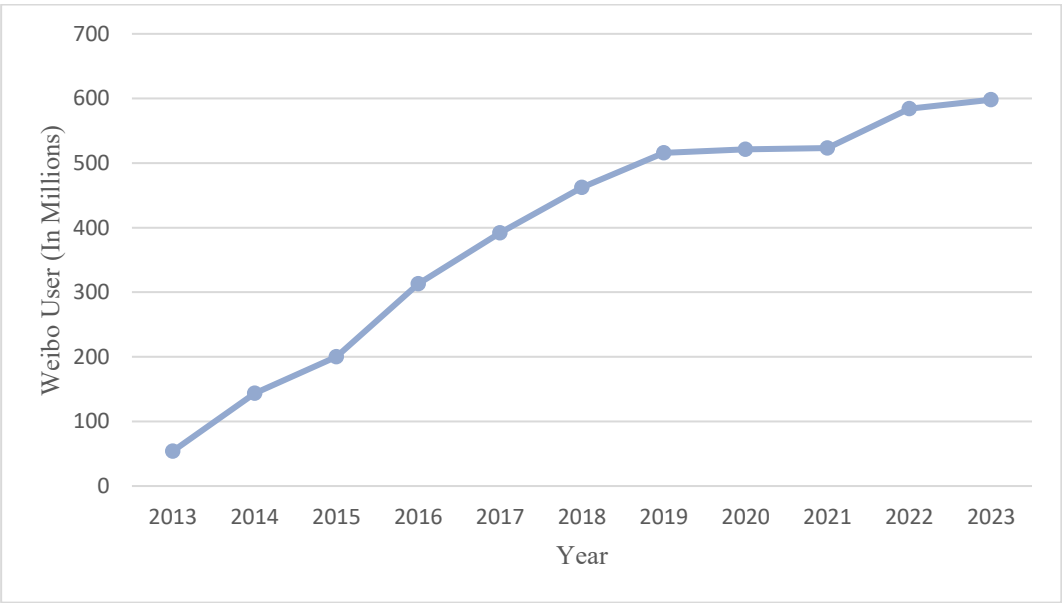
Figure 1.5: WeChat Monthly Active User growth in China, 2013-2023

By featuring Official Accounts, Moments, and message notifications, the platform allows users to stay connected and informed. Users can easily add friends and follow Official Accounts through various functions such as Shake, Search, People Nearby, or by scanning QR codes. WeChat empowers users to share captivating content with friends and broadcast it on their Moments feed for others to discover. WeChat is the “must-have” social commerce platform in China, with over 1.31 billion monthly active users worldwide (Fan, 2023). Figure 1.5 illustrates the growth of WeChat’s user base, showcasing its ability to attract users with its unique features. WeChat stands as the industry leader in instant messaging social platforms.

Weibo has revolutionised information dissemination. It has emerged as a new Internet gateway post-portal and search engine, facilitating instant sharing across its diverse user base (Huang & Sun, 2014). Spanning age, interests, locations, preferences, economic

statuses, and quality, its user demographic ensures that brands and products find their audience, garnering increased exposure and promotional opportunities. Figure 1.6 underscores Weibo’s attractiveness, drawing a significant user base due to its distinctive positioning within the social media landscape.

Weibo is a social media platform centred on user relationships, accessible through various mobile devices like PCs and smartphones. Users engage in real-time interactions, sharing text, images, videos, and diverse multimedia formats (Ruan et al., 2024). Its open platform architecture allows for seamless and immediate public content publishing, fostering viral dissemination while enabling users to intimately connect with the world.

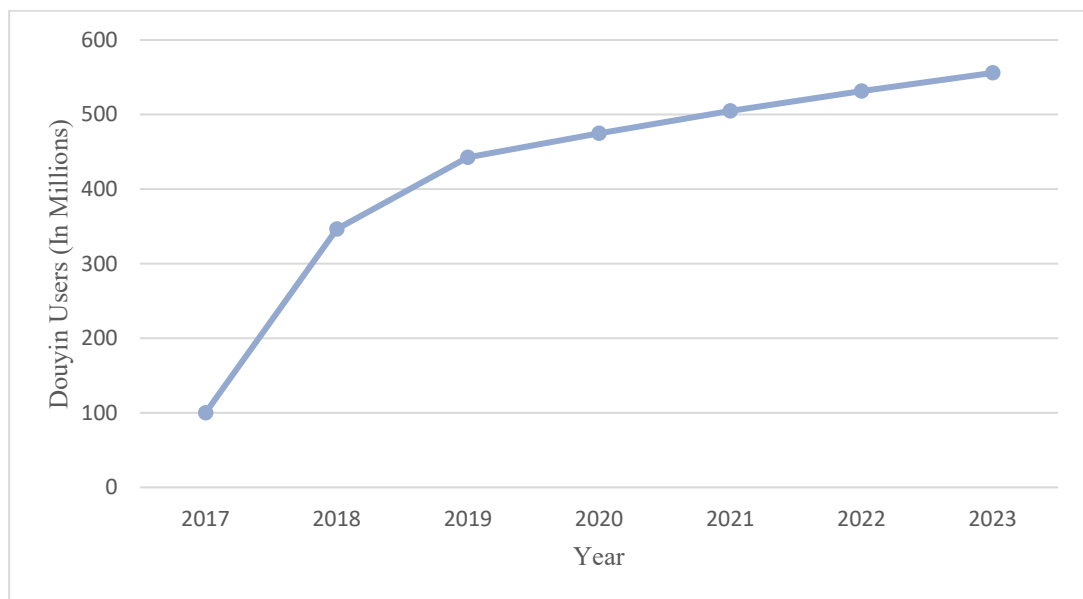


Source: DataReportal (2024).

Figure 1.6: Weibo Monthly Active User growth in China, 2013-2023

Launched September 20, 2016, Douyin is a music short video community platform designed for users of all ages (J. Li, 2018). This app allows users to select songs, create music short videos, and express their creativity. The app curates users’ favourite videos based on their preferences, fostering a personalised experience. Douyin serves as a social

networking application where users can share their lives, connect with others, and explore a wide array of captivating stories (Xian, 2022). Official data released by Douyin in 2023 boasts almost 800 million monthly active users and 130 million creators worldwide (Xu, 2023). With an average daily output of 78 million short videos, Douyin is the premier short video social platform in the industry. Figure 1.7 illustrates the user count on the Douyin platform from 2017 to 2023 in China.



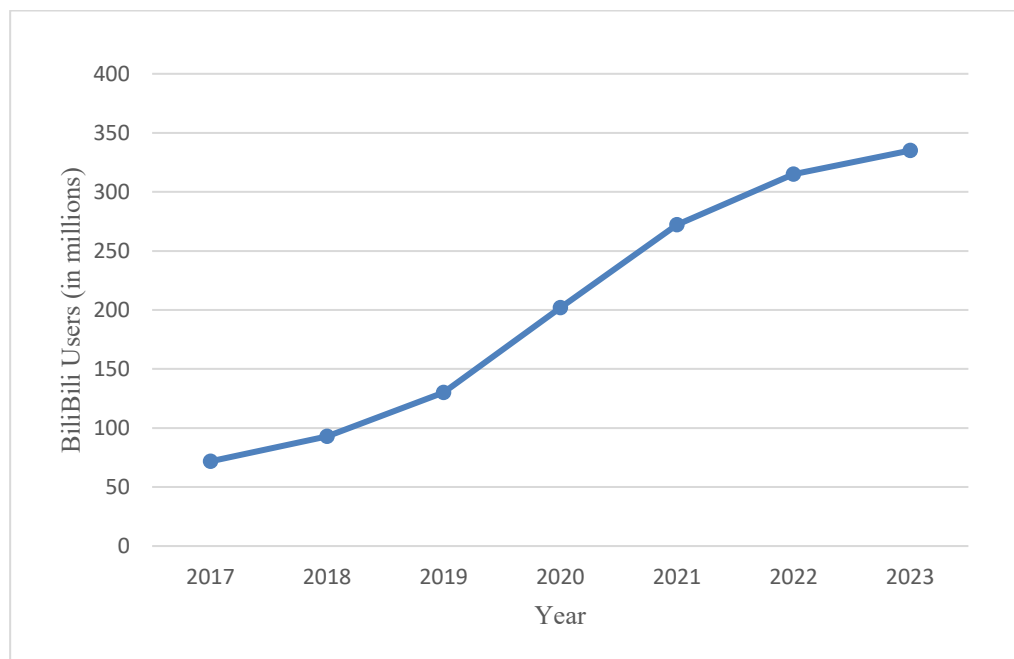
Source: DataReportal (2024).

Figure 1.7: Douyin Monthly Active User growth in China, 2017-2023

Bilibili is a dynamic video-sharing platform and a cornerstone in entertainment. It cultivates cultural engagement for its target audience of youthful viewers. The monthly active users of this online platform reached more than 100 million by the year 2019, the majority being users born after the 1990s and 2000s (Ruan et al., 2024). Users can express their creativity and interests through an ocean of different content from animation, gaming, and music to lifestyle videos describing the vivid culture of contemporary youth. Leveraging the power of advanced machine learning algorithms, Bilibili effectively links users to a wide

array of personalised content, driving high engagement and retention (Xu, 2023). Long-form videos, live streaming, and professional user-generated content have also become the focus of this platform, catering to an ever-growing and diverse audience base.

Bilibili's content particularly appeals to young audiences who perceive it as more authentic and representative of niche interests (Wu, 2022). Regarding its features, the site adopts a community-driven approach. It allows its users to interact through bullet comments overlaid onto videos in real time, creating a sense of connection and interactivity. Figure 1.8 shows Bilibili as a source of creation and consumption of content, underlining its significant and growing online user population in China.



Source: DataReportal (2024).

Figure 1.8: Bilibili Monthly Active User Growth in China, 2017-2023

Chinese adolescents spend an average of 2.95 hours per day on electronic media activities, which includes social media platforms (Bai et al., 2023). This indicates the deep integration of social media into everyday life and its role in shaping social interactions,

consumer behaviour, and business practices in China. Competition among social media platforms in China is intense, owing to the sheer volume of users and the diverse range of services offered (Fuchs, 2015a). Platforms like WeChat have evolved into “super apps” that provide a vast array of services, e.g., messaging, e-commerce, live streaming, gaming, and taxi booking, making them indispensable tools for millions of users (Wydymus, 2023).

This landscape of social media use in China reflects the country’s unique digital ecosystem; platforms have broadened their functionalities to become integral parts of users’ lives. As these developments advance, social media’s influence in China is expected to grow, eliciting possibilities and obstacles for businesses, content creators, and marketers seeking to engage with the largest online audience globally.

1.1.3 Link between Social Media and Economic Growth

Exploring the connection between social media and economic development in China is an engaging subject. While the global digital economy has been analysed across various contexts, China’s distinctive regulatory, social, and economic environment provides a fresh outlook on the influence that digital platforms can have on economic aspects (Zapyantsev, 2024). The Chinese government’s emphasis on technological advancement and digital infrastructure, along with initiatives to expand Internet availability and digital literacy, has laid a strong foundation for the social media economy by fostering knowledge spillovers and human capital development, key tenets of endogenous growth theory (Shen, 2018). Moreover, integrating e-commerce and digital finance with social media platforms has changed consumer behaviour, producing a vibrant online marketplace that significantly impacts the country’s GDP (Asanprakit & Kraiwanit, 2024). This impressive economic progress has been accompanied by a significant digital transformation, establishing China as

a frontrunner in the digital economy. The rapid growth of social media in Chinese society and the economy is essential to the digital realm. At the start of 2023, China revealed that it had 1.05 billion Internet users, a penetration rate of 73.7% (Wang & Liu, 2024). Social media use was also significant, with 1.03 billion users comprising 72.0% of the population. Moreover, there were 1.69 billion cellular mobile connections in the nation, indicating a penetration rate of 118.6% (Sridhar, 2007). These statistics underscore the significant online impact of China, which is essential for examining the economic sway of social media. Social media platforms such as WeChat, Weibo, Douyin, and Bilibili have progressed beyond mere communication tools; they are now crucial for marketing, connecting with consumers, and fostering innovation.

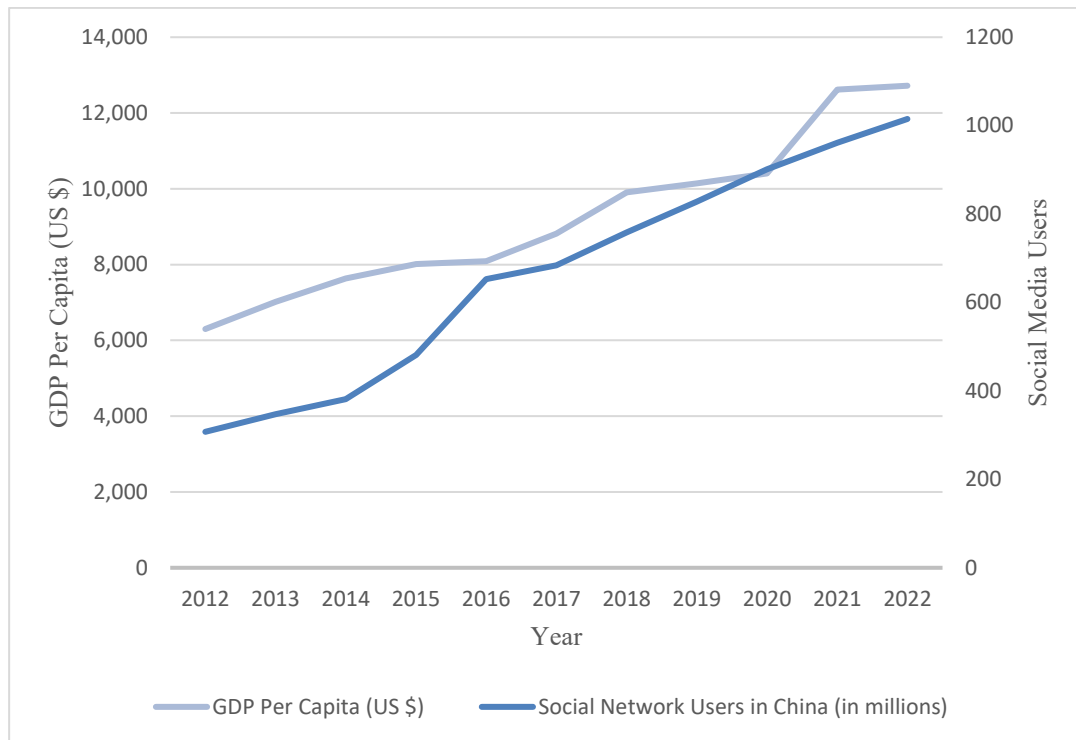
China's economic growth and social media are interrelated in several ways. First, social media platforms can be used to promote economic growth by fostering foreign partnerships (Barczyk & Duncan, 2012). Social media supports innovation, a key driver of economic growth, as seen in Douyin's role in spreading creative content and ideas that fuel entrepreneurship and product development. Social media platforms like WeChat and Weibo have become integral to China's booming e-commerce sector. These platforms facilitate social commerce, enabling users to discover products, share recommendations, and make purchases without leaving the app (Chodak, 2024). Secondly, live streaming has emerged as a powerful tool for driving sales, with influencers (known as key opinion leaders or KOLs) showcasing products to millions of viewers in real time (Zhang et al., 2024). Finally, platforms such as Douyin (live streaming) and Didi Chuxing (ride-hailing) have affected traditional businesses. Businesses use social media to establish direct user connections, promoting a sharing economy that encourages resource efficiency and creativity.

Social media platforms have transformed how businesses market their products and services in China. Instead of relying solely on traditional advertising channels, companies leverage social media to engage directly with consumers, build brand awareness, and drive sales (Lindsey-Mullikin & Borin, 2017). Companies can cultivate brand loyalty and differentiate themselves in a crowded market by creating engaging content and maintaining meaningful interactions with their audience. Moreover, social media has democratised entrepreneurship in China, enabling individuals to start their own businesses and reach customers directly through online platforms with live streaming, short video platforms like Douyin (the Chinese version of TikTok), and e-commerce platforms like Taobao and JD.com (Ma, 2021). Thus, China's largest social media platforms (like Weibo) work in the context of China's growing economy.

The emergence of Bilibili and other content-oriented networks has changed China's digital economy and culture. Gao (2021) examined how Bilibili's business model has transformed through several stages. At each stage, it meets the increased requirements of the emerging market. Bilibili gives more power to content creators by ensuring monetising opportunities via sponsored content; however, this might inversely affect customer engagement if not disclosed (Sun et al., 2023). Bilibili actively shapes vlogging culture through various strategies, including discourse framing, metric-based monetisation, and advertising mediation. This contributes to the platform's economic influence and creates precocity for creators (Wang, 2022). The growth of such platforms has challenged existing businesses and regulatory frameworks, forcing the Chinese government to adapt its governance approach to balancing economic growth, technological advancement, and political control (McKnight et al., 2021). These have gradually become instrumental components of China's digital economy, encouraging innovation and entrepreneurship.

These platforms make money through ads for those who own them, such as government or private companies. Chinese platforms share similarities and differences with the US (e.g., Facebook and Twitter). This comparison focuses on business aspects like profits and who controls the platforms (Hu, 2011). Social media marketing can influence relationship quality factors (commitment, trust, and satisfaction), which can affect China's e-commerce environment and economic growth (Sohaib et al., 2022). Research highlights the significant impact of social media on China's economic growth. Zhang (2020) demonstrates a long-term equilibrium relationship between GDP and consumer spending, emphasising the interconnectedness of consumption demand and economic growth. Rokhadi (2023) discusses how social media has emerged as a major driver of innovation and economic growth, facilitating information exchange and reshaping the global economic landscape. In China, new market-oriented financing channels, among which shadow banking is prominent, have become significant components of AFRE for effective capital allocation and systemic risk management (He & Wei, 2022). Social media innovations in Chinese businesses, e.g., agile product testing and development, payment and distribution channels, integrating consumer feedback into product design, and establishing social media shop fronts Ram and Liu (2018) emphasise that social media drives economic indicators and encourages innovation in China.

Figure 1.9 presents the growth trend in social media usage alongside per capita GDP. A synchronous upward trend is evident, suggesting a relationship between social media and economic growth. This study aims to investigate this relationship.



Source: National Bureau of Statistics of China and China Internet Network Information Center (2023).

Figure 1.9: China's Gross Domestic Product (GDP) and Social Media User Number

Abismail (2024) suggests that social media has recently become instrumental in shaping consumer behaviour, enhancing brand engagement, and driving sales, directly contributing to GDP growth. Bolstered by social media, the rise of the digital economy represents a significant portion of China's GDP growth (Abismail, 2024). Raji et al. (2024) argue that digital transformation, marked by the widespread adoption of social media, e-commerce, and digital payments, has significantly boosted productivity, innovation, and economic diversification. This transformation has not only contributed directly to GDP per capita but has also enhanced the efficiency and competitiveness of traditional industries (Raji et al., 2024).

Björkdahl (2020) suggests that digitalisation is a critical driver in identifying, evaluating, and utilising opportunities to strengthen competitiveness, improve efficiency, and stimulate innovation in a company, particularly in times of uncertainty (Björkdahl,

2020). Against this backdrop, social media presents another new avenue to help mitigate such economic dilemmas. It provides more visibility and profound awareness to an urban area in an economically strong country than in a country about to grow exponentially. It shows four main inefficiencies in their respects. First, transaction and search costs comprise the financial or opportunity costs of conducting research (Heinonen, 2004). Internal search costs may be associated with cognitive expenses, while external forces, e.g., market structure and technology in the outside world, may contribute to market friction. Second, increased search costs from continuously adding new content on the social media platform are not accounted for in publishing such content, leaving behind externalities without corrective measures. Third, issues of crowding-out and adverse selection arise when low-quality content pushes high-quality content based on pricing problems (Lee et al., 2018).

The fourth pertains to the labour-leisure trade-off. Social media are unique in that they do not just offer workers a source of distraction with low productivity (Marotta & Acquisti, 2017). Rather, social media provides a non-monetised contribution to GDP. This means that an over-attempt to substitute paid leisure with free social media could pose a barrier to economic growth (Weiss et al., 2020). However, global social media still presents various opportunities instigated by the COVID-19 pandemic associated with the economic slowdown (Song & Zhou, 2020). The average time of social media users was approximately 2.34 hours per day which is about 2 hours and 20 minutes daily highlighting significant engagement of Chinese user (Li & Liu, 2020).

Thus, a new giant in the global economy is social media. Many people use social media to create new opportunities that impact several aspects of their lives. Moreover, the influence of social media in economical areas is underexplored, while references are made

to its influence in institutional areas (Criado et al., 2017; Park et al., 2017). It affects personal happiness (Chae, 2018), the health sector, and education (Grajales III et al., 2014). While the impact of social media on economic health varies significantly, much discourse highlights concerns about its financial sustainability and broader economic implications. Despite these challenges, many researchers recognize social media as the foremost global communications plater of the modern era, shaping interactions, business practices, and economic trends (Yuefei et al., 2024). Furthermore, social media has become an essential source of work, even deriving new professions like influencers, community managers, and digital marketers.

The rapid development of information technology has significantly impacted daily life, including how people engage in consumption and purchasing decisions. The rising popularity of social media platforms and smartphones in China has radically altered communication patterns and information access methods (DeLisle et al., 2016). Social media has emerged as the key source of information for consumers. It leverages web-based and mobile technology to promote dynamic and interactive communication. Social media offers a range of objectives for users, with the major function being connection and contact with others. Notably, individuals from collectivist cultures, such as China, utilise social media to maintain current relationships with friends and family rather than building new ones. Research indicates that college students represent a dominant group among social media users, particularly regarding information access (Huang, 2023). These “social media natives” typically turn to online open resources to collect information. Social media platforms are significant in establishing online social networks by integrating user data with others within the network (Ahmad, 2024). Belo et al. (2014) suggest that social networking services enable individuals to create profiles, examine others’ profiles, and communicate with them within the platform.

Platforms like WeChat, Weibo, QQ, Facebook, BiliBili, and Douyin encourage cross-regional communication. This facilitates the interchange of information and experiences across geographies and cultures, offering users immediate and direct access to a variety of information. While social media influences customer behaviour, it has become a fundamental feature of the consumer purchase decision process (Chu, 2024). These platforms have converted into vital areas for engagement and communication, considerably altering consumer buying patterns and decision-making (Sashi, 2012). The introduction of online social media platforms has shifted the control of information flow from businesses to consumers (Dwivedi et al., 2021). This trend enables customers to consider positive and negative social media comments in evaluating the quality of products and services businesses provide, influencing their purchasing decisions. The power of social media to facilitate the formation of communities can also influence customer actions (Palalic et al., 2021).

1.2 Problem Statement

Recently, China has undergone rapid digital transformation, with social media platforms such as WeChat, Weibo, Douyin, and BiliBili playing a crucial role in reshaping the Chinese economy (Zapyantsev, 2024). Initially designed for communication, these platforms have evolved into powerful drivers of economic activity, promoting innovation, consumption, and market interaction (Bhimani et al., 2019). As digitisation continues to reshape global economies, understanding the role of these platforms in driving economic progress has become increasingly essential.

The significance of social media platforms in the Chinese economy cannot be overstated. These platforms are communication tools and catalysts for economic activity, driving consumer spending, business innovation, and the widespread adoption of digital

financial services (Yue et al., 2023). Social media has evolved considerably in China from basic communication tools to powerful platforms that influence economic behaviour. Understanding this historical background is important in analysing the contemporary dynamic regarding how social media influences economies. The relevance of today's social media and social networking sites in generating new economic models becomes crucial in digital marketing, e-commerce, crowdfunding, and the online delivery of financial services (Foà, 2019; Linda, 2010). Moreover, research has examined the crucial roles of brand marketing in customer interfaces and market research in forming consumer behaviour and financial tendencies. The widespread use of social media makes it quite simple to share information about the economy. This enables investors, consumers, and governments to undertake their activities quickly and conclusively. For instance, WeChat has developed into a comprehensive digital ecosystem supporting e-commerce, mobile payments, and online transactions. Weibo and Douyin play key roles in content creation, digital marketing, and public engagement (Bolsover & Howard, 2019; Qi, 2019). Bilibili has combined entertainment and social commerce while appealing to younger consumers and driving new business models (Wang & Xiao, 2021).

Despite the evident role of these platforms in China's economy, empirical research on the specific contribution of social media to China's economic growth is lacking (Fatehkia et al., 2018). While it is widely recognised that social media impacts the economy, the exact nature of this impact, particularly in terms of short- and long- term economic performance, remains unclear. There is insufficient understanding of the relationship between social media use and key economic indicators such as the GDP, TRSCG, and AFRE (Wahid & Khalid, 2023). Moreover, the interaction between social media platforms and traditional economic

functions (e.g., market efficiency, innovation, and financial services) has not been fully explored in the unique digital and regulatory context of China (Pan et al., 2022).

This gap in empirical analysis and understanding presents a significant challenge in assessing the role of social media in economic growth. Thus, how social media reshapes consumer behaviour requires further investigation, including real-world examples of businesses that successfully use social media for growth (Lamberton, 2016). This will clarify how platforms can effectively capitalise on changing consumer preferences influenced by social media engagement. However, significant gaps in this body of research make it challenging to understand the unique dynamics of China's social media ecosystem and what, precisely, it portends for the economy. Without a clear understanding of how social media platforms impact China's economy, policymakers, businesses, and researchers will find it challenging to fully grasp the potential and limitations of these platforms in driving sustained economic development (Li, 2023).

The present study addresses this gap by systematically analysing the role of social media platforms in China's economic growth. It examines the long-term equilibrium relationship between social media use and economic indicators such as GDP, TRSCG, and AFRE. In addition, it also explores the short-term causal relationships using statistical methods. The findings provide valuable insights into how social media platforms can contribute to economic growth. This study offers practical policy recommendations on how to encourage digital literacy program, regulating social media platforms, implementing data privacy and supporting equitable internet access in China's rapidly growing digital economy.

1.3 Research Objectives

This study investigates the intricate relationship between social media use and various economic variables in China, including the GDP, TRSCG, and AFRE. This study aims to understand the contribution of social media platforms to economic activity and elucidate their potential in fostering economic growth.

1.3.1 General Objective

The main objective of this study is to examine the multifaceted impact of social media on economic growth in China.

1.3.2 Specific Objectives

The specific objectives of this study are as follows:

- i. To examine the long-run equilibrium relationship between GDP and social media use (WeChat, Weibo, Douyin, BiliBili), TRSCG, and AFRE in China by employing the autoregressive distributed lag (ARDL) method.
- ii. To analyse the short-run causal relationship between GDP and social media use (WeChat, Weibo, Douyin, BiliBili), TRSCG, and AFRE in China by adopting the Granger causality test.
- iii. To provide policy recommendations on leveraging social media platforms (WeChat, Weibo, Douyin, BiliBili), TRSCG, and AFRE to support economic growth in China.

1.4 Significance of the Study

Examining the contribution of social media to China's economic boom has the potential to augment the theoretical understanding and offer useful insights. The

comprehensive framework and analytical results have broad applicability in related fields. The findings provide a reference for subsequent research and potential directions for examining the interactions between social media and other aspects of economic sectors. The study's conclusions enhance the scholarly discussion on this topic while serving corporate strategy in the digital age for policymakers. The contributions of this study comprise multiple important areas, which are detailed below.

From a theoretical standpoint, this study incorporated social media into the analytical framework of economic growth. Past research has demonstrated the potential of social media to promote information dissemination and reduce transaction costs (Albarrak et al., 2020), as well as its positive role in enhancing production efficiency and lowering transaction costs between enterprises (Rialp et al., 2024). Studies have focused on the effects of social media on enterprise innovation (Bhimani et al., 2019) or consumer behaviour (Lee, 2013), with limited exploration of its role in overall economic growth. By integrating variables such as the number of social media users, TRSCG, and AFRE into the model, this study deepens the understanding of the mechanisms through which social media impacts economic growth.

From an empirical standpoint, this study employed an ARDL model to analyse short- and long-term relationships among variables, addressing issues such as low estimation efficiency in traditional cointegration tests (Feng et al., 2023). The existence of long-term equilibrium relationships among variables was further validated based on an error correction term (ECT). By adopting the ARDL model and integrating it with the ECT, this study addressed the challenges of traditional cointegration tests in scenarios involving small samples and mixed-order variables (Malik & Masood, 2022). Compared to existing studies,

this research comprised the critical period from 2017 to 2023, providing a more accurate representation of the dynamic role of social media in China's economic growth.

Economic sectors can encourage deeper integration of social media platforms with traditional industries to stimulate economic vitality (Chui et al., 2012). Media sectors can guide the development of social media platforms while ensuring their contributions to promoting consumption and optimising resource allocation (Hay, 2009). Policymakers can support the development of social media-based data analytics and precision marketing technologies to strengthen enterprise competitiveness and market responsiveness.

Comprising data from 2017 to 2023, a period marked by rapid social media development in China, this study provides a more comprehensive view of the dynamic impact of social media on economic growth compared to past research. Using up-to-date data provides richer empirical insights and foundational data support for future studies. The results of this study are crucial for policymakers, businesses, and scholars by revealing the broader impact of social media on China's economy. Furthermore, the study discusses how digital platforms are transforming modern economies, focusing on the unique challenges and opportunities faced by China's social media ecosystem. Thus, this study not only sheds new light on the relationship between social media use and economic growth in China but also provides theoretical and empirical support for policy development.

1.5 Study Organisation

This study investigated the nexus between GDP and China's social media use. The rest of this study is organised as follows. Chapter One discusses the background of this study, research issues and objectives. Chapter Two presents the past literature that are related to the selected variables, models, and methods used in this study. Chapter Three provides a review

of the past literature regarding the ARDL model and explains the methodology of the data analysis. Chapter Four discusses the empirical findings and further elaborates on their significance. Finally, Chapter Five concludes the findings from this study, providing policy recommendations. It acknowledges the study limitations for future research reference in related fields.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

The literature review in Chapter 2 comprises nine sections: Section 2.1 is the background of related literature and provides an overview of previous research. Section 2.2 outlines this study's theoretical foundation, focusing on endogenous growth theory. Section 2.3 provides the research framework to analyse the relationship between social media use with AFRE, TRSCG and GDP. Section 2.4 provides a detailed explanation of the ARDL model and empirical results. Section 2.5 defines the dependent variables in this study as GDP representing economic growth. Section 2.6 discusses the independent variable of social media use. Section 2.7 explains the control variables. Section 2.8 identifies the gaps in existing research to illustrate the study's contributions. Section 2.9 summarises the literature findings.

2.1 Background on Related Literature

Researchers have extensively examined economic growth and its determinants over the decades. The link between various social media platforms and economic development has attracted significant scholarly attention. Building on this interest, studies have explored the connection between social media platforms using diverse methodologies across several countries. Thus, researchers have shown interest in this field and made several contributions.

Studies using diverse methodologies across countries have contributed insights, though comparisons reveal inconsistencies. For instance, variables like user numbers and engagement metrics are central (Huerta-Alvarez, 2020; Song, 2024). Huerta-Alvarez

emphasizes user growth, while Song focuses on engagement depth, revealing a methodological divide that affects reliability. However, the results obtained are not always consistent due to the nature of the variables being studied. Geographical research location, current policies in the region, and this study period can influence the results obtained.

Several past studies have focused on economic growth, such as Dell’Anno et al. (2016), Adekunle and Kajumba (2021), Okoro et al. (2023), Ebrahimi et al. (2019), Zhang et al. (2024), Salem and Mourtada (2012), Nuseir (2018), Yang and Wang (2021), Wang et al. (2024), Jian Lin (2022). China-specific research by Jian Lin (2022), Wang et al. (2024), Yang and Wang (2021) links platforms like BiliBili, Weibo, WeChat, and Douyin to economic growth. These studies have used several econometric techniques, such as unit root tests, cointegration tests, the ARDL approach and error correction models, to test the link between social media use and China’s economic growth. These studies suggest that economic growth in China is closely associated with social media use, though the variation in methods and timeframes raises questions about generalizability and consistency across findings.

On a global scale, international research underscores the transformative role of social media in stimulating growth by promoting entrepreneurship and enhancing market accessibility. For example, Adekunle and Kajumba (2021) found that the adoption of social media significantly increased economic output in Sub-Saharan Africa by enabling small businesses to reach wider markets. Similarly, Ebrahimi et al. (2019) demonstrated that in emerging economies, platforms like Instagram and Facebook contribute to higher business efficiency and GDP growth by lowering advertising costs and increasing customer outreach. In the context of developed economies, studies have also found several outcomes. Salem and

Mourtada (2012) highlighted that the Gulf Cooperation Council countries experienced rapid economic integration due to the role of social media in diversifying their economies. In contrast, Nuseir (2018) observed that while social media promotes growth, it can also exacerbate economic inequality if access to digital platforms is uneven.

Overall, these diverse findings indicate that the role of social media in economic growth is multifaceted and context dependent. Researchers like Dell’Anno et al. (2016) and Zhang et al. (2024) argued for the integration of country-specific dynamics, including regulatory policies and cultural factors, in the analysis. Recent literature, including Wang et al. (2024) and Jian Lin (2022), provided a China-specific perspective; they demonstrated that social media platforms not only influenced GDP growth but also affected consumer spending patterns and financing activities. While existing research has made valuable contributions, the mechanisms through which social media drives economic development, particularly in emerging economies, need to be further explored. This study augments existing literature by focusing on the interplay between social media use and economic growth in China, emphasising the roles of TRSCG and AFRE as controlling factors.

2.2 Endogenous Growth Theory

Endogenous growth theory, which is grounded in neoclassical economics, places more emphasis on internal factors that propel economic growth than exogenous growth models. Endogenous models concentrate on factors like innovation, human capital, and institutional quality, whereas exogenous models largely attribute growth to external technological advancements. Understanding the dynamics of economic systems and their growth trajectories requires an understanding of this distinction.

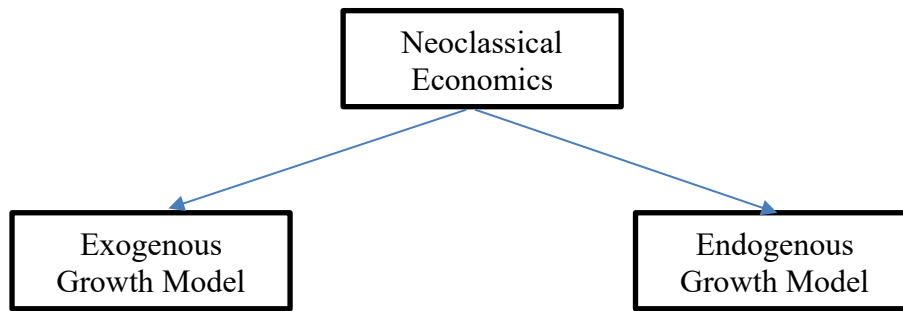


Figure 2.1: Endogenous Growth Model History

One important difference between endogenous and exogenous growth models is the source of growth. Exogenous models state that technological development drives growth from the outside in and is mostly independent of the economy's internal dynamics (Capello, 2019). Conversely, endogenous models argue that growth is driven by internal factors that are influenced by economic decisions and actions, such as innovation and the development of human capital (Capello, 2019).

Another significant difference is the role of institutions. In conventional exogenous growth models, institutions are seen as external, fixed factors that do not directly affect growth (Li, 2020). In contrast, endogenous growth theory takes institutions into account and argues that their development and quality are key to sustaining economic growth. Institutional frameworks that support innovation, education, and efficient markets are believed to facilitate growth (Li, 2020).

In addition, the two models have different assumptions about returns to scale. Exogenous models often assume diminishing returns to capital, which limits the potential for long-term growth without external technological inputs. But according to endogenous growth models, long-term economic growth may be possible by increasing returns to scale

through processes like innovation and knowledge accumulation (Chirwa & Odhiambo, 2018).

Even though endogenous growth theory provides a solid framework for understanding growth dynamics, some economists continue to advocate for exogenous models, emphasising the importance of external technological advancements for long-term growth. This continuing debate highlights the complexity of economic growth and the need for additional research to balance these points of view (Chirwa & Odhiambo, 2018).

Endogenous growth theory was developed by classical economists such as Adam Smith and Allyn Young, who emphasised the division of labour and growing returns as crucial elements of economic progress (King, 2022). Building on this, Joseph Schumpeter's "creative destruction" theory, which further emphasised the role that competition and innovation play in economic growth, enabled later developments in endogenous theory (Швецъ, 2021). Growth theory was altered and modern economic theory was influenced by Paul Romer's formal models, which in the late 20th century included knowledge and technology as endogenous factors (King, 2022).

Human capital is one of the core concepts of endogenous growth theory. The accumulation of knowledge and skills is believed to have a significant impact on productivity and innovation (Capello, 2019). Another important concept is innovation systems, which highlight the ways in which various institutions and actors collaborate to foster innovation and accelerate economic growth (Antonelli, 2017). Moreover, highlighting the role of governments in creating environments that support innovation and sustainable development highlights the theory's policy implications (Швецъ, 2021).

Despite its growing popularity, some critics argue that endogenous growth theory may overlook the complexity of technological change and the socioeconomic factors that influence growth. This suggests that a more integrated approach that considers both endogenous and exogenous elements is necessary to provide a comprehensive understanding of economic dynamics (King, 2022).

The impact of social media on economic growth can be investigated using a variety of sociological and economic approaches. However, there aren't many studies that have looked closely at the relationship between social media and economic growth from both an empirical and theoretical perspective. Conflicting views on social media's impact on productivity highlight the need for more research to understand its true effects. The most popular and effective theoretical framework for this research is endogenous growth theory. This theory emphasizes the significance of internal economic components like knowledge, technical innovation, and human capital in fostering long-term development, making it an excellent lens through which to examine how social media impacts economic dynamics, especially in emerging countries like China.

Endogenous growth theory suggests a solid framework in which investment in human capital, innovation, knowledge, and technology is endogenously involved in determining economic growth (Li, 2020). Endogenous growth is defined as long-term economic growth propelled by internal economic forces that govern the opportunities and incentives to produce technological knowledge (Hanushek & Woessmann, 2020). In contrast, in exogenous models, growth may be given by some outside factors that are not explained from within the model itself (Howitt, 2010). An endogenous approach aligns with models developed by Romer in 1986 (Roos, 2018) and Lucas in 1988 (Clerc & De Vroey, 2023), who suggests that internal factors such as technology, policy decisions, and human

capital investments significantly drive sustained economic growth. Endogenous growth models focus on finding growth determinants by choosing factors inside the model. There are two main directions of endogenous growth models. The first focuses on both physical and human capital for growth, and the second emphasises innovation as the main factor for determining growth (Ehrlich et al., 2017). These models reflect that externality is linked with one of these activities to define long-run growth, offsetting the diminishing return assumption. Since the 1980s, endogenous growth theory has incorporated a comprehensive range of concepts regarding the internal growth of capital and labour into development economics (Foster, 2011). This theory emphasises the importance of ideas, learning, and research and development as catalysts for innovation. In 2018, Paul Romer was awarded the Nobel Prize in Economics alongside William Nordhaus. Romer was recognised for merging technological innovation with economic growth (Villacian Goncer, 2023).

Comparisons with other nations offer insight into social media's varied economic impact. In China, social media platforms like WeChat, Weibo, and Douyin have evolved into key drivers of business, marketing, and consumer engagement. Similarly, in India, platforms such as WhatsApp have supported education and commerce (Morrar et al., 2017). However, in China, regional disparities persist - urban areas benefit from digital infrastructure, while rural regions lag behind due to limited access and low digital literacy (Zhou, 2022). This contrast highlights a productivity gap, with some researchers viewing social media as a tool for economic inclusion, while others see it as reinforcing inequality, underscoring the need for further investigation. These platforms contribute to capital accumulation, innovation, and knowledge sharing, core elements of endogenous growth theory. By integrating social media into economic processes, China has enhanced productivity and innovation (Morrar et al., 2017). The connection between social media and

economic growth is evident in increased consumer spending, operational efficiency, and market reach (Wang & Kim, 2017). Still, differences in focus, such as user volume versus engagement depth, reveal methodological divides that affect findings.

Social media platforms have primarily contributed to financial growth by promoting financial inclusion and enhancing access to most financial services (Liu, 2021). Alipay and WeChat Pay are at the forefront of changing the economy, allowing for an increase in micropayments and an all-inclusive economic environment. This makes more room for allocating capital and mobilising savings, which is critical in funding innovation and economic projects (Zhou, 2022). Social media has also become an essential tool for information diffusion. The fast spread of information in the digital world through these platforms complements market efficiency and consumer awareness. Businesses use social media to minimise information asymmetry, reach a larger audience, and increase the response rate from market demands. An efficient flow of information triggers economic activities and productivity (Desmarchelier & Fang, 2016). Taobao and WeChat are two e-commerce sites illustrating how social media incorporates payment methods, advertising, and customer interaction to reduce market inefficiencies. This encourages innovation and increases production, aligning with the concepts of endogenous growth (Wang & Kim, 2017). Furthermore, social media facilitates online education and professional networking, both of which support human capital growth. For instance, platforms such as Bilibili provide educational resources that foster the development of knowledge and skills, two crucial elements of innovation ecosystems (Desmarchelier & Fang, 2016).

Even though social media promotes economic growth, it has drawbacks, such as data privacy concerns and unequal access. In China, rural people are less able to engage in

innovation and information diffusion due to limited access to digital technology, hindering equitable advancement (Li, 2023). Moreover, as social media can lead to market saturation and diminished returns, concerns regarding over-reliance on these platforms for business objectives cast doubt on its long-term viability as a significant growth engine (Chan, 2024). As social media evolves, technologies like metaverse and artificial intelligence (AI) have opportunities to boost its economic impact. For instance, Douyin's AI-powered algorithms can boost market productivity and efficiency by offering users tailored recommendations (Li, 2024). To prevent censorship and monitoring from impeding creativity and economic potential, policymakers must balance innovation and regulation. By bridging the divide between urban and rural communities, digital literacy efforts might contribute to democratising access to the benefits of social media (Acheampong & Taden, 2024).

As social media continues to evolve, its role in driving economic growth will likely deepen, particularly in economies like China, where it is already a cornerstone of economic activity. Social media platforms are expected to remain critical to sustaining growth by fostering innovation, reducing market inefficiencies, and democratising access to financial and informational resources (Nari Kahle, 2013). Endogenous growth theory provides an ideal framework to explore this interplay, as it captures the dynamic, self-reinforcing mechanisms that characterise the modern digital economy (McCready, 2000). Endogenous growth theory effectively captures the dynamic interplay of social media use and economic growth. This interaction is incredibly potent in China due to the integration of social media in personal and professional circles. As social media continues to increase in user numbers, its impact on economic growth will likely deepen, thereby strengthening the importance of endogenous growth perspectives in understanding contemporary economic activities. The alignment of social media with the principles of endogenous growth highlights its potential

to drive not only economic but also societal transformations. Further research in this area can deepen the understanding of how internal mechanisms, particularly those enabled by digital platforms, contribute to sustained economic development.

The significance of innovation and information sharing is highlighted when examining social media's impact on economic development within the context of endogenous growth theory. Innovation, information, and social media platforms are interdependent. In addition to serving as a communication tool, social media promotes innovation, information sharing, and idea sharing across a range of industries. Through WeChat, BiliBili, and Douyin, users trade new products, services, and ideas, encouraging group learning and the improvement of existing practices. Consequently, a dynamic cycle is established whereby innovation is sparked by creativity, which in turn propels economic progress.

Innovation is a key component of endogenous growth from an economic perspective. Villacian Goncer (2023) emphasized the critical link between technical innovation and sustained economic growth. Social media platforms facilitate this innovation by offering a wide-ranging, reasonably priced platform for consumers and businesses to collaborate on projects, share ideas, and crowdsource information. For example, the widespread use of Douyin has given rise to a completely new marketing approach whereby businesses may leverage influencer marketing, user-generated content, and short films to connect with their target audience. This phenomenon has spurred innovation in the platform and the broader business ecosystem, influencing how businesses engage with their clientele in novel and inventive ways. With the help of these platforms, individuals and companies may access a global knowledge base to create new products, services, and business models that have the potential to revolutionize whole industries.

Along with innovation, one of the most important factors in fostering endogenous growth is knowledge transmission (Cai et al., 2022). The ability of the modern digital economy to disseminate knowledge quickly is one of its key features, and social media plays a major role in enabling this. Through information transfer within and between industries, regions, and countries, businesses can adopt new technologies and practices that increase their productivity and competitiveness. In China, platforms like Taobao and WeChat have accelerated the dissemination of business knowledge, including consumer behavior patterns, market trends, and product preferences (Ma, 2016). For instance, small business owners use these platforms to speak with clients directly and receive prompt feedback that aids in the creation of new goods. This rapid exchange of knowledge aligns with endogenous growth theory's emphasis on the self-reinforcing mechanisms that drive long-term growth (Hanna, 2009). When knowledge flows freely, businesses can innovate more efficiently, leading to greater economic output and sustainability.

The widespread use of mobile devices and internet connectivity in China further increases the potential for innovation and information transfer to spur economic growth (Harwit, 2004). Platforms like WeChat allow businesses to reach a wide audience from urban hubs to rural villages, thanks to their millions of users from a variety of geographic locations and financial levels. The flow of information and the opportunity for innovation to promote economic growth will only rise as mobile internet connection becomes more widely available (Aker & Mbiti, 2010). The endogenous growth paradigm, which emphasizes the value of utilizing internal resources like human capital and technological know-how to promote long-term economic development, is further supported by this.

In conclusion, endogenous growth theory provides a powerful framework for understanding the relationship between social media and economic growth by focusing on

the internal dynamics of technical innovation, knowledge transfer, and human capital development. The integration of social media with China's economy, which has allowed the country to achieve significant economic success, has triggered these internal variables. As social media platforms advance and integrate new technologies, their potential to promote further growth becomes increasingly evident. Therefore, in order to forecast the future development of the world's economies, it is imperative to keep researching the effects of digital platforms, particularly social media, on endogenous growth.

2.2.1 The Economic Role of Social Media in China

Social media platforms such as WeChat, Weibo, Douyin, and Bilibili have become integral to China's economic landscape. These platforms facilitate digital communication, e-commerce, financial transactions, and information dissemination, all contributing to economic activities and growth. Social media makes it easier for people to share ideas and information quickly, which increases the spread of knowledge across industries (Cross & Parker, 2004). These platforms also help businesses market products, reach consumers, and foster innovation, thus driving economic growth. In the context of endogenous growth theory, social media represents a powerful tool for knowledge diffusion, capital accumulation, and entrepreneurship (Liu et al., 2021; Morrar et al., 2017). Therefore, social media use is a key variable for understanding its role in fostering long-term economic growth within the framework of endogenous growth theory.

2.2.2 Economic Growth

Economic growth results from various factors such as technological advancements, innovation, human capital development, and capital accumulation. The impact of social media on economic growth can be observed through increased consumer spending, improved business efficiency, enhanced market reach, and greater financial inclusion (Wang

& Kim, 2017). Endogenous growth theory posits that internal factors, including innovation and human capital, drive sustained economic growth (Stough, 2001). Thus, GDP serves as a direct indicator of economic growth influenced by internal forces, such as those associated with social media use.

2.2.3 GDP

GDP is the primary measure of economic growth, reflecting the total value of goods and services produced within a country. The impact of social media on economic growth is evident through its contribution to sectors like e-commerce, digital payments, and online education, which boost productivity, consumption, and business operations (Howitt, 2010). Therefore, GDP is a crucial variable in examining the economic effects of social media. This is especially evident in economies where technological advancements, particularly those driven by social media platforms, play a significant role in economic development.

2.2.4 ARDL

The ARDL approach has gained popularity due to its ability to overcome issues encountered in cointegration tests, such as those proposed by Engle and Granger (1987) and Johansen and Juselius (1990), Mostafavi (2012), and Ramenah et al. (2018). Alimi (2014) suggest that ARDL is particularly effective in addressing low-power models and other related issues. Researchers have explored how sample size affects the efficacy and accuracy of this model. For instance, Sultan (2010) demonstrates that ARDL is more effective with smaller sample sizes as it provides reliable long-run estimates and detects cointegration even with limited data. The ARDL method is useful in this study to analyse the short- and long-term relationships between social media use and economic growth.

2.2.5 TRSCG

TRSCG represents the growth of scientific and research capital, playing a critical role in endogenous growth models. Central to TRSCG, knowledge and technological innovations are driven by internal factors such as social media platforms, which promote knowledge dissemination and collaboration (Howitt, 2010). Platforms like Bilibili provide educational resources that contribute to the development of human capital and technological knowledge, key elements for fostering long-term economic growth. The relationship between TRSCG and social media highlights the integral role of innovation in economic growth.

2.2.6 AFRE

AFRE encompasses financial flow such as bank loans, debt financing, and other forms of capital movement. Endogenous growth theory posits that economic growth is closely related to capital accumulation, investment, and the flow of financing (Pack, 1994). Social media platforms enhance digital payments, crowdfunding, and other financial services while creating diversified financing channels, thus promoting the development of the real economy. Therefore, AFRE, as a financial variable, reflects the financial support that social media provides to the economy.

2.3 Conceptual Framework

This study's framework outlines key variables and their relationships based on endogenous growth theory, which highlights innovation and knowledge as drivers of growth, positing that social media enhances these to boost GDP. It aligns research objectives with theory and evidence to structure the analysis, ensuring a focus on internal growth mechanisms. Control variables are used to explore their mediating or moderating effects

between social media and GDP, reflecting theoretical influences. Building on previous studies, the connection between economic growth and social media is discussed below.

2.3.1 The Relationship between Social Media and GDP

Many researchers have studied the relationship between social media and economic growth. Shang (2014) highlights the importance of strategic planning and investment outcomes in social media for SMTE. In addition, social media has contributed significantly to marketing, advertising, product distribution, and customer engagement. The rise of social media has fundamentally shaped the way we communicate and share information, prompting extensive research into its complex relationship with economic growth. Several studies suggest that social media can act as a positive economic force. Albarran and Albarran (2013) found that social media platforms level the playing field, particularly for different businesses, managerial and communication industries. Social media fosters competition and innovation by offering affordable marketing and outreach opportunities.

Evans (2010) indicates that social media plays a crucial role in enhancing market dynamics by accelerating the dissemination of information, enabling firms and consumers to make informed decisions and improving overall market efficiency. Furthermore, Oparaocha (2016) found that the collaboration and knowledge-sharing nature of social media drives innovation and entrepreneurship, creating opportunities for growth and advancement. This dynamic applies in the Chinese context, where technological development is a matter of national importance.

Through democratised marketing and innovative means through which businesses connect with consumers, WeChat, Weibo, and Douyin have become some of the most outstanding platforms like targeted marketing, content sharing and creation, e-commerce

integration etc. Powell et al. (2011) suggest that social media has essentially levelled the playing field for businesses through cost-effective marketing and outreach opportunities provided globally. Thus, social media catalyses economic growth, and this is highly supported by literature. The democratisation of these areas creates a highly competitive environment that drives innovation. Constantinides (2014) indicates that social media facilitates a rapid flow of information, enhancing market efficiency and enabling informed decision-making among businesses and consumers alike.

In China, the rapid exchange of information is a key feature of the digital economy, which is essential to the country's overall economic strategy (Zhang & Chen, 2019). Huang et al. (2023) highlight the competitive dynamics between these big social media platforms in China. Based on a model considering user growth, competitive factors, and maximum market capacity, the study identifies that both exhibit an S-shaped user growth curve. This emphasises that increasing user experience over simple competitive strategies will guarantee growth.

Hamid et al. (2017) suggest that social media can help raise environmental sustainability awareness through educational institutions and platforms like Facebook. They estimate that such media can make significant contributions to the pursuit of sustainability goals through the practical dissemination of environmentally friendly practices and the active involvement of different communities in discussing sustainable development.

Moreover, Carayannis et al. (2006) indicate that the tendency of social media to become a hub of collaboration and knowledge exchange acts as a catalyst for innovation and entrepreneurship. This aspect is quite important in China because the country has been working on technological innovation. Given the governmental emphasis on technological

advancement, this allows for social media's capability to spur entrepreneurial undertakings and a symbiotic relationship between digital platforms and economic growth (Jiang, 2023).

Rajan et al. (2023) discuss the negative impacts of social media distraction on workplace productivity, while businesses face a severe challenge in sustaining employee efficiency in today's ubiquitous digital environment. Furthermore, misinformation in social networks can spread fast, leading to market volatility or negatively impacting investment decisions. Misinformation being so common demands the development of strong strategies to reduce its economic impacts (Lewandowsky et al., 2012). Similarly, Magro (2012) calls for strategic government action to exploit the positive economic benefits of social media by mitigating its negative characteristics. Policies on digital literacy and responsible online behaviour can reduce misinformation and improve the general business climate. Moreover, embedding entrepreneurship enabled through social media can further encourage economic activities and innovation, strengthening China's leadership in the digital economy.

Zhang et al. (2020) explore the influence of mobile access to social media on advertising outcomes. The flexibility of time and space, mobile lifestyle, and relevance of advertisements are evident from a survey of WeChat users. The survey findings indicate that increasing consumer purchase intention points to mobility capability as the key to improving social media advertising effectiveness (Zhang et al., 2020). The interrelationship between social media and growth is reciprocal in an intricate, multi-level way, mainly in the emerging digital era occurring in China. The potential through social media is high for economic growth, innovation, and market efficiency.

However, social media also presents challenges that must be handled tactically through policy intervention. As China gradually examines how social media may serve its

vast potential under the economic setup, the global community has also realised the potential of digital platforms on economic paradigms. It is, therefore, crucial to empirically measure the economic impacts of social media and platform-specific effects to comprehensively understand these dynamic relations.

2.3.2 The Relationship between TRSCG and GDP

Overall, TRSCG is used for consumption and is considered the most significant component of GDP. Research highlights that higher retail sales typically signal economic growth since they reflect consumer demand and business activities that contribute to production and service sectors (Eckman et al., 2015). By including TRSCG as a control variable, studies can account for fluctuations in economic activity that may be driven by changes in consumer spending.

Research indicates a long-term equilibrium between TRSCG and GDP, particularly in China, where GDP is found to be a Granger-causal factor for TRSCG. This suggests that increases in GDP lead to higher retail sales, as economic expansion drives consumer spending and enhances market demand (Zeng et al., 2020). In the United States, consumer spending, which constitutes a large portion of GDP, demonstrates a similar dynamic. Higher retail sales have been shown to drive economic growth, accounting for over two-thirds of GDP. This highlights the significance of TRSCG in understanding not only consumption but also its role as a catalyst for overall economic expansion (Scopelliti, 2016).

Research also indicates that social media influences consumers to make purchases, hence affecting TRSCG. Access to product information and focused advertising through social platforms can drive sales, linking social media use with retail and economic outcomes (Agnihotri et al., 2012). From this perspective, in analysing the effect of social media on

GDP, the TRSCG may represent a good control group shift in consumer spending, susceptible to influence from social media use trends. Therefore, the effects of social media can directly impel the spending patterns of consumer TRSCG (Budree et al., 2021). Thus, through advertising, influencer product suggestions, and content made for consumers, social media shapes consumer preference and spending. Within China, WeChat and Douyin have extensive power over retail activities of users' purchase decisions (Ludvigson, 2004).

Numerous factors, such as government spending, consumer behavior, and disposable income, affect the relationship between Total Retail Sales (TRS) and GDP. These factors directly affect retail sales, which in turn affect GDP growth (Jiaying Lin, 2022). The model developed in one study emphasizes the predictive ability of consumption indicators on TRS, underscoring its importance in economic analysis. This model highlights the potential of retail sales as an economic barometer by showing how shifts in consumption patterns may forecast broader economic developments (Zhang & Xu, 2019).

The concept of TRSCG is crucial in understanding economies like China, where a shift in dependency toward consumption-driven growth is evident. Various studies have found that the increase in TRSCG in China has led to an increase in GDP. This is because the economic structure is more dependent on domestic consumption rather than exports or investment alone (Cong et al., 2020). Including TRSCG in econometric models controls for fluctuations that may be related to consumer demand. Thus, it serves to isolate the effect of other variables, including social media use, on economic growth. TRSCG reflects not only the real spending habits of consumers but also their confidence, which could be a leading indicator of economic conditions. Thus, higher retail sales figures indicate optimism among consumers and increased investment by businesses in expanded production and services (Sell, 2002). Similarly, a high level of consumer confidence implies higher consumer

spending, thereby increasing TRSCG. This contributes to the path of economic stability and further growth. These dynamics underscore the predictive role of TRSCG in economic modelling, particularly in studies where domestic demand is a major issue, as with studies focusing on China's transition to consumption growth (Ludvigson, 2004).

2.3.3 The Relationship between AFRE and GDP

The AFRE comprises the amount of money supplied by the entire financial system to the real economy. Therefore, it has been the key variable in most academic research on the topic of Chinese economic growth (Sell, 2002). This measure includes bank loans and corporate bonds and equity, monetary tools reflecting direct economic activities. AFRE is an important index in risk control, particularly in China, where the government tends to control economic growth by adjusting financing channels.

Research indicates that there is a long-term cointegration relationship between GDP and financial development, indicating that GDP tends to rise in tandem with the expansion of financial markets. This suggests that financial institutions are crucial for fostering economic growth since they provide the capital needed for businesses and investments (Jun, 2013). Additionally, German studies highlight the connection between real sector loans and GDP growth. This study demonstrates how credit, when allocated to productive sectors, can significantly enhance economic performance (Hense, 2014).

The Chinese government employs AFRE to guide economic policy, as it reflects direct and indirect financing activities impacting real economic sectors. Hume and Sentance (2009) state that AFRE aligns with the country's economic goals because it captures a larger scenario than standard loan metrics. Thus, AFRE allows policymakers to address issues concerning the credit supply to the real economy (Sell, 2002). The AFRE proves useful in

understanding the financing changes of key sectors such as infrastructure, manufacturing, and services that are continually needed to achieve economic growth (Lardy & Subramanian, 2011).

Chang and Vo (2020) note that AFRE contributes to smoothing the shocks exerted by financial changes and market fluctuations on the economy. AFRE can reveal periods of credit tightening or expansion, which have direct implications for investment levels, consumer spending, and overall economic activity. By observing the AFRE, changes in credit availability that might alter a person's investment and consumption amounts can be tracked. Their results indicate that shifts in AFRE are significant for growth rate management, inflation control, and fostering steady investment flows (Ali et al., 2023). This dynamic plays a pivotal role in balancing the demands of rapid economic growth with the need to manage associated risks.

AFRE is instrumental in understanding the private sector's role within China's economy. Lin (2016) defined this as a means of measuring cash available for private businesses to invest in developing new ideas and jobs. AFRE data provides several examples of how access to credit bears relevance to GDP growth within private businesses, showing how AFRE contributes to the credit conditions that affect economic growth. People increasingly shop through platforms like WeChat, Douyin, or other apps often relying on financial options to support their purchases. AFRE can be used to understand how consumers obtain this obtain financing. Their findings indicate that when social media-driven shopping combines with the financing trends examined using the AFRE, it increases consumer demand, which boosts economic growth.

2.4 ARDL Procedures and Empirical Results

One of the study's objectives is to identify the long- and short-run connection between social media use and economic growth. This section discusses the method for identifying these relationships in detail.

2.4.1 ARDL Procedures

Economic measurement procedures, systematic econometric methods for analysing relationships among variables, were established by Engle and Granger (1987) and improved by Johansen and Juselius (1990) to determine the long-run relationship between variables. These methods are only applicable if the model consists of variables of the same order of integration since the procedures are based on residual-based and maximum likelihood cointegration. Long and Samreth (2008) stated that if variables comprise different orders of integration except for the presence of $I(2)$, these cointegration tests cannot perform the model estimates. Other disadvantages of these models are indicated by Alimi (2014) include the low-power estimates provided by these cointegration tests. Moreover, the cointegration tests by Engle and Granger (1987) and Johansen and Juselius (1990) are not capable of differentiating between dependent and independent variables in the estimated model. These cointegration tests only apply the same lag for the entire estimation techniques, resulting in endogeneity issues (Mostafavi, 2012).

Therefore, the ARDL approach has become popular in recent decades due to the several advantages of this approach in overcoming the problems associated with the cointegration tests of Engle and Granger (1987) and Johansen and Juselius (1990). According to Alimi (2014), the ARDL approach can overcome models with low power and

other issues. Researchers have also determined the maximum sample size that can be used for this model to work effectively and accurately.

The advantage of using the ARDL approach is that the unit root does not necessarily need to be tested before proceeding. According to Alimi (2014); Husaini and Lean (2015), the estimated variables can entirely be $I(0)$, $I(1)$, or a combination of $I(0)$ and $I(1)$. This is because the ARDL technique can estimate variables with the same or different order of integration. This method offers users various choices of optimal lags selected for different variables. Adjusting the lag orders of the model using the ARDL approach can improve endogeneity and autocorrelation.

2.4.2 Empirical Findings of ARDL Approaches

The ARDL model has been widely employed to examine short- and long-term impacts of variables on economic growth, including GDP. For instance, applying the ARDL model to India's total natural resource rents (NRR) and GDP illustrates significant short- and long-term relationships. Research shows that natural resource rents substantially influence GDP growth, validating the ARDL model's capacity to identify immediate and equilibrium relationships (Taneja et al., 2023).

Sinha et al. (2024) conducted a cross-country empirical analysis using a panel ARDL methodology. The findings reveal that while taxation negatively impacts economic growth, investments in digital infrastructure, labour force participation, and financial systems contribute to GDP growth. The study emphasises the importance of digitalisation in enabling inclusive growth by bridging gaps in communication and access to services.

Using ARDL analysis, Khaleq and Shihab (2024) explored how financial inclusion influenced economic growth in Jordan from 2000 to 2021. They found a bidirectional

relationship enhanced financial inclusion boosted economic growth, which in turn promoted further inclusion. The study underscores the significance of accessible financial services for sustainable development while suggesting the integration of digital financial tools to augment growth. Duasa and Ramadan (2019) analysed the long-run impact of digital transformation on economic growth in ASEAN countries using ARDL cointegration tests tailored for small sample sizes. The findings indicate positive long-term effects of digitalisation in nations like Malaysia and the Philippines. However, short-term disruptions were noted due to uneven digital access among member countries. This highlights the need for equitable digital policies to maximise growth benefits.

The benefits of using the ARDL approach compared to the standard cointegration methods are stated, defined, and proved from an economic perspective. Thus, based on its advantages, this study used the ARDL method to determine the long- and short-term connection of the estimated demand model.

2.5 Dependent Variable

Traditionally measured by gross domestic product (GDP) per capita, economic growth represents the aggregate income of a country divided by its total population (Kuznets, 1967). GDP serves as a primary indicator of economic health, reflecting the average economic output per person and providing insights into living standards, productivity, and economic well-being. China's economic growth trajectory is remarkable, transitioning from a predominantly agrarian economy to a global manufacturing powerhouse with a burgeoning digital economy. The country's GDP per capita has increased significantly over the past few decades, indicative of its rapid industrialisation, urbanisation, and integration into the global economy. Scholars like Zhou et al. (2021) have explored China's economic reform

trajectories and the effects on GDP growth, citing technological innovation and digital technological development as essential factors. China's economy has continuously grown at a high rate, with improved GDP per capita over time. This growth has resulted from higher labour force participation and productivity (Perry et al., 1971). In 1978, the Chinese economy stood at the brink of collapse after two decades of central planning and political turmoil. In sharp contrast, between 1978 and 2017, China experienced phenomenal economic growth. During this period, China's GDP grew at an average annual 9.5% growth rate.

Arguably, most aspects regarding how social media influences China's economic growth are deeply linked with the GDP per capita contribution through several channels. Consumer engagement, digital entrepreneurship, and market intelligence form only a small portion of the ways in which this occurs. As China continues forging its path toward becoming a leading digital economy, understanding the nuanced impacts of social media on economic growth remains critical for research and policy development.

2.6 Independent Variables

The Chinese landscape of social media use has turned out to be a peculiar ecosystem, vastly different from the Western pattern of use and predetermined by specific social, economic, and regulatory national contexts. Major Chinese social media players like WeChat, Weibo, Douyin, and Bilibili have moved from simple communication facilities to highly replete digital ecosystems where social networking, e-commerce, and entertainment are integrated (Dai, 2023).

Social media use in China began in the early 2000s; online communication was first made possible through platforms such as QQ. It was not until the launch of Weibo in 2009

and (then) WeChat in 2011 that multi-functioning platforms were developed to meet all types of needs regarding China's internet population (Wang, 2019). Demographically, social media use in China exhibits unique penetration trends across age groups, between urban and rural settings, and socio-economic status. Studies also suggest that Chinese social media users are not merely passive recipients but engaged in content creation, e-commerce, and social interactions (Li & Ranieri, 2013). Live streaming and short video platforms like Douyin further diversify the content ecosystem, attracting hundreds of millions of users. Social media has also become an economic driver for China. This medium contributes to the development of digital commerce, the service industry, and the gig economy. Integrating payment systems such as WeChat Pay and Alipay into social media applications provides seamless transactions, improving consumer spending and financial inclusion (Taylor, 2023).

Social media use in China significantly affects the country's regulatory environment. The censorship of the internet and regulation of its content by the Chinese government has, over time, influenced how users engage platforms and the type of content that circulates (DeLisle et al., 2016). Zhongwei et al. (2015) explored how WeChat affects social interactions and economic activities in China. Emphasising its function in everyday life and trade. Their research highlights how WeChat helps businesses exploit the B2B and B2C models. It highlights that while WeChat facilitates communication and business processes and promotes economic development through social employment, it also inconveniences certain market adaptations and user experiences. Yang and Wang (2021) analysed the shift from state-controlled to internet-based media, dominated by platforms such as WeChat and Weibo, which have taken over more than 90% of the market. This provides insight into how the Chinese government strictly controls the media through censorship and surveillance, as in the case of Fang Fang's "Wuhan Diary" (Fedtke et al.,

2021). These findings highlight the complexity of media consumption, the dominance of certain platforms, and the tension between state censorship and individual expression in China's shifting digital landscape.

Success in the growth landscape elicited problems with social media in China overnight, i.e., fake news concerns and digital addiction (Ma, 2016). These ongoing studies aim to explore the long-term social impacts of evolving regulatory frameworks due to the rise of the social media usage. They also examine the role of the emerging technologies, such as artificial intelligence and how these developments may influence the regulation and management of digital platforms. The Chinese ecosystem is rather complex, at times, with a multi-stakeholder structure representative of the social, economic, and regulatory context of the country (Esposito, 2022). This provides insight into what is considered fundamentally essential in determining how technology will lead such platforms to grow and their positioning within society and the global economy.

2.7 Control Variables

This study included control variables to account for additional factors that could influence the dependent variable, ensuring that the relationship between the independent and dependent variables is accurately assessed. Specifically, we included TRSCG and AFRE as the control variables. TRSCG served as a proxy for consumer demand, a significant driver of economic growth. Similarly, AFRE captured the availability of financing for businesses and households, directly impacting economic activities and GDP growth.

TRSCG includes the total value of all consumer goods sold within a certain period in China (Tang, 2009). It reflects a key indicator of consumer demand and economic activity tendencies. Food, clothing, electronics, and many types of household goods are included in

this category, reflecting consumer trends and preferences throughout the country (Zhang & Xu, 2019). The TRSCG is among the key variables in economic performance. It sheds insight into the health of an economy's retail component, essential for growth.

This study adopted TRSCG as a control variable to capture the general level of consumer demand that has an independent effect on GDP. One clearly understood relationship between retail sales and GDP is that a reasonable volume of retail sales seems to consistently relate to higher economic output and consumer confidence (Aktaş, 2011). A strong retail sector means not only that people are spending more but also that the economy is doing well, leading to more employment, higher incomes, and increased market stability. The TRSCG can also indicate consumer confidence and spending capability. When consumers feel positive about the economy, they tend to spend more. This boosts retail sales and contributes positively toward GDP growth (Nisar & Prabhakar, 2017). However, decreased retail sales may indicate economic downturns and help policymakers and businesses adjust their policies accordingly.

It is equally fundamental for TRSCG to depict the activity of consumption patterns in China, considering rapid urbanisation and lifestyle changes (Zong & Yu, 2024). As the middle class has grown larger and consumer preferences have continued to shift, retail sales reflect online shopping and digital transactions that reflect the burgeoning role of e-commerce in shaping consumer behaviour. By adding TRSCG, the present analysis intends to capture how consumer spending influences economic growth based on social media use and digital engagement (Zhang et al., 2020). With this approach, retail sales and other variables are explored based on the supposition regarding the importance of consumer spending within an increasingly changing economic landscape. Generally, TRSCG is a

platform where researchers carry out their work to contextualise the impact of social media on economic growth and development in China.

AFRE comprises financing alternatives, including loans, bonds, equity, and other forms of credit instruments of an economy. This macro-measure indicates the quantity of financial resources available to people and business enterprises, primarily depicting total liquidity. Since AFRE focuses on how access to capital influences investment, consumption, and growth, it is possible to draw an analysis of economic dynamics.

Current research focuses on AFRE in conjunction with social media. Social media increasingly affects corporate strategies and encourages consumer demand. Well-functioning social media can instigate a surge in demand that increases the level of funds required to purchase expansion plans (Spangler, 2017). Improved access to superior credit for consumers, frequently through e-commerce and social media, has promoted marketing and consumer spending that drove the economy. For instance, in a rapidly growing economy like China, Aktaş (2011) indicate that effective financing channels can support infrastructure projects, technological advancements, and small to medium-sized enterprise (SME) growth, contributing to overall GDP expansion.

AFRE can serve as a key indicator of economic performance. Its fluctuations may partly show the shifting confidence in the economy among businesses and consumers, which has some ramifications for investment and consumption behaviour (Constantinescu, 2012). While a rise in AFRE potentially underlines the financial sector that recognises and responds to demand by offering credit, contraction might reflect a restrictive credit market attitude that may harm economic growth. Linking AFRE with GDP underscores the role of effective financial policies and regulations that assure a flow of capital in the economy (Sheng, 2012).

AFRE can also be considered a leading indicator of economic confidence. This would imply that turning points in the values of AFRE signal turnarounds in business and consumers' behaviour regarding investment and spending decisions. Increasing positive sentiment on social media enhances consumer spending and business investment, raising financing demands (Khan et al., 2019). A lower sentiment might signal negative investment and reduced credit conditions. Ali (2018) has shown that social media sentiment directly affects financial markets and investment behaviour, impacting AFRE and economic outcomes.

Social media is essential in the economy of AFRE as new forms of consumer behaviour and firm strategies. Policymakers must keep constant surveillance of AFRE so that money flow is appropriate, keeping over-indebtedness at bay and growth in view (Adrian et al., 2019). The present study helps to understand how digital engagement interact to influence economic patterns by including social media in the analysis.

2.8 Literature Gap

Existing literature provides a comprehensive review of the potential impact of social media on economic growth in the context of China's digital economy. Studies highlight how platforms like WeChat, Weibo, Douyin, and Bilibili facilitate information dissemination and consumer engagement, contributing to economic activity. Despite these findings, notable gaps remain, which the present study seeks to address.

Although the overall impact of social media on economic growth is identified in current research, studies have typically treated social media as a unified, integrated system without carefully analysing each platform independently. Studies examine the general impacts of social media on economic growth without delving into the specific ways that differing platforms contribute. Social media platforms such as WeChat, which combines

financial services and business operations (Peng, 2017); Weibo, renowned for its rapid information dissemination (Huang & Sun, 2014); Douyin, which powers e-commerce and entertainment (Pun & Fung, 2023); and Bilibili, which emphasises social interaction and video content (Wang, 2022), are not differentiated in studies that demonstrate the potential of social media for business, marketing, and information sharing (Yu, 2023). In contrast, the present research focuses on how social media platforms differently affect China's economic growth, aligning with the goal of analyzing platform-specific impacts within its unique digital regulation. By examining their distinct mechanisms, we aim to determine how WeChat, Weibo, Douyin, and Bilibili affect economic activities such as retail sales, financial inclusion, and consumer engagement. This gap is important in China's controlled digital space, where platforms play unique economic roles shaped by state and market forces, highlighting the need for focused analysis. This rigorous analysis provides businesses and policymakers with a thorough knowledge of social media's intricate role in promoting economic growth. Our methods bridge the gap in the literature by examining the contributions of various platforms rather than social media as a whole.

Most existing research focuses on short-term or cross-sectional assessments, showing the relationship between social media and economic growth. These studies overlook social media use's dynamic, evolving nature and relationship to long-term economic trends. For instance, Fuchs (2015b) emphasises the short-term societal and economic effects of social media while overlooking its long-term effects on broader economic indicators and behavioural shifts. This discrepancy raises unsolved questions about how long-term social media use relates to structural economic variables like AFRE and TRSCG, which are crucial for understanding economic development trends (Al-Obeidat et al., 2020).

The present study addresses this gap by examining the long-term effects of social media on economic growth. By combining short- and long-term data, we augment the understanding of how platforms like WeChat, Douyin, Weibo, and Bilibili impact economic outcomes over time, particularly regarding AFRE and TRSCG. This approach strengthens the theory and supports the goal of assessing platform-specific economic impacts in China's changing digital economy. Therefore, this research provides a more comprehensive view of social media's role in long-term economic development, offering valuable insights for businesses and policymakers seeking to harness these platforms for sustainable growth.

Few studies adopting economic theories to analyse the impact of social media incorporate endogenous growth theory, which emphasises the role of internal factors, including information dissemination, human capital, and innovation (Wang & Kim, 2017). These elements, which are central to social media functions, have not been adequately addressed in the literature (Roos, 2018). Since few studies assess the mechanisms proposed by endogenous growth models, the theoretical and empirical understanding of how social media drives economic growth through these internal factors is lacking (J. S. Song et al., 2024). This study addresses this gap by directly connecting endogenous growth theory with the economic effects of social media. We investigate how platforms like WeChat (financial integration and knowledge dissemination), Douyin (e-commerce innovation), and Weibo (information sharing and human capital) encourage economic growth using mechanisms based on this theory. By empirically validating these theoretical links, our study strengthens the conceptual framework for understanding the role of social media in driving long-term economic development. This approach advances the theoretical discussion while providing actionable data for future research and policy.

2.9 Summary of the Literature

In the existing literature, several studies such as Sahni and Sharma (2020), Asare (2020), Liu et al. (2016), and Yang (2021) have explored the relationship between social media and GDP. However, based on the influence of macroeconomic factors, the study results vary significantly. For instance, differences in the determinants selected for each estimation model, study periods, and methodologies have led to diverse findings. Therefore, ample opportunities exist to examine the relationship between social media and economic growth by applying various econometric methods or incorporating different determinants into estimation models to uncover novel insights regarding the relationships between these variables.

The literature generally suggests that social media and economic growth have a positive correlation, where the development of social media leads to economic growth and vice versa. However, this relationship depends on the country and the period under study. A few earlier studies by Dell'Anno et al. (2016), Asare (2020), and Fernández-Portillo et al. (2020) present a different perspective, suggesting that the relationship between social media and economic growth may be neutral or negative. The lack of consensus regarding the deeper connection between social media and economic growth highlights social media as a variable that requires further exploration.

From an economic perspective, TRSCG and AFRE may positively and negatively impact a country's economic growth. Research suggests that the relationship between TRSCG, AFRE, and economic growth may be positive or negative. For example, Fritzer (2004) and Zhu et al. (2024) identified a negative correlation between TRSCG, AFRE, and economic growth, while (Qudrat-Ullah and Nevo (2021) found that TRSCG and AFRE positively impact economic growth. Therefore, incorporating TRSCG and AFRE into the

estimation model to analyse the impact of social media on economic growth in China adds significant value to this topic.

The present study employed the ARDL method to determine long- and short-term relationships between economic growth, social media, TRSCG, and AFRE. Recently, the ARDL method has been widely applied in research due to its advantages, demonstrated by studies such as (Ramos-Herrera, 2024). The choice of ARDL over traditional cointegration tests was based on its numerous benefits. It addresses the issue of insufficient power in traditional cointegration tests. Moreover, the estimation model can accommodate $I(0)$ and $I(1)$ variables while improving endogeneity and autocorrelation issues by adjusting the model's lag structure.

This study aims to elucidate the specific impact of social media on economic growth in the context of China's economic development. Examining how social media influences economic growth deepens the understanding of media economics and provides empirical support for designing more precise social media policies in China.

Based on the above, this study systematically analyses the relationship between economic growth and its determinants by incorporating core variables such as social media, TRSCG, AFRE, and economic growth within an ARDL framework. This analytical approach reveals the long- and short-term interactions while providing a valuable methodological reference for future research. The findings are expected to provide substantive recommendations and theoretical support for achieving sustainable economic growth in China, optimising the efficiency of social media use and formulating economic policies.

CHAPTER 3

METHODOLOGY

3.0 Introduction

The study examines the relationship between the use of social media and real GDP variables in the context of China's economic growth. Chapter 3 describes the variables, data collection, and timeframe and outlines the methods and tests to achieve the study's objectives. Section 3.1 presents the research design, outlining the approach and framework employed. Section 3.2 details the data collection process. Section 3.3 discusses the data employed in this study and its sources. Section 3.4 presents the empirical model used to analyse the relationship between social media use and economic growth. Section 3.5 explains the analysis methods, including unit root tests to examine the order of variable integration, the ARDL process of analysing long- and short-term relationships, and diagnostic tests to assess the model's robustness. Section 3.6 provides concluding remarks. The ARDL model is particularly suitable for this study due to its ability to handle small sample sizes and variables with different levels of integration, making it more appropriate than traditional cointegration methods.

3.1 Research Design

This study adopts a quantitative approach to determine the causal relationships with growth metrics to explore the impact of social media on China's economic growth. This section outlines the following steps in the design research process: theoretical framework development, data collection strategies, and analytical approach. This study provides an underpinning framework for the significant role of economic theory and existing literature regarding the impact of social media on the dynamic economy. The theoretical

framework's base is economic theory and research on how social media use and platforms affect economic dynamics. We suggest that greater use of social media encourages economic activity by improving customer engagement and information transmission, promoting economic growth. Thus, dependent GDP and independent (social network users (SNU), WeChat users (WECHAT), Weibo users (WEIBO), Douyin users (DOUYIN), Bilibili users (BILIBILI) variables were identified. This shows how these variables are supposed to interact, impacting China's economic growth.

3.2 Data Collection

This study adopts a thorough approach to data collection to ensure the reliability and validity of the results. The information used for analysis was derived from organisations recognised for generating elaborate statistical reports on the Chinese economy and social media. Large datasets from each source were essential in analysing the relationship between economic growth and social media use.

National Bureau of Statistics of China (NBS): Among others, indicators provided by the NBS include GDP and total retail sales of consumer goods as the primary source of economic data for this research. As the Chinese government's official statistical department, NBS is recognised for its careful data collation and dedication to global statistical standards. Typically, NBS databases contain economic data that aid in analysing changes over time to show patterns in economic growth. This information was helpful for this study's economic analysis since it frequently depicts the latest economic trends. The variety of economic statistics from the NBS was crucial in investigating the link between social media use and economic outcomes.

China Internet Network Information Center (CNNIC): While CNNIC focuses on researching how the Internet has developed and is adopted within China, it frequently conducts research and surveys on the number of Internet and social media users. Their annual report, entitled the “Statistical Report on Internet Development in China,” contains comprehensive data on the structure of Internet users, their use, and patterns of digital communication. These reports carry several million data points in their extensive databases. They indicate the phenomenal growth of social media in China over the last few years. Combined datasets from CNNIC outline a comprehensive digital world and its corresponding economic growth. Their detailed information on this topic is relevant to examining the effect of social media on economic activity.

China Mobile Internet Database, Media Group Company Financial Report: This data source examines other social media used, such as WeChat, Weibo, Douyin, and Bilibili. The following reports on mobile Internet use. These financial reports present user numbers and performance details: daily active users, engagement rate, and earnings. With detailed data in these reports, researchers can thoroughly examine how each platform affects economic growth. Investigating how various social media channels define economic indicators provides insight into how the rise in social media use contributes to increased GDP. The level of detail in the data from this source is invaluable for drawing meaningful conclusions about the economic implications of social media in China.

This study derived specific data sources from this website to measure information dissemination, focusing on the active user time on social media in China; the longer individuals remain online, the more data they are likely to consume and disseminate. This

principle is foundational to the algorithms of social media applications. The summary of variables is presented in Table 3.1.

Table 3.1: Summary of the Variables Used

Variable	Symbol	Definition	Source
Gross Domestic Product (GDP)	GDP	The total monetary value of all goods and services produced in China, used as the dependent variable in the study.	National Bureau of Statistics of China
Social Network Users	SNU	The total number of social media users in China, representing the overall usage of social media platforms.	China Internet Network Information Center
WeChat Users	WECHAT	The number of active users on the WeChat platform used to measure the platform specific impact on economic growth	China Mobile Internet Database, Media Group Company Financial report
Weibo Users	WEIBO	The number of active users on the Weibo platform included as an individual social media platform	China Mobile Internet Database, Media Group Company Financial report
Douyin Users	DOUYIN	The number of active users on the Douyin platform, used to examine its specific impact on economic growth.	China Mobile Internet Database, Media Group Company Financial report
BiliBili Users	BILIBILI	The number of active users on the BiliBili platform, another platform specific social media variable	China Internet Network Information Center
Total Retail Sales of Consumer Goods	TRSCG	The total value of consumer goods sold in China, serving as a control variable to account for consumer demand	National Bureau of Statistics of China
Aggregate Financing to the Real Economy	AFRE	The increase in financing available in the current period, another control variable that impacts economic activity	National Bureau of Statistics of China

We systematically reviewed the sources above to extract relevant data from 2017 to 2023. This timeframe was selected to capture the rapid evolution of social media and its potential impacts on the economic landscape in China. Data was cross-verified among multiple sources to ensure accuracy and reliability. Discrepancies were resolved through consultation with primary sources or by adopting conservative estimates to maintain data integrity.

3.3 Data Description

This study utilised multiple variables, requiring clear terminology definitions to benefit readers and future research. This ensures a comprehensive understanding of the terms and their derivation. The study examined the relationship between social media and GDP in China's economy. Monthly data was obtained from January, 2017 to December, 2023. The variables employed were SNU in China, individual social media platforms (WeChat, WEIBO, DOUYIN, BILIBILI), GDP, TRSCG current value (Yuan), and AFRE in the current period (Yuan).

The variables were converted into their logarithmic form because some had enormous values. In contrast, some had smaller values; the conversion could reduce the vast value gap between the estimated variables. Furthermore, transforming the variables into logarithmic form ensures that the estimated model is normally distributed.

3.3.1 Gross Domestic Product

GDP is a key economic indicator that calculates the total value of all completed goods and services produced within a country over a certain time period. It provides an in-depth analysis of economic activity, representing an economy's size, health, and growth direction. Lawmakers, economists, and investors use GDP to evaluate economic performance and devise growth strategies. Domestic consumption, investment levels, government expenditures, and net exports affect GDP. GDP is also impacted by larger socioeconomic and technological trends, such as demographic shifts and technological discoveries.

Using GDP as the dependent variable to explore the correlation between social media and economic growth in China is a unique aspect of this study. The explosive growth of social media platforms has tremendously impacted how people and organisations

communicate, share information, and engage in economic activities. Technological improvements (e.g., better access to the Internet and mobile platforms) are strongly associated with GDP development (Aker & Mbiti, 2010).

This study investigated the economic effects of social media engagement on China's economic growth. By analysing the influence of social media on behavioural patterns and operational processes, this study illustrates how conventional economic measures are transformed based on digital engagement. Understanding this connection is crucial, given the deep integration of social media into Chinese daily life and economic activity. Finally, by investigating the relationship between GDP and social media addiction using time series analysis and econometrics methods, this study provides policymakers, corporations, and academics with insights into the importance of adopting digital transformation in determining economic growth. This illustrates how digital platforms can permeate and redefine facts on the grounds of economics.

3.3.2 Social Network Users (SNU)

In China, the number is referred who regularly use different social media platforms, as SNU. It illustrates the level to which social media usage affect communication and everyday life. The ever-growing effects of digital engagement in contemporary society indicate that this statistic is a leading indicator for social media penetration across the population. As a key independent variable in this study, SNU effectively determines how social media may affect organisational performance. The proliferation of social media has entirely changed how people relate to, interact with, and communicate with organisations for knowledge acquisition.

Social media sites have revolutionised communication and marketing; they create connectedness and can accelerate information sharing. For instance, a literature narrative review suggests that the greater the use of social media, the greater the possibility of economic growth through innovation, e-commerce, and market reach (Khrais & Gabbori, 2023; Otarinia, 2024). In addition to facilitating communication between companies and customers, these platforms enable people to engage in the economy in new ways, such as sharing suggestions or purchasing online.

This study aimed to measure the GDP effect of China's significant social media user base while investigating the relationship between SNU and economic performance. We shed light on the broader effects of digital connectivity on conventional economic metrics by examining the connection between social media activity and economic indicators. This investigation is particularly relevant given China's quickly expanding digital environment and high rate of social media use. Policymakers, corporations, and scholars must all comprehend social media's significance as an economic engine as it continues to develop. To better understand the connection between digital involvement and economic performance, this study examined how SNU affect economic growth. We also show how social media may catalyse economic progress in the digital era. Regarding China's dynamic economy, this research aims to emphasise the significance of using social media to promote economic growth possibilities and increase productivity.

3.3.3 WeChat Users

WeChat is one of China's largest and most influential social media platforms, serving as a multifaceted tool that combines messaging, social networking, e-commerce, and mobile payment functionalities within a single application. The number of active WeChat users is a

critical metric that reflects the platform's extensive reach and its integral role in facilitating digital engagement across various aspects of society. This widespread adoption underscores WeChat's significance in driving social interaction and economic activity. WeChat is a platform that has fundamentally shaped how businesses and individuals connect, communicate, and conduct transactions. It exhibits unique features that allow users to do more than just chat and share content; they can easily make purchases and financial transactions. Combining social media with e-commerce and payment services in one ecosystem enhances the user experience and increases economic participation. Furthermore, Giagnoli (2020) highlights that WeChat's capabilities have enabled small businesses to reach a broader audience, facilitating easier customer interactions and transactions.

This study adopted WeChat users as an independent variable. Separate behaviours and engagement patterns by WeChat users help determine the platform's contributions toward GDP growth. This study analysed the usage dynamics in quantifying how this platform shapes economic performance regarding changes in consumer expenditure and business operations. The seamless functioning of social networking with economic activities through WeChat proves it is one of the most important facilitators of economic growth. Given the ever-evolving Chinese digital ecosystem, discussing WeChat's implications for its user base is increasingly relevant. This study focuses on the relationship between WeChat user engagement and major economic indicators, contributing to the broader understanding of social media's role in shaping economic outcomes. The research presents WeChat's multi-dimensional role of connecting and facilitating economic transactions to portray the platform's potential as a catalyst for growth in China's fast-digitising economy. This will be helpful to policymakers and businesses interested in using digital platforms to advance economic development and innovation.

3.3.4 Weibo Users

Weibo is often described as the Chinese version of Twitter. It is a dynamic microblogging platform for users to publish and share short messages, multimedia content, and opinions in real time. The clearest metric of Weibo's influence is potentially the number of active users, indicating its role in influencing public discourse, trends, and information dissemination among a vast audience. Weibo has become a major social media platform and one of the important spaces where individuals and organisations can participate in dialogue, share news, and express views. Strong public engagement is enabled by the features of Weibo, which have become fundamentally important in affecting consumer behaviour and shaping brand engagement. This provides businesses with an excellent medium to promote themselves. It also helps them reach potential customers through focused campaigns and collaboration with influencers. Chen (2017) argued that activities and conversations on Weibo can significantly affect consumer perception and buying decisions. Its ease of creating viral trends and holding live conversations has transformed how brands reach customers in terms of visibility and sales.

We adopted Weibo users as an independent variable to examine the relationship between public interaction on social media platforms and economic performance. This study used dynamic data regarding Weibo users to analyse their interactions and conversations on the site and how these contribute to GDP growth through increased consumer activity. With its potential influence on public opinion and its ability to lead market trends, Weibo functions as a catalyst for economic development. Hence, in the changing landscape of social media, it is important to understand the implications of Weibo's user base to determine its broader economic implications. This aligns with the research to derive a linkage between Weibo user activities and major economic indicators, placing social media at the forefront of driving

consumer engagement and economic growth. Showcasing the role of Weibo as a water cooler for public discourse and marketing, the study depicts how social media can drive economic empowerment with immense force in China. These findings provide useful lessons for businesses and policymakers regarding the potential of digital platforms to spur economic activity and foster innovation in an increasingly connected world.

3.3.5 Douyin Users

Douyin, known internationally as TikTok, is one of China's leading short-form video platforms, capturing millions of users' attention with its dynamic and engaging content. This app is used to create and share short videos, revolutionising how people interact with media and each other. The number of Douyin users is among the key indicators regarding how the platform impacts content creation, consumer behaviour, and market trends in the Chinese economy. Douyin has fostered creativity and self-expression in users by emphasising user-generated content; it has opened new paths for digital advertising and marketing. Brands now use Douyin to reach younger audiences, leveraging the app's algorithm for target audiences via tailored ads. In this format, viral trends popularise products and services within a very short time frame, leading to rapid changes in consumer behaviour. Chen and Yang (2023) indicate that Douyin plays a significant role in shaping purchasing decisions and driving e-commerce growth, as users are often inspired by the content they view on this platform.

We added Douyin users as an independent variable to analyse its correlation with economic performance. This study examined the effect of Douyin on consumer activity to understand the contribution of social engagement dynamics to GDP growth in China. The rapid growth of Douyin as a potent marketing tool illustrates its power in economic activities; it is increasingly used by brands to reach consumers with creative force. The

ramifications of Douyin's host of users extend beyond entertainment into larger economic and consumption trends, if the digital landscape continues to take shape. This explains how Douyin can support economic development stimulated by users' activity, outlining how social media transforms current economic dynamics. Thus, this study indicates Douyin's role in improving consumer engagement; further economic metrics can be evaluated to outline the relevance of short-form video content as a driver of growth in the digital era. This could hold significant implications for marketers, businesses, and policymakers in capturing the economic development elicited through social media within a continuously shifting marketplace.

3.3.6 Bilibili Users

Bilibili, often called "B Site," is a vibrant video-sharing platform that has carved out a unique space in China's digital landscape, particularly among younger audiences, including Generation Z and Millennials. Known for its rich array of user-generated content, Bilibili features videos on diverse topics such as gaming, animation, pop culture, music, and entertainment. It creates a strong community-driven environment in which users are actively creating and engaging with content, making Bilibili an integral platform for understanding the relationship between media consumption and economic behaviour. Unlike traditional video-sharing sites, live commenting and bullet chatting are interactive features that develop user engagement and build a participatory culture. Subsequently, engagement fuels viewership and drives consumers' economic interest and spending in related areas, such as entertainment and virtual goods. As advertising increasingly shifts online, Bilibili is a vital case study of how social media influences economic growth. More brands recognise the value of Bilibili's unique users, targeting effective advertising strategies with Bilibili's distinctive content and user demographics.

Bilibili has also emerged as a hub of influencer marketing; wherein fashionable content creators collaborate with brands to reach people in innovative ways. This illustrates that platforms like Bilibili, enhance economic engagements by providing greater exposure and interaction between brands and buyers. Gao (2021) shows that advertising through digital media significantly boosts consumer spending, especially in the entertainment industry, where the impact is particularly pronounced.

Based on the above, this study considers Bilibili users as an independent variable to examine the relationship between social media engagement and economic performance in China. This research underscores the economic significance of the platforms by specifying how the unique content and user dynamics offered by Bilibili contribute to GDP growth. The findings highlight the broader implications of user engagement in media consumption and are of considerable value to marketers, content providers, and policymakers. With the continuous development and embeddedness of digital platforms into everyday life, Bilibili influences consumer behaviour and economics. This study extends beyond quantifying the effect Bilibili has on economic growth to highlight how user-generated content can drive market dynamics in the digital age. This study sought to determine the influence of Bilibili on consumer behaviour and its broader economic implications, underlining how important social media platforms have become to China's emerging economy.

3.4 Empirical Model

This study adopted the ARDL model to investigate the impact of social media on China's economic growth concerning individual social media sites and an aggregate measure of SNU. It estimates separate ARDL models for each independent variable: SNU, WeChat, Weibo, Douyin, and Bilibili to capture short- and long-run relationships of social media

activity with economic performance proxies by China's GDP. The models capture broader economic activities through the TRSCG and AFRE variables.

Thus, the GDP function for the social media users, TRSCG and AFRE is presented in equation (3.1),

$$SMU = f(SNU, WECHAT, WEIBO, DOUYIN, BILIBILI) \quad (3.1)$$

$$LGDP = f(LSMU, LTRSCG, LAFRE) \quad (3.2)$$

Where, SNU, WECHAT, WEIBO, DOUYIN, BILIBILI are the number of user of these social media platforms. The general form of the ARDL model for all independent variables is specified as follows.

$$LGDP_t = \beta_0 + \beta_1 LSMU_t + \beta_2 LTRSCG_t + \beta_3 LARFE_t + \epsilon_t \quad (3.3)$$

Where,

- L indicates the natural logarithm of the variable,
- SMU_t indicates SMU values of independent variables, the number of Social Media Users in China and individual platforms WECHAT, WEIBO, DOUYIN, BILIBILI monthly active users,
- $TRSCG_t$ indicates values of the control variable total retail sales of consumer goods,
- $ARFE_t$ indicates values of the control variable aggregate financing to the real economy in the current period,
- ϵ_t indicates the error term capturing unexplained variance.

The ARDL model calculates coefficients for each independent variable, representing short- and long-term impacts on GDP. We used monthly data from 2017 to 2023 to account for temporal variations in social media use and economic activity.

The ARDL methodology has been widely applied to examine the impact of digital technologies and social media on economic growth across various contexts. Studies demonstrate positive relationships between digital connectivity and economic performance in Indonesia (Braun, 2022), Central Asian and European countries (Kurbanov et al., 2023), and Peru (Lima et al., 2021). These studies found that increased Internet use and phone subscriptions significantly contribute to GDP growth. However, social media can also have negative effects. For instance, in Iran, negative propaganda on social networks led to exchange rate fluctuations and decreased economic growth (Ebrahimi et al., 2019). The ARDL model's ability to capture short- and long-term relationships makes it particularly useful for analysing complex interactions between digital technologies and economic growth. These studies collectively highlight the importance of digital inclusion and infrastructural development in driving economic progress while cautioning against the potential negative impacts of social media on economic stability.

This study ensured that the distinct impacts of each social media platform on economic performance were recorded separately using distinct ARDL models for each platform. This enabled a more nuanced understanding of how various forms of social media use contribute to China's economic trajectory. Furthermore, by considering more extensive economic implications, control variables like TRSCG and AFRE ensured that the associations identified were robust and unaffected by extraneous variables.

Table 3.2: Empirical Studies

Study (Year)	Country	Methodology	Variables	Key Findings	Relevance to Current Study
Bajpai Ghosh (2020)	India	Multiple Linear Regression (MLR)	Internet penetration, social media use, GDP	Positive impact of social media on economic development, particularly in increasing consumer engagement.	Highlights the effectiveness of MLR in quantifying social media's role in economic growth.
Li & Zhang (2021)	China	Multiple Linear Regression (MLR)	Digital marketing, social media platforms, retail economy	Digital marketing via social media significantly impacts the retail economy in China.	Shows how social media platforms directly affect consumption patterns, crucial for studying their impact on GDP.
Chen & Li (2019)	China	Time Series Analysis, Granger Causality	Social financing, investment, GDP	Social financing influences economic growth, showing the role of credit availability in supporting expansion.	Reinforces the relevance of controlling for TSCG in studying GDP dynamics.
Wu & Zhang (2020)	China	Time Series Analysis, Regression	Retail sales, consumer spending, GDP	Retail sales act as a significant predictor of GDP, highlighting the consumption-led growth model in China.	Validates the inclusion of TRSCG as a control variable in models of GDP growth.
Kaplan & Haenlein, (2010)	Global	Literature Review	Social media platforms, economic development	Social media reshapes marketing, commerce, and overall business strategies, influencing global economic trends.	Provides a conceptual framework for understanding how social media drives economic growth worldwide.
Kalyanam & McIntyre, (2022)	United States	Regression Analysis	Social media advertising, online sales, GDP	Social media advertising significantly boosts online sales, contributing to broader economic performance.	Supports the investigation of social media's effect on consumption and its link to overall economic growth.
Zhang, Li, & Wang, (2021)	China	Cointegration Analysis, Error Correction	Social media activity, e-commerce, GDP	Cointegration between social media usage and economic growth, with a long-term equilibrium relationship.	Highlights the need for cointegration analysis in studies on long-term social media impact on GDP.

After model estimation, various diagnostic tests were performed to validate accuracy and reliability. Multicollinearity was tested using variance inflation factor (VIF), ensuring that the independent variables did not exhibit high correlation, which could distort the model's coefficients. We used the Durbin-Watson statistic to detect autocorrelation in the residuals, ensuring that the error terms were independently and identically distributed. Furthermore, we tested heteroscedasticity using the Breusch-Pagan test, as the presence of heteroscedasticity could invalidate the statistical significance of the coefficients.

The expected results indicate the significance of various social media platforms in driving economic growth. For instance, the coefficient for SNU was anticipated to be positive, reflecting that an increase in social network users likely spurs GDP growth through enhanced connectivity and digital transactions. Similarly, the impact of platforms like WeChat and Douyin was expected to be substantial, given their widespread use for communication and e-commerce. The control variables TRSCG and AFRE likely exhibit a strong positive association with GDP, capturing broader consumption trends and financing activity.

Using ARDL, this study contributes to the literature by quantifying the role of social media platforms in economic growth, particularly in a rapidly digitising economy like China. By incorporating aggregate social network use and individual platform data, the study provides a nuanced perspective of the multifaceted relationship between digital platforms and economic performance.

3.5 Methodology

This sub-section outlines the study's methods, beginning with unit root tests to determine the order of integration among variables. The ARDL bounds testing approach was then applied to examine the existence of a long-run relationship. A Wald test was used to assess short-run Granger causality between variables. We used a Wald test to determine the Granger causality between variables in. Furthermore, diagnostic tests were conducted to ensure the estimated model was free from econometric issues.

3.5.1 Unit Root Test

To determine if the time series data for each variable was stationary (its statistical features such as mean and variance do not vary over time) or non-stationary, unit root tests were employed. These included the Augmented Dickey–Fuller (ADF) test, the Phillips–Perron test, and the Kwiatkowski–Philips–Shin test. For time series analysis to produce reliable statistical conclusions, these tests are essential. A stationary time series has statistical properties that remain constant over time.

In this study, we tested whether GDP, social media use metrics, and other relevant variables were stationary or not. Stationary time series are more amenable to accurate forecasting techniques, as their past behaviour can be used to predict future trends. Several statistical techniques, such as regression analysis and correlation analysis, assume stationarity. Non-stationary data can result in bias and inconsistent estimates. By transforming non-stationary time series into stationary ones, we can interpret the relationships between variables more accurately and draw meaningful conclusions. If a time series is non-stationary, several techniques can be employed to induce stationarity, such as differencing, log transformation, and seasonal adjustment. Addressing the

stationarity issue improves the reliability and accuracy of our analysis, leading to more robust conclusions regarding the relationship between social media and economic growth.

3.5.1.1 Augmented Dickey-Fuller (ADF) Test

For accurate time series modelling, particularly when examining economic data across time, the stationarity of a time series is measured statistically using the ADF test (Mushtaq, 2011). The statistical characteristics of a time series, e.g., mean and variance, must remain constant across time to prevent erroneous regression analysis results. This is known as stationarity (Baumohl & Lyocsa, 2009). The ADF test increases robustness for economic datasets that may exhibit autocorrelation by extending the classic Dickey–Fuller test to include the variable’s lagged changes to account for higher-order serial correlation. The equation for the ADF test is as follows:

$$\Delta y_t = \alpha + \beta_t + \gamma y_{t-1} + \sum_{i=1}^p \delta_i \Delta y_{t-i} + \epsilon_t \quad (3.4)$$

Where,

- Δy_t indicates the first difference of the variable,
- t indicates the time trend,
- p indicates the number of lags chosen for the test.
- α indicates a constant,
- ϵ_t indicates the error term,
- γ the coefficient of the lagged level of the variable.

The test equation (Equation 3.4) incorporates a constant term, a time trend, and lagged difference terms to correct for autocorrelation. Here, the parameter γ on the lagged level variable y_{t-1} is key. If this coefficient is significantly less than zero, the test rejects the

null hypothesis of a unit root (non-stationarity), indicating that the time series is stationary. Ramenah et al. (2018) show that by adjusting the number of lags, the ADF test minimises the risk of autocorrelation in the error term, denoted as ϵ_t . This ensures a more accurate test outcome.

Stationarity testing with ADF is a common first step in econometric investigations, particularly when using autoregressive models like ARDL. This is because non-stationary variables might produce false results in regression-based research (Lien, 2018). The ADF test's incorporation of time trends and lagged structure is particularly useful for examining variables with deterministic and stochastic trends.

3.5.1.2 Phillips-Perron (PP) test

The ADF and Phillips–Perron (PP) tests use a similar base equation to test for a unit root. Their main difference is the PP tests' alternative approach to addressing serial correlation and heteroskedasticity of the error terms. The PP test equation is as follows:

$$\Delta y_t = \beta_0 + \beta_1 t + \alpha y_{t-1} + \epsilon_t \quad (3.5)$$

Where,

- Δy_t indicates the first difference of the variable at time t ,
- t indicates the time trend,
- β_0 indicates a constant,
- β_1 indicates the coefficient of the time trend, capturing any deterministic trend in the series,
- α indicates the coefficient on the lagged level y_{t-1} , used to test for stationarity,

- ϵ_t indicates the error term, which is assumed to be independently and identically distributed.

The PP test uses a nonparametric method of addressing serial correlation and heteroskedasticity in error terms without correlation structure estimation (Arkaah, 2000). This method has been applied in various econometric analyses, including unit root testing in GNP data Arkaah (2000) and panel unit root tests. Though the PP test possesses robustness to heteroskedasticity, other approaches have been studied more recently. Bunzel and Vogelsang (2005) proposed a test statistic that eliminates the need to estimate the correlation structure, potentially reducing size distortions in cointegration models. Kejriwal et al. (2022) consider two-step methods that employ residuals to proxy for the heteroskedastic distributions against a joint estimation approach to testing for structural change. They documented that joint estimation dampens the effects of variance changes on the size of the test. At the same time, its power properties are generally better than those from the two-step procedures in static and dynamic models.

The PP test is suitable for evaluating economic indicators that change over time since it can also be used to analyse long-term economic trends and trends in financial series where shocks may have a long-lasting effect (Stiglitz et al., 2009). This test has become one of the most widely used in economics and finance research to conduct strong stationarity assessments for various economic contexts, further consolidating its reputation as a reliable test when conventional assumptions are challenging to obtain.

3.5.2 ARDL Model

The ARDL model is robust and is used widely to determine the short- and long-run relationships of variables, especially in examining time series data integrated at different

levels, e.g., $I(0)$ and $I(1)$. It allows modelling relationships that capture the immediate effects of fluctuations in explanatory variables and the slow adjustment of equilibrium over time. Therefore, the ARDL model is well suited to this study because it allowed us to analyse how social media use is captured by platform-specific user metrics and economic control variables that jointly influence GDP in China over differing time horizons.

Long-run relationships, as described in the ARDL model, refer to a situation where variables converge slowly towards a stable equilibrium. This is tested through long-run coefficients, indicating how independent variables affect the dependent variable in the long run when the shock that would alternatively cause transitory fluctuations dissolves. Long-run analysis provides a better understanding of the long-term interaction between the use of social media and economic growth by highlighting the underlying linkages between the two variables. Notably, long-term relationships highlight the lasting impact of digital interactions on economic performance, emphasising the development of strategies via social media to promote economic growth.

The short-term dynamics of the ARDL framework include the short-run effects produced in the dependent variable through changes in independent variables. These effects are represented by the short-run coefficients, showing the pace at which the system responds to shocks. In light of such coefficients, we can estimate the speed of adjustment and short-term responsiveness of some economic statistics, e.g., GDP, to the changes in social media use and other control variables. Policymakers must understand short-run dynamics as they reveal how immediate changes in consumer behaviour or economic status are likely to affect them.

This study took GDP as the dependent variable. Our main ARDL model examined the combined and individual impacts of China's main social media platforms on GDP. The general ARDL model structure is as follows:

$$\begin{aligned}
 \Delta LGDP_t = & \beta_{1,0} + \sum_{i=1}^{p1} \delta_{1,1i} \Delta LGDP_{t-i} + \sum_{i=0}^{q1} \delta_{1,2i} \Delta LSMU_{t-i} \\
 & + \sum_{i=0}^{r1} \delta_{1,3i} \Delta LTRSCG_{t-i} + \sum_{i=0}^{s1} \delta_{1,4i} \Delta LAFRE_{t-i} \\
 & + \beta_{1,1} LGDP_{t-1} + \beta_{1,2} LSMU_{t-1} + \beta_{1,3} LTRSCG_{t-1} \\
 & + \beta_{1,4} LAFRE_{t-1} + \mu_{1t}
 \end{aligned} \tag{3.6}$$

Where,

- *LGDP* indicates logarithm of GDP,
- *LSMU* indicates logarithm of social media usage it includes LSNU, LWECHAT, LWEIBO, LDOUYIN, LBILIBILI,
- *LWECHAT* indicates logarithms of active user on WeChat, Weibo, Douyin,
LWEIBO
LDOUYIN and BiliBili, respectively,
LBILIBILI
- *LTRSCG* indicates logarithm of Aggregate Financing to the Real Economy,
- *LAFRE* indicates logarithm of the Scale of Social Financing,
- *p, q, r* indicates the number of lags for each independent variable,
- λ indicates the error correction term, capturing the adjustment towards the long-term equilibrium,

- $\beta_1^i, \beta_2^j, \beta_3^k$ indicates the coefficients for lagged values of the variables capture the short-term dynamics between the variables,
- ϵ_t indicates error term.

Each platform's distinct impact on economic growth was isolated using independent ARDL models to further examine the effects of each platform. We investigated how each platform affects GDP variations when examined separately based on these models. The following indicates how the platform-specific ARDL models were constructed:

$$\begin{aligned}
 \Delta LGDP_t = & \beta_{1,0} + \sum_{i=1}^{p1} \delta_{1,1i} \Delta LGDP_{t-i} + \sum_{i=0}^{q1} \delta_{1,2i} \Delta LSMU_{t-i} \\
 & + \sum_{i=0}^{r1} \delta_{1,3i} \Delta LTRSCG_{t-i} + \sum_{i=0}^{s1} \delta_{1,4i} \Delta LAFRE_{t-i} \\
 & + \beta_{1,1} LGDP_{t-1} + \beta_{1,2} LSMU_{t-1} \\
 & + \beta_{1,3} LTRSCG_{t-1} + \beta_{1,4} LAFRE_{t-1} + \mu_{1t}
 \end{aligned} \tag{3.7}$$

$$\begin{aligned}
 \Delta LSMU_t = & \beta_{2,0} + \sum_{i=0}^{p2} \delta_{2,1i} \Delta LGDP_{t-i} + \sum_{i=1}^{q2} \delta_{2,2i} \Delta LSMU_{t-i} \\
 & + \sum_{i=0}^{r2} \delta_{2,3i} \Delta LTRSCG_{t-i} + \sum_{i=0}^{s2} \delta_{2,4i} \Delta LAFRE_{t-i} \\
 & + \beta_{2,1} LGDP_{t-1} + \beta_{2,2} LSMU_{t-1} \\
 & + \beta_{2,3} LTRSCG_{t-1} + \beta_{2,4} LAFRE_{t-1} + \mu_{2t}
 \end{aligned} \tag{3.8}$$

$$\begin{aligned}
\Delta LTRSCG_t = & \beta_{3,0} + \sum_{i=0}^{p3} \delta_{3,1i} \Delta LGDP_{t-i} + \sum_{i=0}^{q3} \delta_{3,2i} \Delta LSMU_{t-i} \\
& + \sum_{i=1}^{r3} \delta_{3,3i} \Delta LTRSCG_{t-i} + \sum_{i=0}^{s3} \delta_{3,4i} \Delta LAFRE_{t-i} \\
& + \beta_{3,1} LGDP_{t-1} + \beta_{3,2} LSMU_{t-1} \\
& + \beta_{3,3} LTRSCG_{t-1} + \beta_{3,4} LAFRE_{t-1} + \mu_{3t}
\end{aligned} \tag{3.9}$$

$$\begin{aligned}
\Delta LAFRE_t = & \beta_{4,0} + \sum_{i=0}^{p4} \delta_{4,1i} \Delta LGDP_{t-i} + \sum_{i=0}^{q4} \delta_{4,2i} \Delta LSMU_{t-i} \\
& + \sum_{i=0}^{r4} \delta_{4,3i} \Delta LTRSCG_{t-i} + \sum_{i=1}^{s4} \delta_{4,4i} \Delta LAFRE_{t-i} \\
& + \beta_{4,1} LGDP_{t-1} + \beta_{4,2} LSMU_{t-1} \\
& + \beta_{4,3} LTRSCG_{t-1} + \beta_{4,4} LAFRE_{t-1} + \mu_{4t}
\end{aligned} \tag{3.10}$$

These models break down the impact of each platform on GDP, revealing its unique significance beyond the total user-based aggregate social media indicator. Consistency was ensured by using LTRSCG and LAFRE as the control variables. This provided a direct comparison between the platform-specific models and offered a thorough understanding of the economic impact of each platform. This methodology allowed us to comprehensively evaluate how differences in involvement across all platforms impact China's economic output, identifying immediate and long-term impacts associated with specific social media platforms.

After confirming the existence of cointegration between the variables, the next stage is to estimate the long-run model. In selecting the criterion for the ARDL model, the

Akaike Information Criterion (AIC) estimators have equivalent small sample performance (Pesaran & Shin, 1995). AIC is preferable for predicting model where it does not assume the nature of the model lies in the model space where the selection of Schwarz Bayesian Criterion (SC) does. Therefore, the model selection is based on AIC, and the general long run model is displayed as:

$$\begin{aligned} \Delta LGDP_t = & \beta_{1,0} + \sum_{i=1}^p \delta_{1,i} \Delta LGDP_{t-i} + \sum_{i=0}^q \delta_{1,i} \Delta LSMU_{t-i} \\ & + \sum_{i=0}^r \delta_{1,i} \Delta LTRSCG_{t-i} + \sum_{i=0}^s \delta_{1,i} \Delta LAFRE_{t-i} + \mu_t \end{aligned} \quad (3.11)$$

When there is a presence of a long-run relationship between the variable, the error correction representation should occur (Shahbaz, 2009). The short-run dynamic can be estimated through the general error correction model specified as below:

$$\begin{aligned} \Delta LGDP_t = & \beta_{1,0} + \sum_{i=1}^p \delta_{1,i} \Delta LGDP_{t-i} + \sum_{i=0}^q \delta_{1,i} \Delta LSMU_{t-i} \\ & + \sum_{i=0}^r \delta_{1,i} \Delta LTRSCG_{t-i} + \sum_{i=0}^s \delta_{1,i} \Delta LAFRE_{t-i} \\ & + \theta_1 ECT_{t-1} + \mu_t \end{aligned} \quad (3.12)$$

where ECT_{t-1} is the error correction term which can be defined as:

$$\begin{aligned}
ECT_{t-1} = LGDP_t - \beta_{1,0} - \sum_{i=1}^p \delta_{1,i} \Delta LGDP_{t-i} - \sum_{i=0}^q \delta_{1,i} \Delta LSMU_{t-i} \\
- \sum_{i=0}^r \delta_{1,i} \Delta LTRSCG_{t-i} - \sum_{i=0}^s \delta_{1,i} \Delta LAFRE_{t-i}
\end{aligned} \tag{3.13}$$

3.5.3 Diagnostic Tests

To ensure the reliability of the ARDL model, rigorous diagnostic tests are essential. Once the ARDL model is estimated, diagnostic tests must be conducted to establish its validity and robustness. This included tests regarding the assumptions that underlie the ARDL framework: independence of residuals, normality of residuals, and homoscedasticity. The pattern of residuals indicates autocorrelation and constancy in variance, which could be symptoms of specification errors or omitted variables. The diagnostic tests also established that the long-run coefficients are stable, a prerequisite for reliable forecasting. Finally, conducting these tests strengthened the validity of the conclusions as sound inferences.

Autocorrelation indicates that the residuals are dependent on one another; heteroscedasticity refers to the variance that does not remain constant, factors that may reduce efficiency in model estimates. Once these problems are identified, one can try to eliminate them through certain diagnostic tests to make the model results appropriate and meaningful. The other important diagnostic in ARDL concerns the stability of long-run coefficients. Tests for stability, such as CUSUM (Cumulative Sum of Squares) and CUSUMSQ (CUSUM of Square) test, illustrate how estimations of coefficients have changed over time. This is a prerequisite for generating reliable forecasting and long-term policy implications from the model. No result without stability can be generalised or used for future model predictions.

Such diagnostic tests strengthen the validity of the results obtained from the analysis. In other words, reasonable inferences depend on how good the underlying model is. By thoroughly validating the ARDL model against these tests, robust findings ensure the results have statistically significant and practical value, providing a sound basis for decision-making and further research.

3.5.3.1 Jarque-Bera Test for Normality

The Jarque–Bera test is a standard statistical test determining a regression model’s normality. In this regard, it measures the level of skewness and excess kurtosis of the residuals obtained using an ARDL model. Skewness is best described as the asymmetry of a distribution, while kurtosis measures the “tailedness” of a distribution compared to a normal distribution. The null and alternative hypotheses for the Jarque–Bera test are defined as follows:

H₀: *The residuals are normally distributed.*

H₁: *The residuals are not normally distributed.*

We computed the test statistic based on skewness and kurtosis of the residuals. The Jarque–Bera statistic is a distributed Chi-square. Its p-value is commonly used to determine whether the residuals deviate significantly from normality, with a low p-value indicating rejection of the null hypothesis of normality. Normally, if the p-value is greater than 0.05, the null hypothesis that residuals are normally distributed fails to be rejected. This means that a p-value ≤ 0.05 would imply that residuals are significantly deviated from normality and could affect the robustness of estimates and inferences made using the model. In this case, non-normal residuals might indicate that a model must be adjusted. The adjustments could be made through variable transformations or other modelling approaches.

The Jarque–Bera test is an essential diagnostic tool in evaluating the ARDL model. It ensures that the underlying assumptions of normality in the residuals are met, enhancing the validity of the model’s conclusions.

3.5.3.2 Breusch-Godfrey Serial Correlation LM Test

The Breusch–Godfrey (BG) serial correlation LM test is an essential diagnostic test conducted to establish whether residuals from a regression model are autocorrelated, especially when working with time series data. As noted by Seddighi (2013), autocorrelation occurs when the error terms from one time period are correlated with those from another. This violation of the assumption of independence among error terms can lead to biased estimates and invalid statistical inferences when employing ordinary least squares (OLS) regression.

The BG test is specifically designed to assess the existence of autocorrelation of any order in an estimated model. The null and alternative hypotheses for the BG test are formulated as follows:

H₀: *There is no autocorrelation of any order.*

H₁: *There is autocorrelation of any order.*

The given formula for the computed,

$$BG \text{ test statistic} = (n - p)R^2 \quad (3.15)$$

Where n represents the number of observations. p denotes the number of estimated parameters in the model. R^2 is the coefficient of determination from the auxiliary regression, including the lagged residuals as predictors.

The test result significance is interpreted by comparing the obtained BG test statistic with critical values of the Chi-square distribution corresponding to the significance levels of 1%, 5%, and 10%. If the calculated statistic exceeds the critical Chi-square value, it means the null hypothesis is rejected. In other words, the model residuals are autocorrelated. If the test statistic is lower than the critical value, then the model does not suffer from an autocorrelation issue.

This is crucial because autocorrelation can create inefficiencies in the estimators and distort the statistical significance of the regression coefficients. Once autocorrelation is determined, researchers must reassess the model specifications. They may consider the inclusion of lagged dependent and/or independent variables or estimation using Generalized Least Squares, among other corrective measures against the effects of autocorrelation. Thus, the Breusch–Godfrey test is an essential diagnostic tool to validate the strength and reliability of a regression model.

3.5.3.3 Heteroskedasticity Test: ARCH

The ARCH is a statistical methodology used to test for heteroskedasticity. This is the condition where the model residuals, based on time series data, have a nonconstant variance. If the residual variance changes across the period, heteroskedasticity exists. This will often yield inefficient estimators in the related regression model and invalid hypothesis tests. Heteroskedasticity in models, where variance is assumed to be constant over time, may indicate that residuals have moments at times highly volatile while at other times less volatile, resulting in biased forecasts and statistical inferences.

The ARCH test is applicable when one suspects that the error variances could be driven by volatility or events from previous periods. It tests whether the residuals of a time

series model have conditional heteroskedasticity or time-varying volatility because current error variances are conditional on past squared errors.

The hypotheses for the ARCH test are as follows:

H₀: *Homoskedasticity (constant variance of residuals).*

H₁: *Heteroskedasticity (variance of residuals is not constant).*

To conduct the ARCH test, the original model's residuals are regressed on their lagged values typically squared residuals to determine whether the variances are autocorrelated. The test statistic is compared against a Chi-square distribution based on the degrees of freedom. If the p-value is less than a critical chosen significance level, usually 0.05, the null hypothesis of homoskedasticity is rejected in favour of heteroskedasticity in the residuals. In such cases, this would indicate that some periods may have more volatility in the residuals than others.

ARCH effects are common in financial and economic time series data. Periods of stability may be followed by periods of volatility, which occur with the series of stock returns or interest rates. With heteroskedasticity, one could consider using ARCH models or their generalisation, namely GARCH models. These models allow for time-varying variance by making the current error variance depend on past squared errors, leading to an improved model specification of the volatility dynamics.

3.5.3.4 Ramsey RESET Test

The Ramsey Regression Equation Specification Error Test (RESET) is a diagnostic test for specification errors in the regression equation. It examines the presence of omitted variables or incorrect functional forms and nonlinear relationships present in a model. This specification problem may be because the estimates are biased or inconsistent, making the

model unreliable for inferences or predictions. The RESET test determines whether the model is too simple or poorly specified. Specially, it helps determine whether the model is missing important variables or not capturing key aspects of the relationship between the variables in the data. In other words, it tests if the model adequately reflects the underlying data structure.

The hypotheses for the Ramsey RESET test are as follows:

H₀: The model is correctly specified.

H₁: The model is misspecified.

The testing process is an augmented test of the original regression model by adding additional terms, e.g., higher-order, powers-squared, cubed, or polynomial transformations of the fitted values from the original model. Such terms capture nonlinear relationships or interactions that may have been omitted from the original model. If the additional terms are significant (i.e., the p-value is low), the null hypothesis of no misspecification is rejected. This suggests that the original model may be misspecified, failing to capture all the underlying data structure. If, on the other hand, the p-value of the test is not low, then there is no evidence against the null hypothesis and the model probably is well specified.

The Ramsey RESET test is a practical tool in regression diagnostics, particularly when developing models based on complex or nonlinear data. It highlights the need for potential revisions in the model's functional form or the inclusion of additional explanatory variables.

3.5.3.5 Wald Test

The Wald test represents one of the most widely applied statistical tests in regression analysis. It pertains to the significance of one or more coefficients included in the model. It

tests whether model parameters significantly differ from a pre-specified value, typically zero, implying no effect. Therefore, the most specific application of the Wald test is to determine whether one or a group of predictors significantly contributes to the dependent variable, such as the GDP within an economic model. Therefore, a test can be conducted on single or several coefficients for joint significance testing.

The hypotheses for the Wald test are defined as follows:

H₀: The coefficients being tested are equal to zero (no effect).

H₁: The coefficients are not equal to zero (they have a significant effect).

$$W = \frac{(\hat{\theta} - \theta_0)'[Var(\hat{\theta})]^{-1}(\hat{\theta} - \theta_0)}{k} \quad (3.16)$$

Where,

- $\hat{\theta}$ indicates the estimated coefficient,
- θ_0 indicates the hypothesized value (often zero),
- K the number of restrictions.

The distribution of the Wald statistic is A Chi-square with a d.f. equal to the number of restrictions (K). The computed Wald statistic compared with the critical value from the Chi-square distribution at the selected significance level, $\alpha = 0.05$, decides whether the null hypothesis must be rejected. The null hypothesis is rejected from here, where the Wald statistic is greater than that of the critical value. Thus, the significant coefficients differ from the hypothesised value. That means these influencing independent variables highly affect the dependent variable, GDP. On the other hand, if the Wald statistic is lower than the critical value, a null hypothesis cannot be rejected, which would correspondingly mean that there is insufficient evidence to take the effect as significant.

The Wald test is particularly helpful in multiple regression analyses in which a researcher may want to test the significance of a particular predictor or the collective effect of several predictors. This would include dependent variables such as investment, education, and government spending to predict GDP. Using the Wald test, one should be able to test a hypothesis, such as whether investment and education relate to changes in GDP.

3.5.3.6 CUSUM Test

The CUSUM test tests changes in a regression model's parameters, emphasising the stability of model coefficients over time. It is an important test to determine the existence of structural breaks, i.e., significant changes within the relationship that binds the dependent and independent variables.

Returning to CUSUM testing, the basic idea of which is computing the running sum of the residuals of a regression estimate, these residuals are the difference between the actual and fitted values depicting the error of fit. The CUSUM statistic is computed as follows:

$$CUSUM_t = \sum_{i=1}^t \hat{e}_i \quad (3.17)$$

Where $\hat{e}_i$ denotes the residuals. A plot of the cumulative sum against time or against the index of the observations allows researchers to judge whether the CUSUM statistic stays within bounds. If it stays within boundaries, the model parameters are stable, and the null stability hypothesis is accepted. In contrast, in case the CUSUM plot cuts through the critical boundaries, this means that the model parameters might be unstable, and a structural break is possible.

Generally, the CUSUM test is an important tool in econometric testing; detecting such shifts helps researchers accommodate changes in modelling strategies and aids in arriving at more reliable conclusions regarding the impacts of independent variables upon a dependent variable.

3.5.3.7 CUSUM of Squares Test (CUSUMSQ)

The CUSUM of squares test is an extension of the basic CUSUM test. Instead of the mean of residuals, it measures stability in variance. Notably, when one considers heteroscedasticity, it is a condition where changes in the level of the independent variables may potentially scatter changes in the residuals.

The CUSUMSQ statistic is calculated using the squares of the residuals:

$$CUSUMSQ_t = \sum_{i=1}^t \hat{e}_i^2 \quad (3.18)$$

Similar to the CUSUM test, the CUSUMSQ statistic is plotted against time. This test determines whether residual variance remains constant along the time axis. A nonzero significant breakthrough or crossing of the pre-set critical values in the plot of the CUSUMSQ series illustrates that the residual variances have changed; hence, it signals heteroskedasticity or instability in the variance structure of the model.

One important condition of regression through the CUSUMSQ test is that the error variance should be constant. This way, the conclusion derived from the model will not be spurious. From what has been discussed, the implication is that the CUSUM and the CUSUMSQ tests are of great importance, both for increasing the power of econometric modelling and for full insight into variable dynamics over time.

3.6 Concluding Remarks

Based on the above, the dependent variable of the estimated model in this study is GDP. The independent variables are SNU in China and individual social media platforms (WECHAT, WEIBO, DOUYIN, BILIBILI). The study investigated the years 2017–2023 based on monthly data. Before the model was analysed, data were transformed into logarithms to improve normality. The stationarity of the data was examined, and the order of variable integration was ascertained using the unit root test, specifically the ADF test. We used an ARDL approach to determine the long- and short-term relationships between the variables after the unit root tests were completed; no variable was discovered integrated in the second order.

This study has detailed and highlighted the advantages of the ARDL procedure and the use of the conventional cointegration test. First, ARDL can analyse small sample size series because this method is less vulnerable to the length in the long-run estimation due to its competence in overcoming models with low power. Second, Pesaran et al. (2001) indicate that ARDL can be applied when the regressors are integrated at $I(0)$, $I(1)$ or the combination of both orders. Pesaran and Shin (1995) state that ARDL distinguishes between endogenous and exogenous variables while mitigating the problem of serial correlation and endogeneity. Diagnostic and stability tests were performed on the estimation model to ensure that it did not suffer from econometric problems. The normality test, functional form, serial correlation, heteroscedasticity, CUSUM, and CUSUMSQ were executed.

This study is methodologically sound, using the ARDL approach with rigorous diagnostic tests and careful data preprocessing. It exhibits a comprehensive framework to

analyse the dynamic relationship between social media and economic growth. The results have significant implications for policymakers regarding the potential of digital and social platforms in driving economic growth in the digital era.

CHAPTER 4

EMPIRICAL RESULTS AND DISCUSSION

4.0 Introduction

Chapter 4 presents this study's empirical findings, comprehensively analysing the results. Section 4.1 focuses on the unit root test results, which are crucial for assessing the stationarity of the data. Section 4.2 discusses the estimation results using ARDL, which reflect the overall impact of social networks on China's economic growth. This discussion underlines the effect of various platforms as a collective contribution, detailed below.

Sections 4.3 to 4.6 present the estimation results of ARDL for the four specific social media platforms of WeChat, Weibo, Douyin, and BiliBili regarding economic growth in China. The sections detail how each platform influences GDP, eliciting its specific role within the greater context of how social media influences the economy. Section 4.7 summarises the most significant findings by combining these results into a comprehensive view of the relationships examined in this study.

4.1 Unit Root Test Results

The unit root tests confirm stationarity, guiding lag selection and ARDL bounds testing for cointegration and integration levels. The following section addresses stationarity using two popular unit root tests: ADF and PP. These tests determine whether a time series is stationary or has a unit root. Notably, within the boundary of econometric modelling, a series is supposed to be stationary; a non-stationary series may result in spurious regression results. Thus, it must be differenced or pre-treated in other ways to ensure stationarity.

4.1.1 Augmented Dickey-Fuller (ADF) Unit Root Test Results

This principle was applied in testing the stationarity of the time series data. Therefore, the ADF test was performed to detect the unit root in a series. The null hypothesis of the ADF test considers that a unit root is present and non-stationarity exists; its rejection shows otherwise that the series is stationary. The ADF test was conducted under two specifications: one with an intercept and the other with both an intercept and a trend. In pursuit of stationarity in the data, the test was applied to the first difference series, enabling us to check if differencing could render non-stationary series into stationary series.

Table 4.1: Augmented Dickey-Fuller (ADF) Unit Root Test Results

Augmented Dickey-Fuller (ADF)				
Series	Level		First Difference	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
LGDP	0.4042(10)	-2.1851(10)	-4.0388(9)***	-3.9796(9)**
LSNU	-2.4226(1)	-2.9640(1)	-3.6011(0)***	-3.9719(0)**
LWECHAT	-6.5536(9)***	-4.3272(9)***	-1.3302(9)	-2.8660(9)
LWEIBO	-2.6599(4)*	-1.5617(4)	-2.9193(3)**	-4.8273(5)***
LDOUYIN	-3.3851(9)**	-2.8825(9)	-4.5336(8)***	-4.9171(8)***
LBILIBILI	-2.3050(1)	-0.7593(1)	-8.6026(2)***	-11.1172(2)***
LTRSCG	-2.703(0)*	-4.2033(0)***	-2.9236(11)**	-2.9091(11)
LAFRE	-2.5598(1)	-0.9068(1)	-12.2243(0)***	-12.8729(0)***

Note: The total monetary value of all goods and services produced in China, **LGDP** (Gross Domestic Product GDP) used as the dependent variable in the study. Independent variables are, social media metrics include **LSNU** (The total number of social media users in China), **LWECHAT** (The number of active users on the WeChat platform), **LWEIBO** (The number of active users on the Weibo Platform), **LDOUYIN** (The number of active users on the Douyin platform), and **LBILIBILI** (The number of active users on the Bilibili platform). Control variables include **LTRSCG** (The total value of consumer goods sold in China), **LAFRE** (Aggregate financing to the real economy in current period). “L” prefix indicating that these variables have been log-transformed. The ADF test's asymptotic and finite sample critical values are taken from (MacKinnon, 1996). This test compares the other possibility that a time series is stationary with the null hypothesis that the series includes a unit root. *** represent 1 percent significant level while ** represents 5 percent significant level and * represents 10 percent significant level.

4.1.2 Philips-Perron (PP) Unit Root Test Results

The PP test was conducted as a robustness check to complement the ADF test in assessing the presence of unit roots across the series. The PP test adjusts for potential issues related to serial correlation and heteroskedasticity in the error terms, providing an alternative and more reliable approach. The null hypothesis of the PP test posits the presence of a unit root (non-stationarity), with the rejection of the null indicating stationarity. The results (Table 4.2) provide crucial insights into the stationarity characteristics of the series under study.

Table 4.2: Phillips-Perron (PP) Unit Root Test Results

Phillips-Perron (PP)				
Series	Level		First Difference	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
LGDP	-1.2353(10)	-3.2814(7)*	-9.2825(81)***	-9.4483(81)***
LSNU	-4.0188(5)***	-3.8928(4)**	-3.3444(12)**	-3.6954(9)**
LWECHAT	-8.1916(19)***	-1.8600(17)	-5.6641(55)***	-8.0604(52)***
LWEIBO	-4.1407(2)***	-1.9427(2)	-3.8502(10)***	-4.1663(10)***
LDOUYIN	-12.8770(16)***	-7.5649(15)***	8.2582(4)***	-9.6401(1)***
LBILIBILI	-3.1239(15)**	0.0153(19)	-5.2814(81)***	-5.5170(36)***
LTRSCG	-2.7476(3)*	-4.3900(3)***	10.6460(9)***	-10.5454(9)***
LAFRE	-2.2263(3)	-1.1329(1)	-12.0341(2)***	-12.8729(0)***

Note: The crucial values for limited sample adjustments and the PP test are given by (MacKinnon, 1996). Instead of using lagged difference terms, the PP test is non-parametric and takes serial correlation and heteroscedasticity into account in the error terms, unlike the ADF test. It also contrasts the stationary alternative with the null hypothesis of a unit root. Asterisks *** represents 1 percent significant level while ** represents 5 percent significant level and * represents 10 percent significant level.

4.1.3 Summary of ADF and PP

The integration properties of each series were examined using the ADF and PP. Each test contributes unique insights due to its distinct assumptions and specifications regarding stationarity. The summary and synthesis of the findings (Tables 4.1 and 4.2) indicate a consistent pattern across the tests, with most series displaying similar stationarity

properties, either at levels $I(0)$ or first differences $I(1)$. However, some series exhibited minor discrepancies. Mixed results underscore the complex dynamic properties within the data, where the PP test demonstrated robustness in assessing stationarity across multiple series. Notably, the PP test results, reinforcing level and difference stationarity findings across several series, such as LGDP, LTRSCG, and LSF, at the $I(0)$ level. Meanwhile, series like LSNU, LWECHAT, LWEIBO, LDOUYIN, and LBILIBILI predominantly indicated level stationarity $I(1)$.

The PP test's methodological advantages over the ADF are well-documented. The literature confirms that the PP test is superior in handling serial correlation and heteroskedasticity due to its bandwidth selection and pre-whitening adjustments. Unlike the ADF test's parametric approach, the PP test's nonparametric corrections enable more accurate detection of stationarity in the presence of structural breaks. Cheung and Lai (1997) highlight the PP test's improved reliability, mainly when applied to complex, empirically noisy data.

The robustness of the PP test has provided a strong empirical foundation for classifying the majority of series as $I(0)$ or $I(1)$. Synthesising the findings highlights mixed stationarity properties within the series, suggesting both stationary and non-stationary behaviours. The combination of properties justifies using the ARDL model, which accommodates $I(0)$ and $I(1)$ series, allowing for the simultaneous estimation of short- and long-run relationships without requiring a common order of integration. This methodological choice ensures a robust and flexible analysis of dynamic interactions among the variables. It allowed us to address the stationarity diversity observed within the series and align with established econometric practices for handling mixed-integrated data

Table 4.3: Summary of ADF and PP

Series	Level				First Difference			
	ADF		PP		ADF		PP	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend	Intercept	Intercept & Trend	Intercept	Intercept & Trend
LGDP	0.4042	-2.1851	-1.2353	-3.2814*	-4.0388***	-3.9796**	-9.2825***	-9.4483***
LSNU	-2.4226	-2.9640	-4.0188***	-3.8928**	-3.6011***	-3.9719**	-3.3444**	-3.6954**
LWECHAT	-6.5536***	-4.3272***	-8.1916***	-1.8600	-1.3302	-2.8660	-5.6641***	-8.0604***
LWEIBO	-2.6599*	-1.5617	-4.1407***	-1.9427	-2.9193**	-4.8273***	-3.8502***	-4.1663***
LDOUYIN	-3.3851**	-2.8825	-12.8770***	-7.5649***	-4.5336***	-4.9171***	8.2582***	-9.6401***
LBILIBILI	-2.3050	-0.7593	-3.1239**	0.0153	-8.6026***	-11.1172***	-5.2814***	-5.5170***
LTRSCG	-2.703*	-4.2033***	-2.7476	-4.3900***	-2.9236**	-2.9091	10.6460***	-10.5454***
LAFRE	-2.5598	-0.9068	-2.2263	-1.1329	-12.2243***	-12.8729***	-12.0341***	-12.8729***

Note: Asterisks *** represents 1 percent significant level while ** represents 5 percent significant level and* represents 10 percent significant level.

Table 4.4: Stationarity Classification and Order of Integration

Series	Level				First Difference				Order of Integration
	ADF		PP		ADF		PP		
	Intercept	Intercept & Trend	Intercept	Intercept & Trend	Intercept	Intercept & Trend	Intercept	Intercept & Trend	
LGDP	Non-stationary	Non-stationary	Non-stationary	Stationary	Stationary	Stationary	Stationary	Stationary	$I(0)$
LSNU	Non-stationary	Non-stationary	Stationary	Stationary	Stationary	Stationary	Stationary	Stationary	$I(0)$
LWECHAT	Stationary	Stationary	Stationary	Non-stationary	Non-stationary	Non-stationary	Stationary	Stationary	$I(0)$
LWEIBO	Stationary	Non-stationary	Stationary	Non-stationary	Stationary	Stationary	Stationary	Stationary	$I(0)$
LDOUYIN	Stationary	Non-stationary	Stationary	Stationary	Stationary	Stationary	Stationary	Stationary	$I(0)$
LBILIBILI	Non-stationary	Non-stationary	Stationary	Non-stationary	Stationary	Stationary	Stationary	Stationary	$I(0)$
LTRSCG	Stationary	Stationary	Non-stationary	Stationary	Stationary	Non-stationary	Stationary	Stationary	$I(0)$
LAFRE	Non-stationary	Non-stationary	Non-stationary	Non-stationary	Stationary	Stationary	Stationary	Stationary	$I(1)$

Note: The significance levels of 1%, 5%, and 10% mentioned in this table are sourced from Table 4.4. In that context, the asterisks denote the following significance thresholds: *** signifies a 1 percent significance level, ** represents a 5 percent significance level, and * indicates a 10 percent significance level. These levels interpret the stationarity results across the various tests employed in this analysis.

4.2 ARDL Estimation Result

Social media's impact on economic activity is growing in significance as it develops and permeates more aspects of daily life. ARDL model can help company executives and politicians understand the possible financial gains from encouraging digital involvement by examining the relationship between social media network users and China's GDP. It suggests that methods to increase social media engagement could have a positive economic impact, underscoring the significance of comprehending digital user behaviour as a driver of economic progress. This equation is an essential tool for investigating the relationship between economic progress and digital involvement.

Using LGDP, the total monetary value of all goods and services produced in China, as the dependent variable, the model captures both short- and long-term influences of social media engagement and economic controls on economic growth. The selected ARDL specification via the Akaike Information Criterion (AIC) successfully accounts for lagged relationships, providing a comprehensive perspective of the interplay between these variables over time.

ARDL approach was applied in the study to identify the long-run and short-run relationship between the variables (including SNU, Wechat, Weibo, Douyin and Bilibili) through bounds test for cointegration to identify the presence of long-run; estimation of error correction model in order to examine ECT_{t-1} ; estimation of long-run coefficient; and Granger causality test to find the causality of the variable in the short-run. The findings are tabulated into sub-sections, as shown below:

4.2.1 Empirical Tests and Analytical Findings on SNU

The preliminary long-run relationship result is identified via the bounds test. Further on, the presence of cointegration can be obtained by making use of the error correction model. The computed F-statistic is applied to detect whether there is a cointegration exists between the explanatory variables and dependent variable or not by comparing the computed F-statistic to the critical values provided by Narayan and Smyth (2005) which takes small sample size ($30 < x < 80$) into account. The Johansen and Juselius cointegration test pointed out that there is a possibility that more than one cointegration relationship could be identified through the estimates of a model. Nevertheless, according to the assumption of (Pesaran et al., 2001), there is only one cointegration exists among the independent variables and regress and in the estimated model. Thus, the bounds test result for the model are revealed in Table 4.5.

Table 4.5: Bounds Test for Cointegration Results on SNU

Model	Sample size		F-statistic		ARDL Order	
LGDP, LSNU, LTRSCG, and LAFRE	74		8.9327***		(7,10,9,3)	
Critical values bounds of F-statistic: restricted intercept and no trend (k = 3, n = 75)						
Significance	10%		5%		1%	
Sample	<i>I</i> (0)	<i>I</i> (1)	<i>I</i> (0)	<i>I</i> (1)	<i>I</i> (0)	<i>I</i> (1)
70	2.482	3.31	2.924	3.86	3.916	5.088
75	2.482	3.334	2.946	3.862	4.048	5.092
Asymptotic	2.37	3.2	2.79	3.67	3.65	4.66

Notes: Critical values are obtained from (Pesaran et al., 2001), table Case II: restricted intercept and no trend as well as from Narayan and Smyth (2005), table Case II: restricted intercept and no trend. The lag length selection is based on the Akaike Information Criterion (AIC). The asterisk (***) indicates significant at 1% level respectively.

The number of independent variables used in this study is presented in Table 4.5 as “k” while the number of observations is showed as “n”. As mentioned in the study previously

that the number of observations is 74. However, the number of observations displayed in Table 4.5 is 75. It is because the critical values proposed by Narayan and Smyth (2005) is at an interval of five observations, for example, starting from 70, 75, 80, and so on observations. So, when the number of observations of the study is 74, the suggested number of observations should be 75 when reading the critical values presented by Narayan and Smyth (2005) because the critical values are not significant if the number of observations of 70 is taken into account in this case. Next in the line are 75 observations where the critical values provided are statistically significant because the 74 observations are still within the range from 70 to 75 observations. So, n equals to 75 are employed in this study.

The outcome of the SNU model suggested there is a long-run relationship found between the tested variables. From the table, the bounds test of the industrial sector model showed the F-statistic of 8.9327, which is exceeded the upper bound critical value of Narayan and Smyth (2005) at the one percent significance level. Therefore, it is concluded that there is a long relationship that exists among the variables in the SNU model.

Social media's impact on economic activity is growing in significance as it develops and permeates more aspects of daily life. ARDL model can help company executives and politicians understand the possible financial gains from encouraging digital involvement by examining the relationship between social media network users and China's GDP. It suggests that methods to increase social media engagement could have a positive economic impact, underscoring the significance of comprehending digital user behaviour as a driver of economic progress. This equation is an essential tool for investigating the relationship between economic progress and digital involvement.

$$\text{LGDP} = 20.523 - 2.078\text{LSNU} + 0.583\text{LTRSCG} + 0.783\text{LAFRE} \quad (4.1)$$

(9.208)*** (-4.973)*** (4.284)*** (9.802)***

The coefficients reflect the strength and direction of the relationship between each variable and China's GDP. The constant term 20.523 represents a baseline level of GDP when all other variables remained constant. The coefficient for total retail sales of consumer goods (0.583) indicates a positive relationship with GDP, suggesting that increases in total retail sales significantly contribute to GDP growth. Similarly, the coefficient for aggregate financing to the real economy (0.783) demonstrates a significant positive association, indicating that increases in aggregate financing are positively linked to GDP growth.

Using LGDP, the total monetary value of all goods and services produced in China, as the dependent variable, the model captures both short- and long-term influences of social media engagement and economic controls on economic growth. The selected ARDL specification via the Akaike Information Criterion (AIC) successfully accounts for lagged relationships, providing a comprehensive perspective of the interplay between these variables over time.

The cointegration test confirms that there is a long-run equilibrium relationship between China's GDP and various social and economic indicators social network users, total retail sales of consumer goods, and aggregate financing to the real economy as evidenced by the statistical significance of the error correction term estimated at -0.487 ($p < 0.001$). The implication is that the adjustment process can be rapid, with approximately 48.70% deviation from equilibrium corrected every month. This suggests that the model can capture a stable long-term relationship. This result aligns with the theoretical framework of Banerjee et al. (1998) who postulated that a high value of ECT (Error Correction Term) in an ARDL model infers the existence of a powerful long-run

relationship among variables. The speed of adjustment is very high, implying that shocks in social media engagement, consumer demand, and financing will return the economy to equilibrium quickly, making the economic system responsive.

Table 4.6: Long-Run ARDL Estimation for SNU (Social Network Users)

Regressor	Coefficient	SE	<i>t</i>-statistics	<i>p</i>-value
LSNU	-2.0760***	0.4180	-4.9730	0.0000
LTRSCG	0.5830***	0.1360	4.2840	0.0001
LAFRE	0.7830***	0.07990	9.8020	0.0000
Constant	20.5230***	2.2290	9.2080	0.0000

Note: Asterisks *** represents 1 percent significant level while ** represents 5 percent significant level and represents 10 percent significant level.

The social network user's long-run coefficient was -2.078 ($p < 0.001$). This finding implies that increasing social network users negatively affects China's GDP (Gross Domestic Product) in the long run. This negative effect could be justified with a crowding out effect, as indicated by Bick et al. (2021) and Kaplan and Haenlein (2010), where too much digital engagement reduces time spent on economically productive activities. On the one hand, the negative effect suggests that though there is connectivity through social media and digital consumption, extended use may detract from traditional economic participation, especially in consumption and labour.

In contrast, total retail sales of consumer goods had a coefficient of 0.58 in the long run ($p < 0.01$). This suggests that consumer demand is instrumental in stimulating economic growth. This result aligns with Keynesian consumption theory, which considers consumer spending an essential determinant of economic output. A strong positive coefficient reassures the role of retail sales as part of the GDP, indicating that higher consumption is instrumental in directly and positively underpinning the economy's

expansion. This strong correlation underlines the bottom line of domestic demand in the structure of the Chinese economy, where consumption still fuels growth amid digital transformation.

The long-run coefficient was 0.78 for aggregate financing to the real economy, and the p-value was less than 0.001. This indicates that financing significantly and positively affects GDP. Based on the financial development hypothesis of King and Levine (1993), increased availability of financing encourages economic growth through capital investment and liquidity towards consumption. This positive effect aligns with Beck and Levine (2004); it reflects the role of social financing in providing the resources required for businesses and households to support current consumption and long-term investment that underpin sustainable growth.

The ARDL results emphasise the role of digital engagement, consumer demand, and financing in driving China's economic growth. The findings indicate that increased social media usage, proxied by LSNU, exerts a long-lasting effect on economic output. This serves as a new channel for consumer engagement and business outreach. The findings align with Kaplan and Haenlein's (2010) exploration of how social media affects business and marketing strategies, as well as Zhu et al. 2020, where they found that digital platforms significantly contribute to consumer engagement and economic productivity. The findings also imply that the presence of social media can introduce economic trade-offs by diverting time from traditional economic activities. This supports the insights from the empirical works of Kaplan and Haenlein (2010) and Bick et al. (2021) regarding the complex influence of social media, notably when the patterns of use switch towards extensive, less productive engagement.

Table 4.7: ARDL Estimation for SNU

Regressor	Coefficient	SE	<i>t</i>-statistics	<i>p</i>-value
ΔLGDP_{t-1}	0.6060***	0.0920	6.5620	0.0000
ΔLGDP_{t-2}	0.0290	0.1280	0.2230	0.8240
ΔLGDP_{t-3}	-0.2900**	0.1250	-2.3220	0.0250
ΔLGDP_{t-4}	0.3360***	0.0890	3.7720	0.0010
ΔLGDP_{t-5}	0.0440	0.1030	0.4270	0.6720
ΔLGDP_{t-6}	0.1390	0.0800	1.7430	0.1220
ΔLSNU_t	-4.6700***	1.6510	-2.8280	0.0070
ΔLSNU_{t-1}	4.7590**	1.0410	2.2170	0.0320
ΔLSNU_{t-2}	6.1740**	2.2870	2.7000	0.0100
ΔLSNU_{t-3}	-11.4510***	2.5950	-4.4130	0.0000
ΔLSNU_{t-4}	6.4800**	2.4790	2.4140	0.0200
ΔLSNU_{t-5}	7.1130**	2.8120	2.5290	0.0150
ΔLSNU_{t-6}	-7.4890***	2.6890	-2.8600	0.0060
ΔLSNU_{t-7}	0.6820	1.1500	0.0590	0.8380
ΔLSNU_{t-8}	3.7700*	2.1670	1.7400	0.0890
ΔLTRSC_t	6.6350***	1.6250	4.3700	0.0010
$\Delta \text{LTRSC}_{t-1}$	0.2780***	0.0280	10.070	0.0000
$\Delta \text{LTRSC}_{t-2}$	-0.1070	0.0410	-2.6460	0.1810
$\Delta \text{LTRSC}_{t-3}$	0.0650	0.0490	1.3370	0.1180
$\Delta \text{LTRSC}_{t-4}$	-0.2570***	0.0520	-4.9590	0.0000
$\Delta \text{LTRSC}_{t-5}$	0.0290	0.0520	0.5620	0.5960
$\Delta \text{LTRSC}_{t-6}$	0.1740***	0.0500	3.4980	0.0010
$\Delta \text{LTRSC}_{t-7}$	-0.1940***	0.0390	-4.9310	0.0000
$\Delta \text{LTRSC}_{t-8}$	0.1610***	0.0340	4.7370	0.0000
$\Delta \text{LTRSC}_{t-9}$	-0.1280***	0.0400	-3.2230	0.0020
ΔLAFRE_t	-3.3640***	0.4800	-7.0030	0.0000
$\Delta \text{LAFRE}_{t-1}$	2.4050***	0.6690	3.6240	0.0010
ECT_{t-1}	-0.4870***	0.0700	-7.0010	0.0000

Note: Asterisks *** represents 1 percent significant level while ** represents 5 percent significant level and * represents 10 percent significant level. While the CUSUM and CUSUM2 tests demonstrate the model's stability, diagnostic tests evaluate the model's validity by demonstrating that the conditions of normality, serial correlation, and heteroskedasticity are met.

The model also highlights the distinct effects of total retail sales of consumer goods and aggregate financing on the real economy as control variables. LTRSCG, the total value of consumer goods sold, directly impacts China's GDP, underscoring the importance of consumer demand as a driver of economic growth. This finding aligns with established economic theory, which posits consumer spending as a critical determinant of GDP (Mankiw, 2021). Meanwhile, representing an increase in available financing, LAFRE positively affected China's GDP through multiple lagged terms. This variable reflects the social financing scale in China, capturing the increased liquidity available to businesses and households. Similar to Beck and Levine (2004), the availability of financing stimulates investment and consumption, promoting economic growth. These findings support King and Levine's (1993) finance-growth hypothesis, emphasising that financial development fosters sustainable economic progress by improving resource allocation and providing liquidity to market participants.

The model's confirmation of consumer spending and financing as major contributors to economic output aligns with macroeconomic principles. This emphasises the importance of domestic demand and financial support structures for sustained growth. As China continues its digital transformation, these findings indicate that policies encouraging social media expansion, consumer demand, and financing support can enhance economic resilience and stimulate additional growth. Our analysis provides valuable empirical support for policymakers and economic strategists aiming to leverage digital platforms and consumer spending as catalysts for economic development.

The ARDL estimation results provide important insights into the dynamic relationship between China's GDP (LGDP) and key indicators including social network

users (LSNU), total retail sales of consumer goods (LTRSCG) and aggregate financing to the real economy (LAFRE). Notably, the negative coefficient for LSNU suggests a potential crowding-out effect, though alternative explanations like measurement error, omitted variables, or reverse causality merit attention.

Table 4.8: Granger Causality Test for SNU

Null Hypothesis for SNU Model	
LSNU does not Granger causes LGDP	37.5249 [0.0000]***
LTRSCG does not Granger causes LGDP	124.1663 [0.0000]***
LAFRE does not Granger causes LGDP	21.6570 [0.0001]***

This table shows that LSNU, LTRSCG, and LAFRE are all significantly Granger-causes of LGDP, as indicated by the high value of test statistics and p-values below 0.01. This implies that differences in these factors provide predictive information about LGDP, which supports their role in influencing economic growth. The null hypothesis of no Granger causality running from LSNU to LGDP is rejected at a test statistic of 37.5249 and a p-value of 0.0000. This result means that the changes in social media user numbers, LSNU, significantly Granger cause GDP per capita, LGDP, in the short run. This means that the growth in social media users in the short run positively influences economic growth through improved consumer activities that amplify digital marketing processes, thereby enhancing e-commerce growth. These effects insinuate an increasing role of the digital economy in influencing short-run economic performance.

Moreover, the null hypothesis of no Granger causality from LTRSCG to LGDP was rejected, considering a highly significant test statistic and a p-value of 0.0000 from 124.1663. This therefore establishes that, at least in the short run, retail sales of consumer goods

Granger cause GDP per capita. Since retail sales reflect aggregate consumer spending, higher sales stimulate demand for goods and services and encourage business activity, and in this way, economic growth. The short-run causality indicates that consumer spending has a pivotal role in driving the performance of the economy over a short time horizon. Also, the null hypothesis of no Grange causality from LAFRE to LGDP is rejected at the test statistic value of 21.6570 and p-value of 0.0001. This result indicates that aggregate financing to the real economy significantly causes variations in GDP per capita in the short run. Social financing activities, such as loans, bond issuances, and other credit facilities, have a direct impact on the liquidity available for businesses and households. Access to capital facilitates investments and consumption, thus fostering short-run economic growth.

Table 4.9: Diagnostic Test for SNU

Diagnostic Tests	
Normality	0.3060 (0.8580)
Serial Correlation	0.1930 (0.9080)
Heteroskedasticity	0.09740 (0.7550)
Ramsey RESET	0.6650 (0.4120)
CUSUM	Stable
CUSUM²	Stable

The Granger causality test results confirm that LSNU, LTRSCG, and LAFRE are significant short-run predictors of economic growth as proxied by GDP per capita-LGDP. This short-run causality from these variables underlines the importance of digital engagement, consumer spending, and financial liquidity for stimulating economic activities. In sum, these findings are in tune with the extant literature that centers on how social media penetration and retail activity interact with financial development to influence economic growth. These elements are very supportive in the short-run perpetuation of sustainable

economic growth. The Granger causality test is estimated using an error correction model derived from the ARDL framework, with F-statistics indicating the significance of lagged variables.

Diagnostic tests confirm the robustness of the ARDL model. The Breusch–Godfrey Serial Correlation LM test ($p > 0.75$) and the ARCH test ($p > 0.75$) indicate no serial correlation or heteroskedasticity issues, confirming a well-specified model with consistent error terms over time. The Ramsey RESET test ($p > 0.27$) suggests no omitted variable bias, implying that all essential variables were included in the model. The CUSUM and CUSUMSQ confirm model stability at the 5% significance level, aligning with (Pesaran & Shin, 1995) recommendations for ARDL applications. The results suggest that the model's parameters remained stable, validating its capacity to capture both short- and long-run relationships reliably.

With stable parameters, a functional form that is appropriately specified, and normally distributed, uncorrelated, and homoskedastic residuals, the diagnostic tests collectively demonstrate the model's robustness. The p-value of 0.8580 indicates that the residuals of the model are normally distributed because it is greater than the usual significance level of 0.05. This supports the assumed normality of the residuals. The p-value of 0.9080 indicates that there are no indications of serial correlation in the residuals. This implies that the residuals are independent and meet the requirement of uncorrelated errors. The p-value of 0.7550 does not show heteroskedasticity, suggesting that the residuals' variance is consistent across observations. This supports the assumption of homoskedasticity. The p-value of 0.4120 indicates that there is no evidence of model misspecification. This implies that the functional form of the model is suitably defined. The

stability of the model parameters over time in both tests shows that the model is dynamically stable and unaffected by structural breaks.

Figures 4.1 and 4.2 show the results of the CUSUM and CUSUMSQ tests, which indicate the model's stability when evaluating the relationship between social network users and GDP growth in China. These tests help confirm the validity of the results by determining whether the correlation between social network users and GDP growth in China remains over time.

In Figure 4.1, the CUSUM test shows stability since the displayed line stays inside the 5% significance boundaries. This indicates that the model has no notable structural fractures. Figure 4.2 shows that the CUSUMSQ test validates the model stability, indicating the constancy of social network users' impact on GDP growth. Overall, the stability tests assure that the correlation between China's GDP development and social network use has not changed over the observed time.

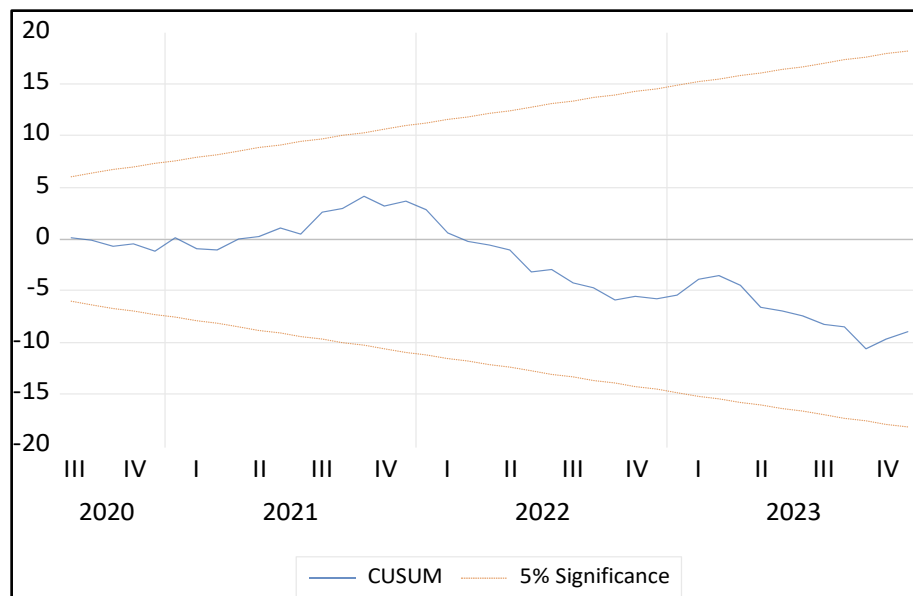


Figure 4.1: CUSUM for Overall Impact of Social Network Usage on GDP Growth in China

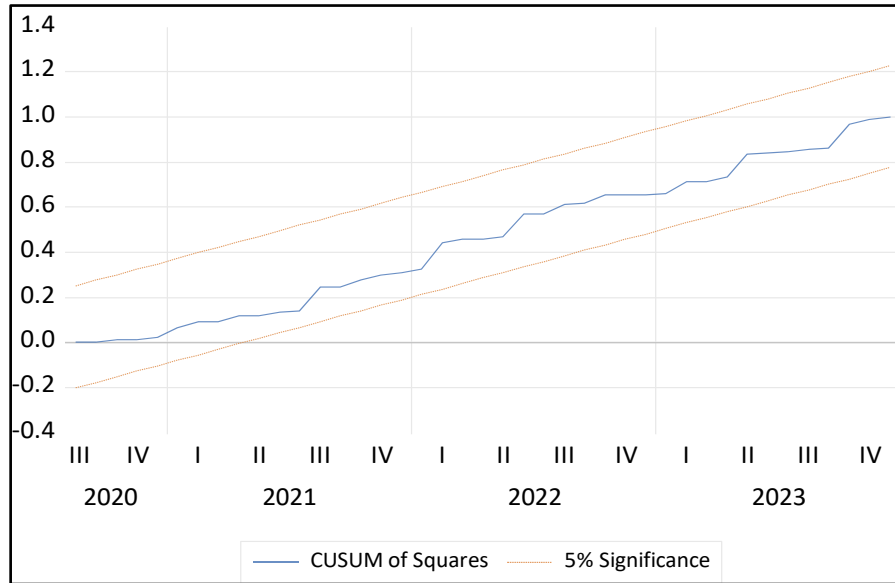


Figure 4.2: CUSUM of Squares for Overall Impact of Social Network Usage on GDP Growth in China

The above analysis exhibits the intricate relationships between retail spending, social network use, and financial accessibility regarding China's economic growth, as shown by the logarithm of China's GDP (LGDP). The model identifies strong long-run equilibrium relationships between the major variables, indicating that departures from this equilibrium are rectified at a notable rate of about 48.7% every month. This finding highlights how these factors are interrelated in promoting growth and indicates a strong economic structure that adjusts to challenges over time. Higher social network users had a negative effect on GDP in the long term, which is consistent with studies that indicate possible distractions related to digital engagement. The present study found that social media platforms are essential to contemporary marketing and communication methods. However, excessive use may take time away from profitable business ventures, which could reduce total economic production. On the other hand, the findings demonstrate that retail consumption increases GDP, supporting the long-held notion that consumer spending is a key factor in economic expansion. This finding is consistent with the larger body of

economic research emphasising how important retail activity is for promoting economic dynamics. The notion that easily available funding is essential for encouraging investment and consumption and creating an atmosphere that promotes sustainable economic growth is supported by the positive correlation between aggregate financing and the real economy.

4.2.2 Empirical Tests and Analytical Findings on WeChat Users

The result for WeChat Users recommended the existence of a cointegration relationship between the independent variables and the dependent variable. The value off-statistic at 7.3114 is greater than the critical upper critical value of Narayan and Smyth (2005) at the one percent significance level. Thus, the identification of the long-run relationship between the variables selected in the transportation sector model is found to be a success.

All models are found to have a cointegration connection between the selected variables in the respective model. After that, the error correction model is applied because it is another technique to analyze the long-run relationship between the variables through the error correction term (ECT). Thus, the next sub-section of the study is to elaborate on the results of the error correction model before further proceeding on the long-run coefficient estimation results.

Table 4.10: Bounds Test for Cointegration Results on WECHAT

Model	Sample size		F-statistic		ARDL Order	
LGDP, LWECHAT, LTRSCG, and LAFRE	77		17.6367***		(5,1,7,1)	
Critical values bounds of F-statistic: restricted intercept and no trend (k = 3, n = 80)						
Significance	10%		5%		1%	
Sample	<i>I</i> (0)	<i>I</i> (1)	<i>I</i> (0)	<i>I</i> (1)	<i>I</i> (0)	<i>I</i> (1)
75	2.482	3.334	2.946	3.862	4.048	5.092
80	2.474	3.312	2.92	3.838	3.908	5.044
Asymptotic	2.37	3.2	2.79	3.67	3.65	4.66

As mentioned in the study previously that the number of observations is 77. However, the number of observations displayed in Table 4.10 is 80. In the line of 80 observations where the critical values provided are statistically significant because the 77 observations are still within the range from 75 to 80 observations. Therefore, n equals to 80 is employed in this study.

Next, the result for the WECHAT model recommended the existence of a cointegration relationship between the independent variables and the dependent variable. The value of F-statistic at 17.6367 is greater than the critical upper critical value of Narayan and Smyth (2005) at the one percent significance level. Thus, the identification of the long-run relationship between the variables selected in the WECHAT model is found to be a success.

This ARDL model specification, where WeChat user activity is treated as the primary measure of social network engagement, yielded considerable insight into the relationship between platform-specific social media usage and economic growth in China. In this model, LGDP was the dependent variable that captured the trajectory of economic

growth. The log of WeChat users (LWECHAT) was the proxy for social network use and engagement. The variable of interest is used to capture platform-specific effects. Second, this model controlled for the logarithm of total retail sales of consumer goods, LTRSCG, and the logarithm of the aggregate financing of the real economy, LAFRE, to absorb the effect on economic growth by broader consumption and financial factors. The ARDL model, which has the minimum AIC, best describes both the short-run and long-run dynamics from August 2017 to December 2023.

This analysis has significant consequences for many users. Businesses can optimise user interaction to strengthen economic activity by incorporating WeChat's impact on economic indicators into their marketing and engagement strategies. The findings, which emphasise the importance of platforms like WeChat in fostering economic growth, can help policymakers' direct activities related to the digital economy. Ultimately, this formula emphasises how important social media is in influencing economic environments and the necessity of focused policies that utilise these online platforms for long-run, sustainable economic growth.

The cointegration analysis reveals a significant long-run relationship between the GDP of China, WeChat users, total retail sales of consumer goods, and aggregate financing to the real economy. The error correction term (ECT) was -0.248 ($p < 0.001$). This indicates a strong adjustment mechanism where approximately 24.80% of deviation from the equilibrium level will be corrected in the following period. This rapid adjustment rate suggests a highly stable and responsive equilibrium relationship, wherein changes in WeChat user engagement and economic controls impact economic output at an accelerated pace. This finding aligns with the literature that supports the stability and effectiveness of

ARDL models in capturing long-run dynamics in models that incorporate digital engagement (Pesaran et al., 2001).

Table 4.11: Long-Run ARDL Estimation for Model Focusing on WeChat Users

Regressor	Coefficient	SE	<i>t</i>-statistics	<i>p</i>-value
LWECHAT	0.6120*	0.3570	-1.7130	0.0910
LTRSCG	0.2310	0.2800	0.8240	0.4130
LAFRE	0.8320***	0.2050	4.0540	0.0001
Constant	14.580***	2.4990	5.8340	0.0000

Note: Asterisks *** represents 1 percent significant level while ** represents 5 percent significant level and * represents 10 percent significant level.

The findings in Table 4.11 provide significant insights into the relationships between social media use, retail sales, social financing, and GDP growth over time for the long-run ARDL model focusing on WeChat users. The estimated long-run coefficient for WeChat usage was 0.612 ($p = 0.091$). This indicates a somewhat significant but modestly positive correlation between GDP and WeChat users. This finding suggests that greater WeChat use might eventually support economic development, even though it was barely meaningful at the 10% level. This may be explained by WeChat's vast function in China's digital economy, which includes supporting financial transactions and business ventures in addition to facilitating communication through platforms like WeChat Pay. It promotes digital commerce, facilitates profitable transactions, and improves business-to-consumer interactions, all of which have the potential to increase GDP. The low level of statistical significance, however, indicates the possibility of conflicting impacts on consumption and production. This suggests that WeChat's economic impact may differ depending on how users interact with the site. This aligns with previous studies that indicate the economic

advantages of social media rely significantly on how these platforms are used (Adekunle & Kajumba, 2021; Chamberlain, 2014).

Regarding LTRSCG, the long-run coefficient was 0.231 ($p = 0.413$), indicating a non-significant relationship between retail sales and GDP in this model. The lack of statistical significance may suggest that traditional consumer spending through retail sales does not play a significant role in driving long-run economic growth in the context of WeChat users. This may be due to the shift in consumption patterns towards more digital transactions, which are increasingly mediated by platforms like WeChat. The shift from traditional retail to digital commerce could mean that the broader economic effects of retail sales are less pronounced when viewed through the lens of WeChat; the platform's influence may extend more towards the services sector and digital consumption rather than physical retail.

The LAFRE coefficient of 0.832 ($p < 0.001$) indicates the long-term beneficial effect of social finance on GDP. This result aligns with the larger body of research on financial development, suggesting that finance availability promotes economic expansion by facilitating investment, liquidity, and consumption (Salas & Odell, 2022). This theory suggests that WeChat's contribution to financial inclusion may be reflected in the importance of social finance, as its integrated financial services (e.g., digital lending and WeChat Pay) give both consumers and enterprises critical access to financing. This access promotes business growth, boosts buying power, and encourages entrepreneurship, contributing to the economy's rise. The significant benefits of social financing highlight the critical role financial structures play in promoting long-term economic activity,

particularly in a digitalised economy where platforms such as WeChat have made it more challenging to differentiate between money, trade, and communication.

The constant term indicates the GDP baseline when the underlying variables, WeChat users, retail sales, and social financing, remained constant at 14.58 ($p < 0.001$). This suggests that underlying reasons continue to support China's long-term economic development even when there are no changes in certain digital and financial variables that were part of the model. These factors might include global trade integration, technological development, and structural economic policies, which offer a solid basis for long-term GDP growth independent of the direct contributions of the digital economy.

$$\text{LGDP} = 14.58 + 0.612\text{LWECHAT} + 0.231\text{LTRSCG} + 0.832\text{LAFRE} \quad (4.2)$$

$$(5.834)^{***} \quad (-1.713)^* \quad (0.824) \quad (4.054)^{***}$$

Equation 4.2 presents the relationship between GDP (LGDP) and three key variables: WeChat usage (LWECHAT), total retail sales of consumer goods (LTRSCG), and aggregate financing to the real economy (LAFRE). The constant term of 14.58 represents the baseline level of GDP. The coefficient for WeChat usage (0.612) indicates a modestly significant positive effect on GDP, suggesting that increased social media engagement might be associated with enhanced economic performance. This positive impact could stem from WeChat's facilitation of digital commerce, financial transactions, and consumer interaction, which boost economic activity.

Total retail sales of consumer goods also show a positive relationship (coefficient of 0.231), but with lower significance (t-statistic of -1.713), suggesting its weaker impact on GDP. In contrast, aggregate financing to the real economy has a strong positive relationship with GDP (coefficient of 0.832) and a significant t-statistic of 4.054, highlighting its key role in driving economic growth.

The results emphasize the importance of social media usage and financing in economic growth, while also revealing the potential negative effects of digital engagement, suggesting that policymakers should consider the potential impact of digital participation on productivity when promoting the development of the digital economy.

Table 4.12: ARDL Estimation for Model Focusing on WeChat Users

Regressor	Coefficient	SE	<i>t</i>-statistics	<i>p</i>-value
$\Delta LGDP_{t-1}$	0.6570***	0.0690	9.5300	0.0000
$\Delta LGDP_{t-2}$	-0.1080	0.0770	-1.4170	0.1610
$\Delta LGDP_{t-3}$	-0.4050***	0.0810	-5.0230	0.0000
$\Delta LGDP_{t-4}$	0.5270***	0.0590	8.1460	0.0000
$\Delta LWECHAT_t$	-1.0160***	0.3440	-2.9560	0.0040
$\Delta LTRSCG_t$	0.2540***	0.0300	8.6170	0.0000
$\Delta LTRSCG_{t-1}$	0.0190	0.0420	0.4530	0.6520
$\Delta LTRSCG_{t-2}$	-0.0360	0.0450	-0.8060	0.4230
$\Delta LTRSCG_{t-3}$	-0.1150**	0.0440	-2.6120	0.0110
$\Delta LTRSCG_{t-4}$	-0.0250	0.0360	-0.6930	0.4910
$\Delta LTRSCG_{t-5}$	-0.1060***	0.0330	-3.2210	0.0020
$\Delta LTRSCG_{t-6}$	-0.1010***	0.0340	-2.9630	0.0040
$\Delta LAFRE_t$	-3.9260***	0.4740	-8.2740	0.0000
ECT	-0.2480***	0.0260	-9.7040	0.0000

Note: Asterisks *** represents 1 percent significant level while ** represents 5 percent significant level and * represents 10 percent significant level. While the CUSUM and CUSUM2 tests demonstrate the model's stability, diagnostic tests evaluate the model's validity by demonstrating that the conditions of normality, serial correlation, and heteroskedasticity are met.

The ARDL findings for the model focusing on WeChat users reveal the complex role of platform-specific social network engagement in shaping economic outcomes. This supports studies on the economic implications of digital platform use, such as Kaplan and Haenlein, (2010). However, the presence of a strong long-term equilibrium relationship

confirms that digital engagement is integrated into the broader economic framework, contributing positively to growth in alignment with macroeconomic fundamentals.

The significant roles of total retail sales of consumer goods and aggregate financing to the real economy as control variables emphasise the interconnectedness of consumption, financing, and digital engagement in driving economic performance. Retail sales directly influence China’s GDP in both the short and long run. Financing exhibited delayed but significant positive impacts on economic output. These findings are consistent with empirical studies that suggest consumption and liquidity are key determinants of economic resilience and expansion, particularly in rapidly evolving digital economies (Beck & Levine, 2004; Zhu et al., 2020).

The ARDL results for the model with WeChat users reinforce the notion that digital platforms play a nuanced role in economic dynamics. The findings suggest that when measured through platform-specific metrics, digital engagement influences short-term fluctuations while contributing to long-term economic stability. This analysis highlights the need for policymakers to consider both the immediate and long-term effects of social media engagement on economic growth, particularly as digital transformation continues to shape consumer and business behaviours in China.

Table 4.13: Granger Causality Test for WeChat Users

Null Hypothesis for WECHAT Model	
LWECHAT does not Granger causes LGDP	55.9853 [0.0000]***
LTRSCG does not Granger causes LGDP	108.8387 [0.0000]***
LAFRE does not Granger causes LGDP	2.2030 [0.1377]

Given that both LWECHAT and LTRSCG are significantly Granger-cause LGDP, the results imply that they have a strong predictive impact on economic growth. However, LAFRE does not show a statistically significant effect, indicating that it may not offer this model any predictive. The null hypothesis of no Granger causality from LWECHAT to LGDP is rejected, given that the test statistic stands at 55.9853 with a p-value of 0.0000, showing a significant short-run causal relationship in the change of WeChat usage affecting GDP per capita. The linkage in the short run has reflected the contribution of digital platforms like WeChat in economic activity. WeChat facilitates the centralization of e-commerce, financial transaction, and information dissemination; therefore, such an application amplifies consumer engagement and economic growth. The findings stress that digital economy dynamics are contributors to short-run economic performance in China.

Alternatively, the null hypothesis of no Granger causation of LGDP by LTRSCG was rejected at test statistic 108.8387, and p-value 0.0000. This finding reveals that LTRSCG is significantly affecting GDP per capita in the short run. Retail sales reflect consumer spending, which is considered one of the most critical drivers of economic growth. Therefore, a strong short-run relationship would suggest that changes in consumer demand have immediate consequences for economic activity in a country such as China, which is increasingly moving towards a consumption-driven growth model. The null hypothesis of no Granger causality from LWECHAT to LGDP is rejected, given that the test statistic stands at 55.9853 with a p-value of 0.0000, showing a significant short-run causal relationship in the change of WeChat usage affecting GDP per capita. The linkage in the short run has reflected the contribution of digital platforms like WeChat in economic activity. WeChat facilitates the centralization of e-commerce, financial transaction, and information dissemination; therefore, such an application amplifies consumer engagement

and economic growth. The findings stress that digital economy dynamics are contributors to short-run economic performance in China. On the other hand, the null hypothesis that LAFRE does not Granger cause LGDP cannot be rejected, as the test statistic of 2.2030 yields a p-value of 0.1377. This result implies that aggregate financing to the real economy (LAFRE) does not exhibit a statistically significant short-run causal impact on GDP per capita. While social financing is crucial for supporting business investments and liquidity, its effects on economic output may not materialize immediately. This insignificance could also suggest that financial flows have a more lagged or indirect impact on GDP growth, requiring a longer time horizon to observe their influence.

Overall, the Granger causality test confirms that both WeChat usage and retail sales significantly and directly influence GDP per capita in the short run, underscoring the growing importance of digital engagement and consumer spending in shaping China's economic landscape. Conversely, the lack of a significant short-run relationship for aggregate financing suggests that its impact may work through more complex or delayed channels. These findings highlight the critical role of consumer-oriented factors, particularly digital platforms and retail activity, in driving short-term economic growth in China.

Table 4.14: Diagnostic Test for WeChat Users

Diagnostic Tests	
Normality	0.1810 (0.9130)
Serial Correlation	1.4460(0.4850)
Heteroskedasticity	0.9770 (0.3230)
Ramsey RESET	0.1490(0.7010)
CUSUM	Stable
CUSUM²	Stable

The diagnostic tests confirmed the robustness of the ARDL model. The Breusch–Godfrey Serial Correlation LM test ($p > 0.58$) and ARCH test ($p > 0.32$) indicate no issues with serial correlation or heteroskedasticity, suggesting that the model’s error structure was well-specified and consistent over time. The Ramsey RESET test ($p > 0.70$) showed no evidence of omitted variable bias. The CUSUM and CUSUMSQ tests confirmed model stability within 5% significance. This indicates that the model was robust for the specified sample period. The diagnostics align with the high standards for econometric models involving digital engagement metrics, highlighted by Pesaran and Shin (1998).

CUSUM and CUSUM of Squares tests are used to evaluate the stability of WeChat. These tests determine whether the correlation between GDP growth and WeChat use held steady over time, which is crucial for model robustness.

CUSUM test in Figure 4.3 indicates stability, as the line remained within the 5% significance bounds, indicating no structural breaks. The CUSUMSQ test in Figure 4.4 confirmed stability, validating that WeChat’s influence on GDP growth remained consistent across the study period. These results confirm the reliability of WeChat’s impact on GDP growth.

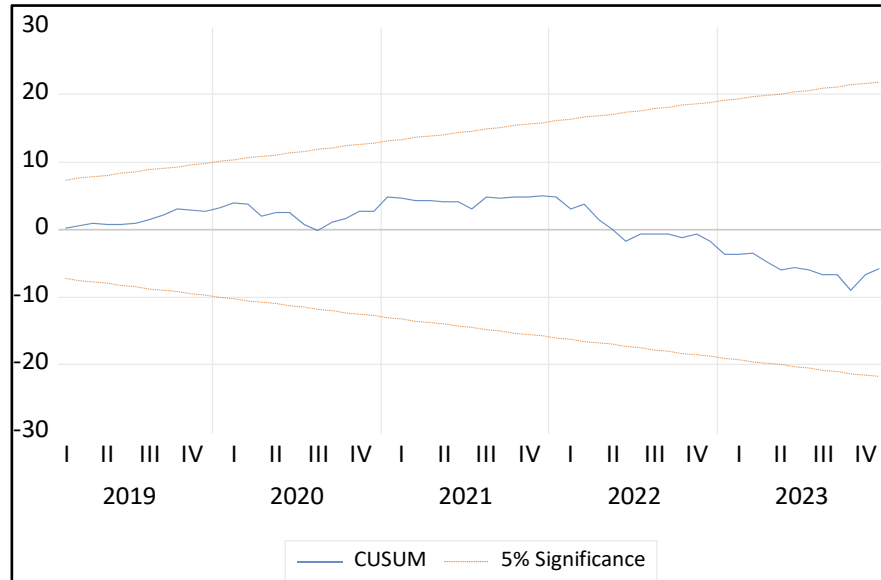


Figure 4.3: CUSUM for WeChat Social Media Platform Usage Impact on GDP Growth in China

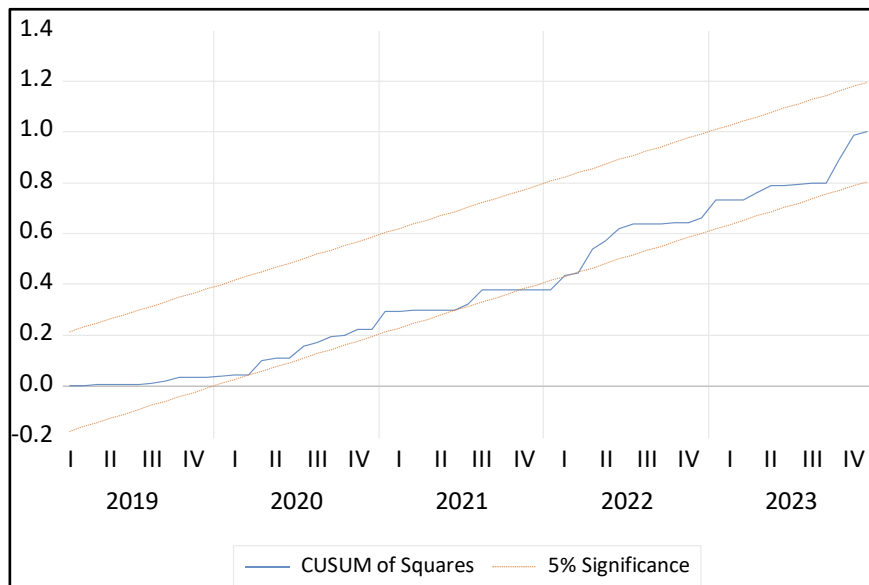


Figure 4.4: CUSUM of Squares for WeChat Social Media Platform Usage Impact on GDP Growth in China

The ARDL estimation focused on WeChat users' contribution to China's economic development, providing new insight regarding the dynamic long- and short-term interactions between digital platforms and conventional economic factors. From a practical standpoint, the results indicate that although WeChat and similar platforms are now required for modern life, their long-term effects on economic output are complex. The

inverse long-term association between GDP and WeChat use may result from a crowding-out effect; more time spent on social media may mean less time for economically beneficial pursuits. This finding is consistent with past research (Marotta & Acquisti, 2017; Watanabe et al., 2018). This indicates that conventional economic involvement, e.g., physical consumption and workforce participation, may be hampered by digital distractions. This could result in lower consumer spending on products and services or lower worker productivity, both of which are conventional growth drivers.

In a rapidly digitising economy like China, WeChat's extensive use has significant implications for policy and business strategies. The findings suggest that excessive engagement on WeChat could reduce participation in key economic sectors such as retail and manufacturing. Businesses should integrate WeChat's tools, e.g., payment systems, without compromising traditional sales channels. Policymakers may need to regulate WeChat's use to ensure it promotes productivity rather than detracts from it. China's economy is digitising quickly, and WeChat's popularity has significant implications for company strategy and policy. Research suggests that excessive WeChat use may lower involvement in critical economic sectors, including manufacturing and retail. Businesses should integrate WeChat's payment methods and other technologies without sacrificing conventional sales channels. To ensure WeChat increases productivity rather than decreases it, policymakers may need to control its use.

The contribution of WeChat Pay to improving financial inclusion is consistent with data indicating that financial liquidity fosters investment and consumption, two important long-term economic drivers. To maximise the effectiveness of digital tools in sustainable finance and development, policymakers should implement comprehensive frameworks that

leverage technology, improve financial literacy, foster stakeholder collaboration, and develop supportive regulations. While WeChat makes e-commerce easier, the long-term effects of retail consumption are weaker, meaning that conventional consumption may still be the primary driver of development. Companies could include WeChat's capabilities. However, they should also focus on strategies that guarantee sustained customer involvement instead of temporary fluctuations (Zhiqin, 2018). Based on the above, WeChat's impact on productivity, retail, and finance underlines the necessity of well-rounded plans that combine digital finance.

4.2.3 Empirical Tests and Analytical Findings on Weibo Users

Weibo is an important social media site in China. This formula provides insights into the impact of social media on consumer behaviour and general economic activity by evaluating the relationship between user engagement on Weibo and economic growth. The preliminary long-run relationship result is identified via the bounds test. The bounds test result for the model on Weibo are revealed in Table 4.15.

Table 4.15: Bounds Test for Cointegration Results on WEIBO

Model	Sample size		F-statistic		ARDL Order	
LGDP, LWEIBO, LTRSCG, and LAFRE	77		15.3597***		(5,5,7,1)	
Critical values bounds of F-statistic: restricted intercept and no trend (k = 3, n = 80)						
Significance	10%		5%		1%	
Sample	<i>I</i> (0)	<i>I</i> (1)	<i>I</i> (0)	<i>I</i> (1)	<i>I</i> (0)	<i>I</i> (1)
75	2.482	3.334	2.946	3.862	4.048	5.092
80	2.474	3.312	2.92	3.838	3.908	5.044
Asymptotic	2.37	3.2	2.79	3.67	3.65	4.66

The study previously noted that there were 77 observations. However, the number of observations displayed in Table 4.15 is 80. In the line of 80 observations where the critical values provided are statistically significant because the 77 observations are still within the range from 75 to 80 observations. Therefore, n equals to 80 are employed in this study.

The third model is the WEIBO model. The F-statistic value computed for the WEIBO model is 15.3597, which is greater than the upper bound critical value proposed by Narayan and Smyth (2005) at one percent significance level. Thus, the identification of the long-run relationship between the variables selected in the WEIBO model is found to be a success.

The ARDL model estimation focusing on Weibo users provides a nuanced understanding of the impact of platform-specific social media engagement on economic growth in China. In this model, the dependent variable, LGDP, represents China's gross domestic product. At the same time, Weibo users, LWEIBO, measured social media engagement, and TRSCG and Aggregate Financing acted as the control variables. This ARDL specification was chosen based on AIC and is adequate to capture the short- and long-run dynamics from August 2017 to December 2023. The findings explain how digital engagement on the Weibo platform influences economic activity.

The model's conclusions can guide marketing strategies and help companies maximise their Weibo presence to promote economic involvement. By understanding the role that digital platforms such as Weibo play in economic statistics, policymakers can create policies that use social media to improve economic performance. This formula

highlights how critical it is to analyse social media interactions to understand their possible economic impacts.

The cointegration analysis and ARDL model estimation underscore a significant and complex long-term equilibrium among GDP (LGDP) and three key variables: Weibo use (LWEIBO), total retail sales (LTRSCG), and aggregate financing (LAFRE) while revealing insights into how digital engagement over the Weibo platform, retail consumption, and financial factors interrelate with economic growth in China. The long-run coefficient for LWEIBO was -0.33 ($p = 0.05$). This suggests that increased Weibo engagement correlates with a slight decline in economic output over time. This negative association suggests a crowding out effect; increased social media use diverts resources, particularly time and attention, away from traditional economic activities such as retail shopping or productive labour. This interpretation aligns with Bick et al. (2021), who argue that heightened digital engagement can detract from productivity by reducing time allocated to work or consumption. However, this long-term relationship should be interpreted cautiously, as social media engagement may also catalyse new forms of economic activity, such as digital commerce, that are not fully captured in traditional GDP measures.

Table 4.16: Long-Run ARDL Estimation for Model Focusing on Weibo Users

Regressor	Coefficient	SE	<i>t</i>-statistics	<i>p</i>-value
LWEIBO	-0.3330*	0.1690	-1.9700	0.0530
LTRSCG	0.2040	0.2770	0.7370	0.4640
LAFRE	0.8670***	0.1740	4.9700	0.0000
Constant	12.0010***	2.1320	5.6230	0.0000

Note: Asterisks *** represents 1 percent significant level while ** represents 5 percent significant level and * represents 10 percent significant level.

Regarding total retail sales of consumer goods, the long-run coefficient of 0.20 ($p = 0.46$) indicates a potential, though statistically weak, positive impact of retail consumption on GDP. This result aligns with Keynesian consumption theory, which posits consumer expenditure as a primary driver of economic growth (Mankiw, 2021). The weak statistical significance could suggest that digital engagement reshapes consumption patterns, potentially diluting the impact of traditional retail sales on GDP. This finding implies that retail sales alone may not fully capture the evolving consumption dynamics in China; online spending increasingly complements or substitutes traditional retail purchases.

In contrast, the long-run coefficient for the scale of aggregate financing to the real economies was significantly positive at 0.87 ($p < 0.001$). This indicates that increased financing significantly correlates with GDP growth. This finding supports the financial development theory proposed by King and Levine (1993), which asserts that access to financing drives investment and consumption while fostering long-term economic growth. The high significance and positive magnitude suggest that credit and liquidity availability are instrumental for business and consumer expansion, aligning with China's economic policies to enhance access to credit as a catalyst for growth.

$$\text{LGDP} = 12.001 - 0.333\text{LWEIBO} + 0.204\text{LTRSCG} + 0.867\text{LAFRE} \quad \text{Equation 4.3}$$

$$(5.623)^{***} \quad (-1.970)^* \quad (0.737) \quad (4.970)^{***}$$

Equation 4.3 presents the relationship between GDP (LGDP) and three independent variables: Weibo use (LWEIBO), total retail sales of consumer goods (LTRSCG), and aggregate financing to the real economy (LAFRE). The constant term of 12.001 represents the baseline GDP level. The coefficient for Weibo use was -0.333 , while total retail sales exhibited a positive impact with a coefficient of 0.204. This indicates that increased retail

sales are associated with higher GDP, although this effect was not highly significant (t-statistic 0.737). In contrast, the coefficient for total social financing was 0.867, suggesting a significant positive association with GDP. This indicates that increased social financing significantly contributes to economic growth, as reflected in the significant t-statistic of 4.970. The equation emphasises the importance of social financing in enhancing GDP.

Table 4.17: ARDL Estimation for Model Focusing on Weibo Users

Regressor	Coefficient	SE	<i>t</i>-statistics	<i>p</i>-value
$\Delta LGDP_{t-1}$	0.7720***	0.0680	11.4350	0.0000
$\Delta LGDP_{t-2}$	-0.0820	0.0780	-1.0530	0.2970
$\Delta LGDP_{t-3}$	-0.4210***	0.0780	-5.4320	0.0000
$\Delta LGDP_{t-4}$	0.5730***	0.0580	9.7920	0.0000
$\Delta LWEIBO_t$	-0.5610**	0.2650	-2.1170	0.0390
$\Delta LWEIBO_{t-1}$	0.7340**	0.3040	2.4110	0.0190
$\Delta LWEIBO_{t-2}$	0.1330	0.2630	0.5080	0.6130
$\Delta LWEIBO_{t-3}$	-0.9300***	0.3130	-2.9730	0.0040
$\Delta LWEIBO_{t-4}$	1.0500***	0.2570	4.0800	0.0000
$\Delta LTRSCG_t$	0.2480***	0.0310	8.1140	0.0000
$\Delta LTRSCG_{t-1}$	0.0000	0.0430	-0.0090	0.9930
$\Delta LTRSCG_{t-2}$	-0.0240	0.0450	-0.5320	0.5970
$\Delta LTRSCG_{t-3}$	0.1120**	0.0480	2.3610	0.0210
$\Delta LTRSCG_{t-4}$	0.0250	0.0380	0.6500	0.5180
$\Delta LTRSCG_{t-5}$	-0.0810**	0.0340	-2.3710	0.0210
$\Delta LTRSCG_{t-6}$	-0.0630*	0.0350	-1.7860	0.0790
$\Delta LAFRE_t$	-3.4890***	0.4310	-8.0900	0.0000
ECT	-0.2780***	0.0310	-9.0770	0.0000

Note: Asterisks *** represents 1% significance level while ** represents 5% and * represents 10%. While the CUSUM and CUSUMSQ tests demonstrate the model's stability, diagnostic tests evaluate the model's validity by demonstrating that the conditions of normality, serial correlation, and heteroskedasticity are met.

The ARDL results for the model with Weibo users reveal a complex interplay between digital engagements, consumer spending, financing, and economic output. The negative short-term impact of Weibo use on GDP suggests that social media engagement may crowd out traditional economic activities by diverting consumer attention from productive engagements. This supports the findings of Kaplan and Haenlein (2010), who argue that social media platforms, while beneficial for engagement, can lead to reduced economic productivity if engagement becomes excessive. However, the long-term stability in the relationship indicates that Weibo engagement eventually integrates with the economic system, potentially by fostering digital consumption and online business activity (Zhu et al., 2020).

The significant roles of total retail sales of consumer goods and aggregate financing to the real economy underscore the importance of consumer demand and financing in supporting economic growth. The findings indicate that retail consumption directly impacts GDP, reflecting the foundational role of consumer spending in economic models. Meanwhile, the long-run positive effect of aggregate financing suggests that financial development is crucial in stabilising and sustaining growth, consistent with the finance–growth nexus theories proposed by Levine (2005). The model illustrates that, while social media engagement may initially detract from traditional economic activity, the availability of financing supports immediate consumption and long-term investment, balancing out short-term disruptions in output.

The ARDL analysis presented in Table 4.17 demonstrates that platform-specific social media engagement, as measured through Weibo users, exerts short-term pressure and long-term integration within China’s economic landscape. Policymakers may need to

consider these dual effects when formulating digital economy policies, balancing the benefits of social media engagement with the need to maintain productive economic activity. This analysis contributes to the broader literature on digital engagement and economic growth, highlighting the dynamic roles of digital and economic variables within a rapidly transforming economic context.

Table 4.18: Granger Causality Test for Weibo Users

Null Hypothesis for WEIBO Model	
LWEIBO does not Granger causes LGDP	70.9160 [0.0000]***
LTRSCG does not Granger causes LGDP	107.1022 [0.0000]***
LAFRE does not Granger causes LGDP	3.2843 [0.0699]*

Given that both LWEIBO and LTRSCG Granger-cause LGDP, their importance in predicting economic growth is evident. However, LAFRE only offers shaky proof of causation, suggesting that its contribution to this case is either inconsistency or lack of significance. This means that, in the short run, the consumption of Weibo contributes most to GDP per capita. The high significant causality determines that the platform of social networking, such as Weibo-which promotes computer-mediated communication, consumer activities-related economic growth across China is effectively influenced. With increased Weibo subscribers, there would probably be increased consumers and interaction leading to a hike in short-run economic activities to directly affect its contribution to the GDP growth rate. Rejection of the null hypothesis supports the fact that Weibo is a significant short-run driver of economic performance.

Similarly, LTRSCG, representing total retail sales, also has a very strong Granger causality with LGDP: test statistic = 107.1022, p-value = 0.0000. Retail sales are a major short-run indicator of consumer confidence and economic demand, and this further reinforces the concept that changes in consumer spending have an immediate effect on GDP growth. This accords with China's shift to a consumption-driven economic model, whereby shocks in retail sales should have a current, observable impact on the value of GDP. As found with Weibo, the rejection of the null hypothesis for LTRSCG at the 1% significance level confirms that it has a strong short-run impact on economic growth.

On the other hand, LAFRE, representing aggregate financing to the real economy, reveals somewhat mixed results. Given the test statistic of 3.2843, with a p-value of 0.0699, which is significant at a borderline 10%, this indicates that the strength of the causality between LAFRE and GDP will not be as strong and/or immediate as compared to the other variables. The marginal significance indicates that while the financial flows to the real economy might be relevant, it is still more likely that its impact on GDP will occur along a longer horizon rather than in the short term. Financial flows mostly have an effect in a lagging manner; businesses and industries take time to absorb such funds and then convert them into productive economic activities. Therefore, the null hypothesis of no short-run causality among LAFRE and LGDP cannot be rejected fully, pointing out that the effect of financial flows is usually delayed.

The Granger causality test results therefore indicate that both Weibo users and retail sales have a significant short-run impact on GDP per capita, hence are vital drivers of economic growth in China. The immediacy of these effects underlines the central role of consumer-driven factors and digital engagement in China's evolving economic landscape.

The causality from aggregate financing is weaker and states that impacts on GDP come more lagged, further justifying the fact that the influence of financial flows on economic output is long. The study, therefore, presents a scenario in which digital platforms and consumption patterns have short-term and immediate importance in predicting China's economic trajectory, whereas the effects of financial flows take a little time to impress on GDP.

Table 4.19: Diagnostic Tests for Weibo Users

Diagnostic Tests	
Normality	0.3060 (0.8580)
Serial Correlation	0.1930 (0.9080)
Heteroskedasticity	0.0974 (0.7550)
Ramsey RESET	0.6650 (0.4120)
CUSUM	Stable
CUSUM²	Stable

Diagnostic tests further confirmed the model's robustness. The Breusch–Godfrey Serial Correlation LM test exhibited $p > 0.81$; the ARCH test also revealed $p > 0.85$, indicating no issues with serial correlation or heteroskedasticity. Thus, the model estimates are unbiased and consistent. The Ramsey RESET reported a p -value > 0.12 , indicating the model has no omitted variable bias and is well specified. The CUSUM and CUSUMSQ tests indicate stability at 5% significance. This further suggests that the model parameters remained stable over the sample period. The findings align with the specification guidelines of the ARDL model outlined by Pesaran and Shin (1998), confirming the validity of this model in representing the short- and long-run relationships in this dataset.

Figures 4.5 and 4.6 show the CUSUM and CUSUMSQ tests, which assess the stability of Weibo use's influence on GDP growth in China. These tests confirm whether

the correlation between GDP growth and Weibo use remained steady over time, which is crucial for confirming the model’s validity. Figure 4.5 shows the CUSUM test indicates stability because the line remains inside the 5% significance boundaries, indicating no discernible structural changes. The CUSUMSQ test in Figure 4.6 further confirmed stability. This reaffirms that Weibo’s impact on GDP growth remained constant during the study period. These findings confirm the validity of Weibo's influence on GDP growth.

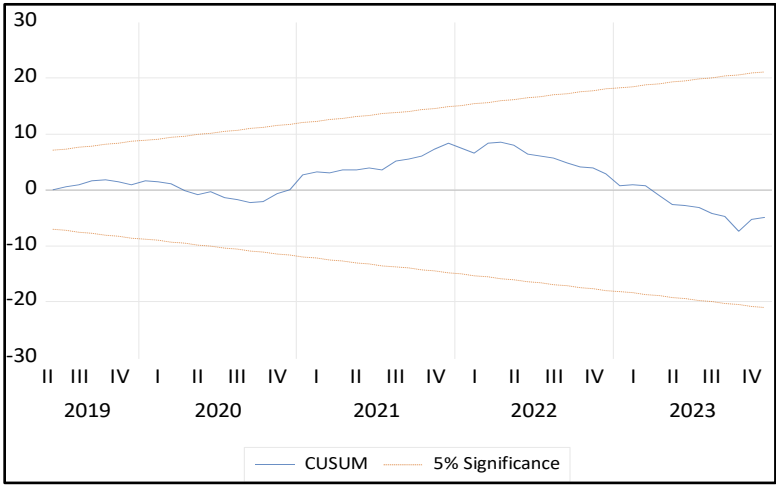


Figure 4.5: CUSUM for Weibo Social Media Platform Use Impact on GDP Growth in China

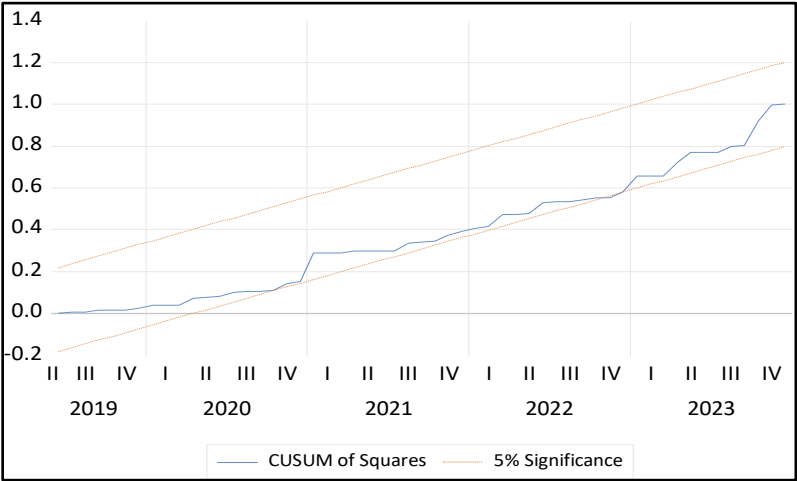


Figure 4.6: CUSUM of Squares for Weibo Social Media Platform Usage Impact on GDP Growth in China

This analysis offers significant insights into the complex dynamics of social media's impact on economic growth. It uses ARDL estimation to examine the link between Weibo user engagement and economic production in China. The results indicate that the variables exhibited a stable long-term equilibrium and that departures from this equilibrium were gradually rectified. This consistency indicates a continuous relationship between economic success and Weibo participation, which is essential for understanding how digital interactions affect conventional economic indicators.

The long-term correlation between GDP and higher Weibo participation highlights the complicated interplay between digital consumption and economic production. These dynamics reveal how excessive digital participation affects conventional economic methods. The difficulty is striking a balance that encourages economic involvement without giving in to the temptations of digital surroundings as Weibo and related platforms grow increasingly ingrained in daily life. While the association between retail consumption and GDP was positive, it seemed less significant in this context. This indicates that social media use may mitigate the influence of consumer spending, which is still a crucial aspect of economic growth. This finding highlights the need for a more thorough investigation of how digital platforms change consumption habits. It aligns with more general economic theories that emphasise the role of consumer behaviour in promoting growth. It is necessary to examine how consumer preferences and behaviours evolve in the digital age due to the interaction between conventional retail consumption and social media participation. Furthermore, the substantial long-term beneficial impact of financial availability on GDP highlights how important access to financing is to maintain economic growth. This emphasises well-established economic theories that support strong financial institutions as stimulators of investment and spending (Gwartney et al., 2006). Initiatives that improve

financial inclusion and guarantee that people and companies may use financial resources to spur growth must be given top priority by policymakers. This is crucial in an economy where digital money is increasing, calling for a legal framework that encourages sustainable financial activities.

Based on the above, the implications of the combined analysis extend beyond simple statistical findings; they provide a tactical framework for understanding the complex connection between social media use and economic expansion. A comprehensive strategy to digital engagement is becoming increasingly necessary as platforms like Weibo continue to grow in popularity.

4.2.4 Empirical Tests and Analytical Findings on Douyin Users

The fourth model is the DOUYIN model. The F-statistic value computed for the DOUYIN model is 15.8903, which is greater than the upper bound critical value proposed by Narayan and Smyth (2005) at one percent significance level. As a result, the identification of the long-run relationship occurs between the variables in this model. In China, Douyin is a significant social media platform. By analysing the connection between Douyin user engagement and economic growth, this formula offers insights into how social media affects consumer behaviour and overall economic activity. The bounds test determines the initial long-term relationship result. Table 4.20 displays the model's Weibo bounds test results.

Table 4.20: Bounds Test for Cointegration Results on DOUYIN

Model	Sample size		F-statistic		ARDL Order	
LGDP, LDOUYIN, LTRSCG, and LAFRE	77		15.8903***		(5,0,7,1)	
Critical values bounds of F-statistic: restricted intercept and no trend (k = 3, n = 80)						
Significance	10%		5%		1%	
Sample	<i>I</i> (0)	<i>I</i> (1)	<i>I</i> (0)	<i>I</i> (1)	<i>I</i> (0)	<i>I</i> (1)
75	2.482	3.334	2.946	3.862	4.048	5.092
80	2.474	3.312	2.92	3.838	3.908	5.044
Asymptotic	2.37	3.2	2.79	3.67	3.65	4.66

As mentioned in the study previously, the number of observations is 77. However, the number of observations displayed in Table 4.20 is 80. In the line of 80 observations where the critical values provided are statistically significant because the 77 observations are still within the range from 75 to 80 observations. Therefore, n equals to 80 are employed in this study.

The ARDL estimation results for the overall model yield valuable insights into the dynamic relationships between the logarithm of gross domestic product (LGDP) in China and key social and economic indicators, specifically, the logarithm of the total number of Douyin users (LDOUYIN), the logarithm of total retail sales of consumer goods (LTRSCG), and the logarithm of the aggregate financing (LAFRE). By designating LGDP as the dependent variable, representing the logged total monetary value of all goods and services produced in China, the model effectively captures the short- and long-term influences of social media engagement and economic indicators on economic growth. The selected ARDL specification was determined through the Akaike Information Criterion (AIC). It accounts for relevant lagged effects and provides a comprehensive view of the interrelationships among these logged variables over time.

This model's insights can assist companies in customising their marketing plans to capitalise on Douyin's distinct features, which could increase consumer spending and boost GDP. Furthermore, understanding how Douyin use affects the economy might help policymakers generate plans that leverage social media trends to support economic stability and expansion.

Table 4.21: Long-Run ARDL Estimation for Model Focusing on Douyin Users

Regressor	Coefficient	SE	<i>t</i>-statistics	<i>p</i>-value
LDOUYIN	-0.0240*	0.0120	-1.9100	0.0600
LTRSCG	0.1830	0.3020	0.6070	0.5460
LAFRE	0.7120**	0.1370	5.1910	0.0000
Constant	13.4150**	2.5620	5.2370	0.0000

Note: Asterisks *** represents 1 percent significant level while ** represents 5 percent significant level and * represents 10 percent significant level.

Regarding long-run dynamics, the coefficient for the total number of Douyin users was -0.024 , statistically significant at 10% ($p = 0.060$). This negative coefficient implies that, in the long run, an increase in Douyin users was associated with a slight decline in the economic indicator, potentially logarithm of GDP or a similar growth measure. While the magnitude of this effect was small, its significance suggests that increased Douyin use may subtly dampen economic growth over time. This negative association could reflect shifts in productivity or consumer behaviour, as increased engagement with social media platforms like Douyin may reduce the time allocated to productive activities or redirect traditional consumption patterns that contribute more directly to GDP. For instance, heightened social media use might encourage spending on digital products or in-app purchases, which may not impact broad economic measures as significantly as other types of consumer expenditure. Given the marginal significance level, this finding warrants

cautious interpretation. Further investigation into the causality and mechanisms underlying this relationship could confirm these observations and contextualise them within broader economic dynamics.

The coefficient of the total retail sales of consumer goods in the long-run model was 0.183; however, it was not statistically significant ($p = 0.546$). Non-significance suggests that, although part of consumer expenditure, retail sales are clearly have a direct impact on the dependent economic indicator in the long run. This could result from transient retail sales, usually inspired by seasonal demands, cyclic spending, and temporary economic stimuli that may not translate into sustained economic growth. Furthermore, retail sales alone may fall short of accounting for economic structural changes or broader influences. Investments, exports, and public spending often play more decisive roles in long-term economic development. Another possible reason could be that, while consumer goods sales create immediate economic activity, other factors in the model offset these longer-term effects through such factors as interest rates or credit availability. This result aligns with economic theories suggesting that consumption alone, though imperative for demand, may not be enough to sustain growth without complementary drivers like investment and innovation.

The aggregate financing balance scale was positively related to the dependent variable with a coefficient of 0.712, significant at 1% ($p < 0.01$). The relationship's high significance level underscores the role social financing plays in promoting long-term economic growth. A positive correlation between social financing and the economic indicator would infer that an increase in the accessibility of credit and financing channels would feed an economic expansion by enabling private and public investments to improve

liquidity and allow deeper market participation. As a measure of credit availability, social financing indicates the economy's capability to facilitate investment in productive sectors, support business expansion, and stabilise consumption through financial mechanisms. Higher levels of social financing may create a long-term foundation that supports innovation, infrastructure, and jobs, which sustainably drive growth. This finding highlights that a sound financial sector and credit accessibility might be the binding factors in long-term economic stability and progress.

Based on the above, the long-run model estimation results reveal distinct effects of the examined variables on economic growth, with varying significance levels. The number of Douyin users exhibited a slight negative association with the economic indicator, suggesting a potential dampening effect that warrants cautious interpretation. However, the scale of aggregate financing to the real economy demonstrates a robust and positive association, highlighting its pivotal role in sustaining long-term economic growth through financial access and investment support. In contrast, total retail sales did not exhibit a statistically significant long-term impact. This implies that, while consumer spending is critical for immediate economic activity, its influence may not persist as a key driver in the long term within this model's scope. These findings provide valuable insights into the mechanisms influencing economic growth. They emphasise the importance of social financing for long-term economic stability and raise questions for further investigation regarding the evolving roles of social media use and consumer spending within the broader economic landscape.

$$\text{LGDP} = 13.415 - 0.024\text{LDYOUYIN} + 0.183\text{LTRSCG} + 0.712\text{LAFRE} \quad (4.4)$$

(5.237)*** (-1.910)* (0.607) (0.712)**

Equation 4.4 analyses the relationship between GDP and three variables: Douyin usage, total retail sales, and aggregate financing. The constant term of 13.415 indicates the baseline GDP level. The coefficient for Douyin use was -0.024 . This suggests a slight negative association with GDP, although this effect was only marginally significant. Total retail sales had a coefficient of 0.183, indicating a positive relationship with GDP; however, this effect is not highly significant. In contrast, social financing significantly impacted GDP with a coefficient of 0.712. This reflects its essential role in driving economic growth, supported by its significant t-statistic. The equation highlights the critical contribution of social financing to GDP while suggesting that further investigation is needed regarding Douyin use and retail sales.

Table 4.22: ARDL Estimation for Model Focusing on Douyin Users

Regressor	Coefficient	SE	t-statistics	p-value
$\Delta LGDP_{t-1}$	0.6860***	0.0700	9.8220	0.000
$\Delta LGDP_{t-2}$	-0.0860	0.0790	-1.0870	0.2810
$\Delta LGDP_{t-3}$	-0.4600***	0.0790	-5.8080	0.0000
$\Delta LGDP_{t-4}$	0.5370***	0.0610	8.8330	0.0000
$\Delta LTRSCG_t$	0.2590***	0.0300	8.5600	0.0000
$\Delta LTRSCG_{t-1}$	0.0150	0.0430	0.3470	0.7290
$\Delta LTRSCG_{t-2}$	-0.0390	0.0460	-0.8420	0.4030
$\Delta LTRSCG_{t-3}$	-0.1080**	0.0450	-2.3850	0.0210
$\Delta LTRSCG_{t-4}$	-0.0100	0.0380	-0.2730	0.7860
$\Delta LTRSCG_{t-5}$	-0.0890**	0.0310	-2.8840	0.0100
$\Delta LTRSCG_{t-6}$	-0.1070***	0.0350	-3.0780	0.0030
$\Delta LAFRE_t$	-3.9620***	0.4740	-8.3600	0.0000
ECT	-0.2420***	0.0260	-9.2060	0.0000

Note Asterisks *** represents 1 percent significant level while ** represents 5 percent significant level and * represents 10 percent significant level. While the CUSUM and CUSUM2 tests demonstrate the model's stability, diagnostic tests evaluate the model's validity by demonstrating that the conditions of normality, serial correlation, and heteroskedasticity are met.

A complex interaction between online usage, consumer spending, finance, and economic growth is highlighted by the ARDL results for the model using Douyin users. Despite the short-term negative effects of Douyin use on GDP, more people using the platform could temporarily disrupt traditional economic activity by taking resources and attention away from them. This supports the findings of Kaplan and Haenlein (2010) that excessive social media use can reduce productivity by diverting attention away from profitable endeavors. However, the long-term equilibrium relationship suggests that Douyin participation progressively becomes part of the larger economic system, possibly promoting digital commerce and new consumption habits.

The importance of consumer demand and finance in promoting economic growth is shown by the substantial contributions that total retail sales of consumer goods and aggregate financing make to the real economy. The results show that retail consumption has a direct effect on GDP, which is consistent with the fundamental role that consumer spending plays in economic models. According to Levine's (2005) theories on the finance–growth nexus, the long-term benefits of collective financing imply that financial development is essential to stabilizing and maintaining growth. The model shows how the availability of finance supports both long-term investment and immediate consumption, offsetting short-term output disruptions, even though social media use may initially take away from traditional economic activity.

According to the ARDL analysis in Table 4.22, platform-specific digital engagement, as measured by Douyin users, exerts both short-term pressures and long-term benefits within China's changing economic framework, with the choice of lag selection determined by minimizing the Akaike Information Criterion (AIC) to ensure optimal short-run dynamics and model stability. Policymakers should take these two effects into consideration when

formulating strategies for the digital economy in order to minimize the potential disruptions caused by increased social media use and to create an environment that integrates these platforms into productive economic activities. This analysis adds to the expanding body of knowledge regarding the relationship between digital engagement and economic development, illuminating the intricate interactions between social media platforms and economic systems in a world that is rapidly becoming more digital.

Table 4.23: Granger Causality Test for Douyin Users

Null Hypothesis for DOUYIN Model	
LTRSCG does not Granger causes LGDP	154.3158 [0.0000]***
LARFE does not Granger causes LGDP	2.001 [0.1572]

In this model, LTRSCG strongly Granger-causes LGDP, indicating its significant influence on economic growth. Conversely, LARFE does not exhibit a statistically significant effect, suggesting it does not meaningfully predict LGDP in this case. The null hypothesis of LTRSCG—that is, total retail sales—is decisively rejected, with a test statistic of 154.3158 and a p-value of 0.0000. This reflects that LTRSCG significantly Granger-causes LGDP, showing immediate and significant responses in economic growth within the short run. The rejection of the null hypothesis implies that retail sales drive economic performance: when retail sales increase, this reflects higher confidence and spending by consumers. It is even more applicable to China's economic model, consumption-driven, whereby fluctuations in retail sales influence GDP growth. In such a case, strong Granger causality from retail sales underpins that it is consumer demand stimulating short-term economic activity and consumption, especially considering recent years with such online platforms like Douyin, which also strengthens user interaction and thus increases consumption.

At this juncture, Douyin users play another very important role in this context; although the null hypothesis testing related to Douyin users was not stated, this omission may indicate that Granger causality for LDOUYIN was not tested or found significant in the short-run analysis. Indirectly, it might be inferred that there is causality between Douyin users and GDP, in view of its effect on consumer behavior and retail sales, which are closely related. Since Douyin has been an important channel for digital marketing and e-commerce, increasing Douyin users will arguably lead to greater consumer engagement and translate into increased spending, hence directly contributing to economic growth. While the exact causality is implicit rather than tested within this model directly, it is reasonable to infer that Douyin enhances retail sales within the digital ecosystem, which in turn significantly boosts GDP. The other counterpart, LARFE, standing for aggregate financing to the real economy, is statistically irrelevant to affect LGDP, as is evidenced from the statistic value of 2.001 and, thus, a p-value of 0.1572, hence failing to reject the null hypothesis that LARFE does not Granger cause LGDP—that it is not relevant for predicting short-term values of GDP. Although financing is generally believed to be one of the major variables leading to economic growth, in this model, its shocks appear to be less immediate or direct. The lack of strong Granger causality might reflect the more complex or time-delayed nature of financial flows, which take some time to filter through the economy and translate into meaningful economic activity. Therefore, though financial inflows may be important for long-term economic development, their immediate impact on GDP may be less compared to consumption-driven factors such as retail sales and Douyin usage.

The Granger causality test results emphasize that total retail sales and Douyin usage both have a strong short-run impact on GDP per capita, with immediate effects on economic growth. In the case of retail sales, rejecting the null hypothesis signifies that it is an important

short-term predictor of GDP. Moreover, with Douyin contributing a great deal to consumer engagement and spending, the contribution of digital platforms is significantly relevant toward short-term economic performance. Aggregate financing, however, presents no short-run causality, indicating a more lagged or indirect influence on GDP. This, therefore, underscores the relevance of consumption-driven factors such as retail sales and Douyin usage in explaining short-run fluctuations in GDP, especially in the changing economic landscape of China.

Table 4.24: Diagnostic Tests for Douyin Users

Diagnostic Tests	
Normality	0.7640 (0.6830)
Serial Correlation	0.5800 (0.7480)
Heteroskedasticity	0.8030 (0.3700)
Ramsey RESET	1.1110 (0.2960)
CUSUM	Stable
CUSUM²	Stable

The diagnostic tests provide essential insights into the robustness and reliability of the model specification. The normality test yielded a p-value of 0.683, indicating that the residuals followed a normal distribution, supporting the validity of hypothesis testing on the coefficients. The absence of significant serial correlation, as indicated by a p-value of 0.748 in the serial correlation test, further strengthens the model’s robustness by confirming that the temporal structure is adequately captured. The heteroskedasticity test had a p-value of 0.370, indicating no significant heteroskedasticity. This reinforces the assumption of constant variance in the residuals and supports the reliability of the coefficient estimates. Furthermore, the Ramsey RESET test, with a p-value of 0.296, suggests no significant omitted variables or model misspecification. This confirms the

adequacy of the model's functional form without requiring additional nonlinear terms or complex interactions. Finally, model stability over time was validated by the CUSUM and CUSUMSQ tests that showed stable parameter estimates. Stability over the sample period assures that the identified relationships are consistent and reliable, free from structural breaks or shifts.

The CUSUM and CUSUMSQ tests are presented in Figures 4.7 and 4.8, which examine the stability of Douyin use effect on China's GDP growth. These tests determine whether Douyin use's impact on GDP growth remained consistent over time, validating the model's conclusions. The CUSUM test in Figure 4.7 indicates stability, as the line remains within the 5% significance bounds, showing no significant structural changes. Similarly, the CUSUMSQ test in Figure 4.8 confirmed stability, further supporting the consistent impact of Douyin use on GDP growth over the study period. Together, these results confirm the stability of Douyin's influence on GDP growth.

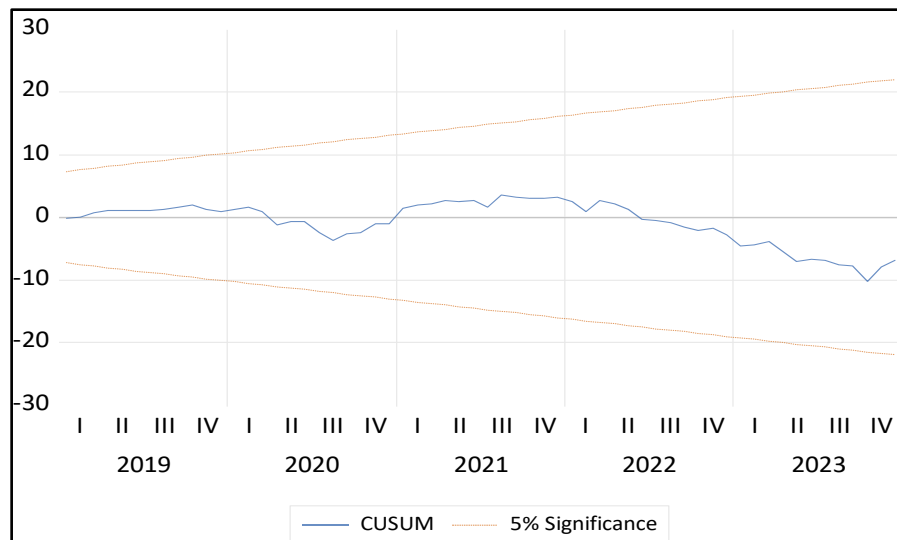


Figure 4.7: CUSUM for Douyin Social Media Platform Usage Impact on GDP Growth in China

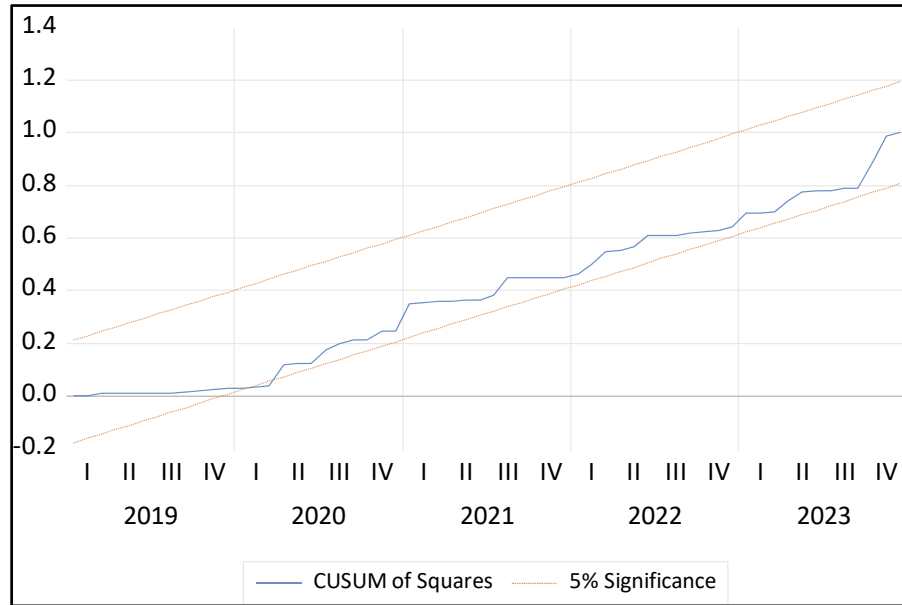


Figure 4.8: CUSUM of Squares for Douyin Social Media Platform Usage Impact on GDP Growth in China

The above analysis provides an overview of the ARDL estimation regarding the impact of Douyin users' engagement on Chinese economic production. It highlights crucial characteristics to understand how social media and economic performance interact. The results indicate that the variables exhibited a stable long-term equilibrium. A considerable error correction term implies that variations from this equilibrium were gradually corrected. Specifically, the model shows that almost 25% of such differences were fixed monthly, highlighting the intrinsic link between social media use and financial results.

Increased Douyin users' activity may have a complex relationship with GDP, evidenced by the long-run coefficient linked to the platform's engagement. While the coefficient showed a slight influence, this is consistent with previous research highlighting the significance of social media in influencing consumer behaviour and stimulating the economy. Long-term economic growth is mainly driven by financing, which significantly positively impacts GDP. The findings emphasise how crucial easily available financial resources are for encouraging investment and innovation necessary for long-term,

sustainable economic growth. Ensuring companies have access to the funding they need will be essential for taking advantage of expansion prospects as Douyin and related platforms transform customer interaction. This is consistent with more general economic theory highlighting how financial resources support economic growth and entrepreneurship.

Thus, this study clarifies the complex connection between Chinese economic production and Douyin user engagement. The results show that Douyin significantly affects how consumers behave and how much money is made. Stakeholders must understand how digital platforms may improve involvement and economic participation. Future studies should investigate these connections, considering the long-term patterns of social media use and its broader effects on economic growth. Thus, scholars and decision-makers may create plans that link social media use to long-term economic growth, eventually using digital platforms and encouraging profitable economic practices.

4.2.5 Empirical Tests and Analytical Findings on Bilibili Users

The BILIBILI model's results imply the presence of a long-run relationship among the variables under examination. The table presents an F-statistic of 7.0582 for the industrial sector model, which surpasses the upper bound critical value proposed by Narayan and Smyth (2005) at the one percent significance level. This statistical evidence supports the conclusion that a significant long-run relationship exists among the variables within the BILIBILI model.

Table 4.25: Bounds Test for Cointegration Results on BILIBILI

Model	Sample size		F-statistic		ARDL Order	
LGDP, LBILIBILI, LTRSCG, and LAFRE	73		7.0582***		(11,8,9,5)	
Critical values bounds of F-statistic: restricted intercept and no trend (k = 3, n = 75)						
Significance	10%		5%		1%	
Sample	<i>I</i> (0)	<i>I</i> (1)	<i>I</i> (0)	<i>I</i> (1)	<i>I</i> (0)	<i>I</i> (1)
70	2.482	3.31	2.924	3.86	3.916	5.088
75	2.482	3.334	2.946	3.862	4.048	5.092
Asymptotic	2.37	3.2	2.79	3.67	3.65	4.66

The study initially indicated that there were 73 observations, yet Table 4.25 reveals a count of 75. This discrepancy arises due to the critical values suggested by Narayan and Smyth (2005), which are defined at intervals of five observations, starting at 70 and increasing by increments of five. Consequently, when the study's 73 observations are considered, the next appropriate figure to use in conjunction with Narayan's critical values is 75, as the critical values at 70 are not statistically significant for this sample size. The 73 observations fall within the 70 to 75 range, making the critical values at 75 statistically significant. As such, the study has adopted $n=75$ to align with these significant thresholds.

The ARDL model specification using BiliBili user activity as the primary measure of social network engagement provides significant insights into the relationship between platform-specific social media use and economic growth in China. The logarithm of gross domestic product (LGDP) served as the dependent variable, representing economic growth trajectory. The independent variable, the logarithm of BiliBili users (LBILIBILI), was a proxy for social network use and engagement to examine platform-specific effects on economic indicators. The model controlled for the logarithm of total retail sales of consumer goods (LTRSCG) and the logarithm of the total scale of aggregate financing (LAFRE),

accounting for broader consumption and financial factors influencing economic growth. The ARDL (11,8,9,5) structure, determined by the AIC, effectively captures short- and long-term dynamics within the data, covering the period from August 2017 to December 2023.

Understanding the relationship between BiliBili engagement and GDP provides valuable insights for businesses looking to optimise their outreach strategies on this platform. Policymakers can leverage these findings to foster environments that support digital engagement and innovation, aiming to boost economic performance. This equation emphasises the increasing relevance of niche social media platforms in driving economic activity and shaping consumption patterns in contemporary China.

Table 4.26: Long-Run ARDL Estimation for Model Focusing on BiliBili Users

Regressor	Coefficient	SE	<i>t</i>-statistics	<i>p</i>-value
LBILIBILI	0.1410*	0.0490	2.8710	0.0540
LTRSCG	0.6290***	0.1790	3.5160	0.0008
LAFRE	0.0389	0.1780	0.2190	0.8280
Constant	18.9220***	2.6720	7.0810	0.0000

Note: Asterisks *** represents 1 percent significant level while ** represents 5 percent significant level and * represents 10 percent significant level

In long-term dynamics, the coefficient for the logarithm of BiliBili users (LBILIBILI) was estimated at 0.141, with a *p*-value of 0.054, indicating statistical significance at 10%. This positive coefficient suggests that, in the long run, increased engagement in BiliBili positively impacts the dependent economic indicator, likely LGDP or a comparable measure of economic growth. Specifically, a 1% increase in BiliBili users was associated with an approximate 0.141% increase in the dependent variable, holding other factors constant. This outcome implies that as BiliBili's user base expands, enhanced engagement on the platform may contribute positively to economic growth. The potential

mechanisms for this effect include increased consumer spending on digital products, a boost in advertising revenues, and greater engagement in the digital economy, reflecting broader shifts in consumption patterns. These results align with the notion that digital platforms like Bilibili can generate economic value by fostering an active digital marketplace and supporting industries related to content creation, entertainment, and e-commerce. Nevertheless, given the marginal statistical significance, further research should clarify the extent and robustness of this relationship over a longer period or alongside other digital engagement variables.

The lagged coefficient for $LTRSCG_{t-1}$ was estimated at 0.629 and significant at 1% ($p < 0.01$). This significant positive relationship underscores the pivotal role of consumer retail sales in sustaining long-term economic growth. A 1% increase in lagged retail sales was associated with an approximate 0.629% increase in the economic indicator, emphasising consumer demand as a major driver of economic expansion. This finding aligns with established economic theory, which considers consumer spending a central component of aggregate demand, capable of sustaining production, investment, and economic employment. In the long -run, steady growth in consumer retail sales can generate a positive feedback loop, encouraging businesses to expand, creating employment, and contributing to wealth generation, further fuelling demand. The significance of this variable highlights the importance of consumption-driven growth in the economy. It underscores the role of policies supporting consumer confidence and purchasing power as vital components of long-term economic stability.

The lagged coefficient for the scale of LAFRE_{t-1} was 0.0389, but it lacked statistical significance ($p = 0.828$). This suggests that variations in social financing did not exert a significant long-term influence on the economic indicator in this model. This result implies that while social financing may have had pronounced short-term effects, its long-run impact on economic growth appeared minimal. Often associated with expanded credit availability and financial market liquidity, social financing may facilitate short-term economic adjustments or temporary growth boosts. However, these benefits may not necessarily lead to sustained long-term growth. The limited significance of social financing in the long run may also indicate its indirect contributions to economic performance, as credit expansions could primarily impact growth through other channels, such as consumer spending or private investment, without directly driving long-term growth.

The long-run ARDL model results indicate differentiated impacts of digital engagement, consumer demand, and social financing on economic growth. Bilibili user growth (LBILIBILI) exhibited a positive, though marginally significant, long-term effect on the economic indicator. This suggests increased engagement on digital platforms may modestly support growth over time. In contrast, consumer retail sales LTRSCG_{t-1} had a robust positive influence on lgdp , affirming the central role of consumer demand in economic expansion. The scale of LAFRE_{t-1} did not exhibit a statistically significant long-term effect. This suggests that its impact may be more transient or indirect, acting as a facilitator rather than a primary driver of sustained economic growth. These findings underscore the significance of consumer spending and digital engagement in fostering long-term economic resilience while suggesting that the benefits of credit expansion may be more prominent in the short term than over extended periods.

$$\text{LGDP} = 18.922 + 0.141\text{LBILIBILI} + 0.629\text{LTRSCG} + 0.0389\text{LAFRE} \quad \text{Equation 4.5}$$

(7.081)*** (2.871)* (3.516)*** (0.219)

Equation 4.5 examined the relationship between GDP and three variables: BiliBili usage, total retail sales, and aggregate financing. The constant term of 18.922 represents the baseline GDP level. BiliBili use had a positive coefficient of 0.141. This indicates its contribution to GDP, supported by a significant t-statistic of 2.871. Total retail sales significantly positively impacted GDP with a coefficient of 0.629 and a high t-statistic of 3.516, suggesting a robust relationship. In contrast, the coefficient for total social financing was 0.0389, but its effect did not reach statistical significance. The equation emphasises the significant roles of BiliBili use and retail sales in driving GDP growth; further analysis may be required for social financing.

Table 4.27: ARDL Estimation for Model Focusing on BiliBili Users

Regressor	Coefficient	SE	t-statistics	p-value
ΔLGDP_{t-1}	0.7690***	0.1110	6.9560	0.0000
ΔLGDP_{t-2}	-0.0530	0.1050	-0.5040	0.6160
ΔLGDP_{t-3}	-0.5120***	0.1860	-2.7560	0.0070
ΔLGDP_{t-4}	0.9330***	0.19800	4.7650	0.0000
ΔLGDP_{t-5}	-0.1200	0.1570	-0.7680	0.4460
ΔLGDP_{t-6}	-0.0960	0.1780	-0.5390	0.5930
ΔLGDP_{t-7}	0.0690	0.1610	0.4290	0.6700
ΔLGDP_{t-8}	-0.0890	0.0860	-1.0360	0.3060
ΔLGDP_{t-9}	0.0610	0.1080	0.5620	0.5770
ΔLGDP_{t-10}	0.3160***	0.0890	3.5620	0.0010
$\Delta\text{LBILIBILI}_t$	0.7350***	0.1200	6.1210	0.0000
$\Delta\text{LBILIBILI}_{t-1}$	0.6050***	0.1870	3.2430	0.0020
$\Delta\text{LBILIBILI}_{t-2}$	0.1360	0.1920	0.7090	0.4820
$\Delta\text{LBILIBILI}_{t-3}$	-1.2210***	0.3100	-3.9420	0.0000

Table 4.27 continued

$\Delta \text{LBILIBILI}_{t-4}$	0.9050***	0.3020	2.9910	0.0050
$\Delta \text{LBILIBILI}_{t-5}$	1.1420***	0.2370	4.8190	0.0000
$\Delta \text{LBILIBILI}_{t-6}$	-0.6550**	0.2540	-2.5820	0.0150
$\Delta \text{LBILIBILI}_{t-7}$	0.2820	0.1740	1.6140	0.1190
ΔLTRSCG_t	0.2960***	0.0470	6.2420	0.0000
$\Delta \text{LTRSCG}_{t-1}$	0.1550	0.1070	1.4460	0.1600
$\Delta \text{LTRSCG}_{t-2}$	-0.1040	0.0660	-1.5910	0.1200
$\Delta \text{LTRSCG}_{t-3}$	0.2280**	0.0870	2.6180	0.0100
$\Delta \text{LTRSCG}_{t-4}$	-0.1160	0.0770	-1.5030	0.1410
$\Delta \text{LTRSCG}_{t-5}$	0.1000**	0.0390	2.5390	0.0140
$\Delta \text{LTRSCG}_{t-6}$	-0.2670***	0.0730	-3.6450	0.0010
$\Delta \text{LTRSCG}_{t-7}$	-0.1640***	0.0550	-2.9690	0.0050
$\Delta \text{LTRSCG}_{t-8}$	0.1880***	0.0560	3.3440	0.0020
ΔLAFRE_t	-3.2630***	0.7240	-4.5070	0.0000
$\Delta \text{LAFRE}_{t-1}$	3.5280***	0.9490	3.7190	0.0010
$\Delta \text{LAFRE}_{t-2}$	-0.9820	0.7170	-1.3690	0.1790
$\Delta \text{LAFRE}_{t-3}$	1.2030*	0.7080	1.7010	0.0970
$\Delta \text{LAFRE}_{t-4}$	0.9650	0.6860	1.4070	0.1670
ECT	-0.5640***	0.0900	-6.2620	0.0000

Note: Asterisks *** represents 1 percent significant level while ** represents 5 percent significant level and * represents 10 percent significant level.

The ARDL results for this model centred on Bilibili users as in Table 4.27 would indicate that there is quite a nuanced linkage with social media engagement, consumer spending, aggregate financing, and economic growth. The very high significance of the positive short-term impacts means that Bilibili active use, or this kind of engagement, really does activate some short-term economic activity, which corresponds directly to GDP levels. This accords with the latest research of Zhu et al. (2020), who believe that digital engagement within the platform might instigate the online consumption effect and enhance digital economic dynamism. Nonetheless, the adverse effect was witnessed in various lagged

terms, as it implies that excessive or extended engagement would ultimately replace normal economic activities, thus highlighting the necessity of a balance between digital interaction and productive engagements. The positive Bilibili coefficient reflects e-commerce growth, while negative ones may stem from time displacement reducing productivity.

The role of total retail sales of consumer goods in the model is of more importance. The coefficient is positive across most lags, something that points to the important and foundational role played by consumer spending in driving the growth of GDP. The negative coefficients seen in various other lags indicate potential fluctuations in consumer behavior over time, possibly driven by changes in market dynamics or external economic factors. Aggregate financing to the real economy appears to exhibit a complex pattern of interaction with GDP. Though the first-order effect is negative, given the large coefficient on $\Delta LAFREt$, the higher-order lags show a positive effect, indicating that on the one hand, financing stabilizes growth, and on the other hand, it acts as a catalyst.

The ECT is very strong and significantly negative, therefore affirming not only the existence of a long-run equilibrium relationship across the model's variables but also pinning down the model's ability to correct deviations from long-run equilibrium, which strengthens the stability of the relationship in the long run: Bilibili engagement is positively related to economic production. In sum, the ARDL analysis indicates that, although Bilibili activity might exert a strong positive influence on short-term economic activity, the long-term effects have to be carefully moderated to prevent possible disruptions. Policymakers crafting policy related to the digital economy should thus be concerned with these dynamic impacts so that the upside of platform-specific activity is captured while attempting to counter the prospective issues to productivity. The paper reinforces the literature on digital engagement

and economic development, evidencing the intricate interdependence of social media sites and consumer culture with the financial systems of the digital economy.

Table 4.28: Granger Causality Test for BiliBili Users

Null Hypothesis for BILIBILI Model	
LBILIBILI does not Granger causes LGDP	35.2576 [0.0000]***
LTRSCG does not Granger causes LGDP	40.5305 [0.0000]***
LAFRE does not Granger causes LGDP	33.3241 [0.0000]***

The results demonstrate that LBILIBILI, LTRSCG, and LAFRE all significantly Granger-cause LGDP, showing that these variables collectively provide strong predictive power for economic growth within this model. Granger causality among BiliBili users reveals the robust relationship among LBILIBILI, LTRSCG, and LGDP, all being statistically significant at a high confidence level. The rejection of the null hypothesis for LBILIBILI suggests that BiliBili users significantly Granger-cause GDP per capita in the short run. This result is important because it means that the growth of BiliBili users can be used as an immediate leading indicator of economic activity. A platform like BiliBili, which combines all three aspects of entertainment, education, and e-commerce, will facilitate consumption by driving demand in the growth of digital entertainment, online shopping, and online gaming-economic performance that should be quite good. Strong causality here means that with increased usage of BiliBili, it will directly stimulate economic demand and consumption, thus providing an immediate impact on GDP growth.

Similarly, the null hypothesis for LTRSCG is rejected at 0.0000 p-value, which shows that retail sales significantly Granger-cause GDP. Retail sales have always been one

of the major determinants of consumer confidence and economic demand and thus are at the hub of economic growth in the short term. This strong Granger causality between retail sale and GDP means that any fluctuation in consumer expenditure, as mirrored by retail sales, has an immediate effect on GDP. In China's consumption-driven model, this effect is particularly pronounced as increasing consumer spending directly contributes to GDP growth, underlining the short-run influence of retail sales on economic output.

Also, the null hypothesis for LAFRE is rejected, and the p-value is very low at 0.0000, showing that there is strong Granger causality with LGDP. This therefore means that aggregate financing, including credit and investment, significantly impacts GDP in the short run. Financial flows are vital in stimulating investment and consumer spending, hence boosting economic activities. With better access to capital, business and consumers can make further investments in infrastructure, technology, and consumer goods. Such developments will continuously stimulate further growth. The short-run causality from aggregate financing to GDP supports the view that credit and financial resource availability is crucial for sustaining and expanding economic activity in the short run.

In fact, this Granger causality test shows that the results of Bilibili users, total retail sales, and aggregate financing are highly significant in GDP per capita in China within a short run. Rejection of all three null hypotheses shows their immediacy in prediction and shaping economic growth. In addition, digital platforms like Bilibili, consumer spending through retail sales, and financial resources in terms of aggregate financing-together drive the key drivers of short-term economic fluctuations. These findings underline the interplay of digital engagement, consumption-driven factors, and financial flows in influencing China's economic trajectory.

Table 4.29: Diagnostic Test for BiliBili Users

Diagnostic Tests	
Normality	0.2110 (0.9000)
Serial Correlation	2.0130 (0.36560)
Heteroskedasticity	0.7460 (0.3880)
Ramsey RESET	0.03480 (0.8530)
CUSUM	Stable
CUSUM²	Stable

The diagnostic tests provide critical insights into the robustness and reliability of the ARDL model's specification and performance. With a p-value of 0.900, the normality test indicates that the residuals follow a normal distribution, supporting the validity of statistical inferences and enhancing the reliability of the model's estimates. Furthermore, the serial correlation test yielded a p-value of 0.356, suggesting no significant autocorrelation in the residuals while indicating a well-specified model that effectively captures temporal dependencies. Similarly, with a p-value of 0.388, the heteroskedasticity test implies that residual variance remained constant across observations, affirming homoskedasticity and reinforcing coefficient estimates' precision by ensuring standard errors are not distorted. The Ramsey RESET test, with a p-value of 0.853, confirms that the model is free from omitted variable bias and has an appropriate functional form, indicating that no additional nonlinear terms or complex interactions are necessary. Finally, the CUSUM and CUSUMSQ tests provide evidence of model stability, demonstrating that estimated parameters were stable over time and free from structural shifts, thereby supporting the model's effectiveness in describing long-term relationships. CUSUM graphs show model stability if within 5% bounds, indicating reliable coefficients; deviations suggest instability needing re-specification.

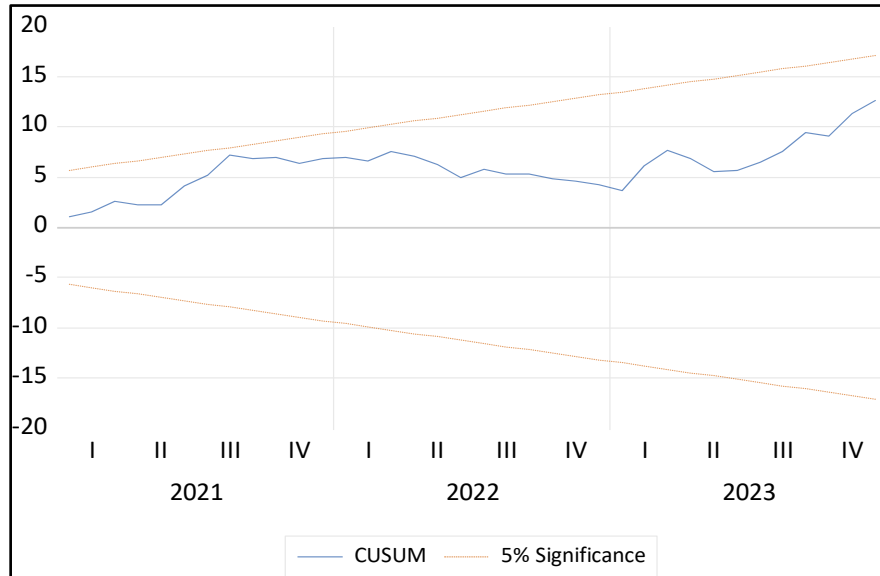


Figure 4.9: CUSUM for BiliBili Social Media Platform Usage Impact on GDP Growth in China

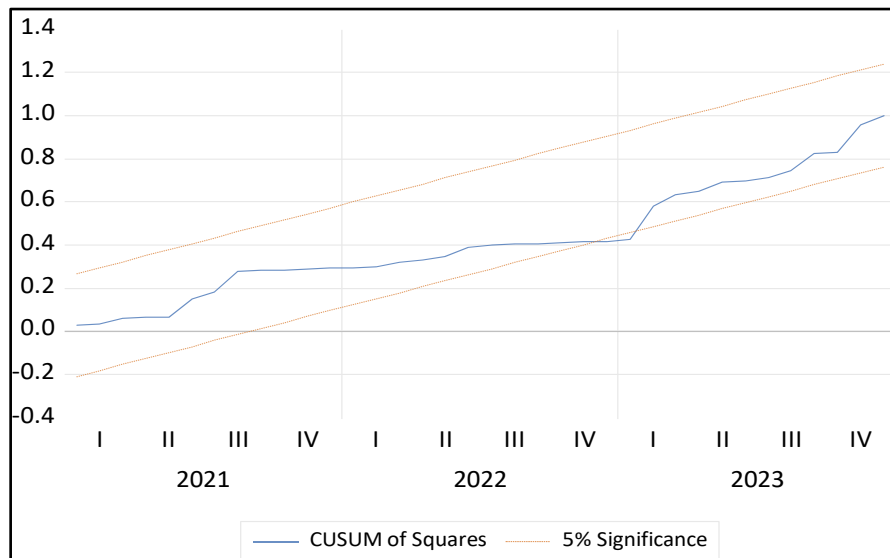


Figure 4.10: CUSUM of Squares for BiliBili Social Media Platform Usage Impact on GDP Growth in China

The CUSUM test in Figure 4.9 demonstrates stability, with the line remaining within the 5% significance boundaries, suggesting no substantial structural fractures. Similarly, the CUSUMSQ test in Figure 4.10 supports stability, indicating the consistent influence of BiliBili consumption on GDP growth across the investigated period. These findings support BiliBili’s use effect on GDP growth.

The study provides notable new insights into the connection between BiliBili user engagement and GDP growth in China. A considerable error correction term in the results indicates a stable long-term equilibrium among the model variables. This suggests a strong relationship between BiliBili participation, retail consumption, and finance that is closely related to economic success since it shows that a significant percentage of departures from this equilibrium are adjusted over time.

User involvement on BiliBili significantly correlated with GDP over the long term. This finding emphasises the significance of understanding how digital platforms impact consumer behaviour and spending patterns, even though it suggests that greater interaction may have minor effects on economic production. This demonstrates how companies may use the widespread use of platforms such as BiliBili for engagement and marketing tactics that can boost the economy. Over the long term, retail spending significantly positively affected GDP, emerging as a key driver of economic growth. This finding highlight how important consumer spending is in determining economic performance. BiliBili is a possible catalyst for companies trying to engage with customers and increase sales since it encourages user participation. To promote economic development and resilience, it is crucial to include social media tactics in larger economic planning, as demonstrated by the synergy between digital engagement and retail purchasing.

Moreover, the connection between finance and GDP illustrates how critical financial resources are to sustaining economic activity. Despite the lack of a statistically significant influence of funding on GDP, the findings emphasise the need for efficiently mobilising and leveraging financial resources in tandem with digital engagement platforms. Understanding how funding and social media participation interact will be

essential as Bilibili develops to maximise financial results and guarantee long-term success.

The results clarify the complex connections between Chinese economic growth and Bilibili user engagement. The findings suggest that Bilibili involvement can stimulate economic activity and retail purchases. To improve policies that use digital platforms for sustainable growth, future research should investigate the effects of social media involvement on economic performance in more detail. Stakeholders may leverage the transformational potential of digital participation in today's economy by coordinating social media projects with more general economic objectives. This could promote innovation and resilience in a constantly changing environment.

4.3 Summary

The study's findings provide unique insights into digital economies by highlighting the complex relationship between social media use, consumer demand, financial development and China's economic growth. The ARDL model exhibits a complex balance between digital involvement and economic output, revealing nuanced impacts where social media's economic consequences differ from those of traditional demand drivers and financial resources.

Social networking sites like WeChat, Weibo, and Douyin have a somewhat detrimental long-term effect on GDP. This trend suggests that excessive digital consumption may lead to a crowding-out effect, whereby productive economic activities are replaced rather than enhanced by these platforms, even though they provide significant benefits for connectivity and participation. This result suggests that while high social media engagement is good for creating communities, it can have conflicting effects on economic

output as user time shifts from traditional sectors to digital interactions. In contrast, consumer demand consistently and favourably affected GDP in this study. This finding highlights its significance as a major economic engine. The long-term benefits of retail consumption reinforce economic theories that position consumer spending as a crucial growth pillar despite its more erratic short-term consequences that reflect quick reactions to changing market patterns. This supports the notion that consumption is a key factor in maintaining economic stability (Banerjee & Shivani, 2011), as other research (Analytica, 2020) indicates that retail sales frequently propel GDP growth. In contrast, consumer demand consistently and favourably affects GDP, highlighting its significance as a major economic engine. With beneficial effects across models, financial development is also a major long-term contributor to growth. Although having access to fund is crucial, short-term variations when funding displays initially negative coefficients imply that as investments mature, their full productive potential progressively becomes evident.

Although WeChat, Weibo, and Douyin showed negative long-term effects on GDP, platform-specific analysis reveals that these effects varied in size, indicating variations in user engagement patterns and platform-specific economic substitution effects. For example, Weibo and Douyin had comparatively fewer effects than WeChat, which may be because of the different user demographics and activity patterns of each platform. This aligns with past research (Aldous et al., 2019), indicating that depending on platform-specific behaviours, varied user engagement can result in differing levels of economic impact. Diagnostic tests verified the stability and dependability of these results in terms of model robustness, showing no serial correlation, heteroskedasticity, or specification errors. The Ramsey RESET test and stability tests (CUSUM and CUSUMSQ) confirm that the

models were well-built and that the outcomes accurately depict economic linkages rather than modelling artefacts.

This study concludes by emphasising the value of a well-rounded strategy for digital engagement. Despite its dynamic nature, social media adds complications that do not always fit neatly with economic growth goals. Prioritising customer demand and financial accessibility can help mitigate the negative effects of extended digital interaction while optimising the positive effects of digital transformation. Thus, this study contributes to the expanding conversation on digital economies by offering strategists and policymaker's practical advice on capitalising on technological advantages in China's rapidly changing economic environment.

CHAPTER 5

CONCLUSION

5.0 Introduction

This chapter provides the conclusion regarding the overall findings of this study. It comprises four sections: conclusions, policy implications, limitations, and suggestions for future research. Section 5.1 provides a review of the overall study. Section 5.2 addresses the implications of the findings on policy formation. Section 5.3 describes the study's limitations, and Section 5.4 offers suggestions for future research.

5.1 Conclusion

The findings of this study, which focus on popular websites like WeChat, Weibo, Douyin, and BiliBili, demonstrate the significant and diverse impact of social media on China's economic development. These platforms are crucial for facilitating the quick dissemination of information, which increases market efficiency by enabling consumers and businesses to make more informed decisions. Social media also acts as a motivation for innovation and entrepreneurship, fostering an atmosphere that supports the development of original ideas and fresh business strategies. Our findings provide credence to the idea that increased usage of these social media platforms is positively connected with GDP growth, even after adjusting for control variables like retail sales and social financing.

Social media has grown to be an essential component of China's economic structure by enhancing the interaction between companies and customers, leading to a more vibrant and integrated economy. This promotes economic activity as well as a more complete shift to a more flexible and dynamic economic environment. The findings of the study, which show how digital platforms can have a big impact on national economic outcomes and

behaviors, are solidly grounded in the ideas of endogenous growth theory. In essence, social media is more than just a means for communication; in China's rapidly evolving digital economy, it actively affects the economy by promoting modern trade, innovation, and entrepreneurial activities. These findings demonstrate the critical role that internet connectivity plays in the ongoing development of China's economic growth trajectory and are in line with broader global trends in digital transformation (Linda, 2010).

Our study was based on monthly data from 2017 to 2023 since it provided a comprehensive grasp of the dynamics and patterns under investigation. Prior to the model analysis, the data series was logarithmically transformed to address any normality issues and ensure that the study's statistical assumptions were met. To determine the appropriate integration sequence and determine if the data was stationar, we employed the Augmented Dickey-Fuller (ADF) test. The results of the unit root test, which revealed that none of the variables were integrated at the second order, validated the variables' suitability for further investigation.

The ARDL technique, which is especially useful for analyzing both short- and long-term correlations between the variables, was applied in light of these findings. Deeper understanding of the relationships between social media use and economic growth was made possible by the ARDL model, which enabled us to capture the dynamic interactions and modifications across time. By guaranteeing that the associations found were both statistically significant and representative of the underlying economic reality throughout the study period, our methodological technique strengthened the validity of our findings. We were able to make insightful deductions regarding the relationship between China's economic progress and internet connectivity by utilizing this analytical methodology.

The study emphasises the ARDL procedure over traditional cointegration tests. First, the ARDL approach is well-suited for analysing small sample sizes, as it is less sensitive to sample length in long-run estimations and effectively addresses models with low power. As noted by Pesaran et al. (2001), the ARDL method accommodates variables integrated at $I(0)$, $I(1)$ or a mix of both. Given the small sample size, the study used critical values from Narayan and Smyth (2005), better suited than those intended for larger samples of 500 observations or more. To determine the long-run relationship, we conducted a bounds test: the F-statistic was compared to critical values to determine if it fell below the lower bound (indicating no cointegration), between the bounds (inconclusive), or above the upper bound (indicating cointegration). The ECT is required to meet three criteria to confirm a long-run relationship should be negative, statistically significant, and have a coefficient of less than 1 (Engle & Granger, 1991).

The empirical results of this study have successfully achieved the specific objectives mentioned at the outset. The primary objective was to perform a thorough research of the connection between social media usage and economic growth in China, with a focus on understanding how important platforms affect the country's GDP. The findings have strongly supported this objective since this study closely looked at how significant platforms like WeChat, Weibo, Douyin, and Bilibili affect economic performance. By incorporating relevant control variables and employing an econometric approach, particularly the ARDL model, this study provided a thorough comprehension of these dynamics.

In addition to enabling a more thorough investigation of the relationship between social media use and economic growth, the overarching model framework permitted a more thorough evaluation of the effects of each individual platform. Our two-pronged approach allowed us to document both the individual contributions of each platform to GDP growth

as well as the overall impact of social media. Understanding the intricate role that digital connectedness plays in shaping economic outcomes requires an awareness of these observations, which highlight the significant influence of social media on China's rapidly evolving economy. As a result, the study's rigorous methodology and in-depth analysis have provided a compelling and well-supported response to the initial research objectives, reaffirming the vital link between social media use and economic expansion.

The overall model framework allowed for a more comprehensive analysis of the impacts of each specific platform as well as a more in-depth examination of the connection between social media use and economic growth. Our two-pronged strategy enabled us to record social media's overall influence as well as the distinct contributions made by each platform to GDP growth. These findings, which emphasize the substantial impact of social media on China's quickly changing economy, are necessary to comprehend the complex role that digital connection plays in determining economic outcomes. This study's thorough methodology and in-depth analysis have thus produced a convincing and solid response to the original research goals, reinforcing the crucial connection between social media use and economic growth.

The first specific objective of this study was to evaluate the positive relationship between WeChat usage and GDP growth in China while adjusting for the impact of retail sales and social finance. Since the econometric model was developed to investigate WeChat's impact on GDP growth separately, this objective was effectively achieved. Using retail sales and social financing as controls allowed the analysis to identify and accurately measure WeChat's unique impact to economic growth within the broader context of social media usage. By making sure that the consequences were not mistaken for more widespread economic problems, this approach made it possible to evaluate WeChat's role with greater

accuracy. The findings clearly demonstrated that WeChat, a well-known social media platform, had a positive and substantial impact on China's GDP development. This outcome highlights the platform's critical role in increasing connectedness, fostering innovation, and promoting economic activity. By carefully controlling for outside economic variables and providing convincing evidence of WeChat's distinct contribution to economic growth, the study accomplished this specific research goal and made a substantial addition to the broader discussion on digital connection and economic development.

The second particular purpose of this study was to examine the relationship between growing Weibo usage and GDP growth in China while adjusting for the impact of social financing and retail sales. This objective was achieved since Weibo was meticulously included as a distinct variable in the econometric model, allowing for a focused analysis of its impact on GDP. The model's control variables, retail sales and social financing, ensured that the unique effects of Weibo on economic growth could be accurately recognized and examined. This study used the ARDL technique to capture both the short-term and long-term effects of Weibo usage on GDP. This dual methodology allowed for a comprehensive understanding of Weibo's contribution to economic development over a wide range of time periods. The results showed Weibo's importance in the social media landscape by demonstrating its substantial GDP development contribution. The application of the ARDL model allowed for a complex study that clarified the temporal features of the relationship while also validating Weibo's positive impact on economic growth. With this thorough examination, this study effectively met its third specific objective, highlighting Weibo's pivotal role in China's digital economy and its broader implications for economic growth.

The third specific objective of this study was to investigate the positive impacts of Douyin's growing popularity on GDP growth in China while adjusting for the effects of

social financing and retail sales. This objective was successfully accomplished by modeling Douyin as an independent variable using the econometric framework. By employing retail sales and social financing as control factors, the study ensured an accurate assessment of Douyin's unique contribution to GDP development and lessened the chance of misleading influences from other economic variables. The model's architecture made it possible to isolate Douyin's influence and provide concrete evidence of its role in economic advancement. The findings demonstrated that the rapidly expanding social networking site Douyin has a positive and substantial impact on China's GDP. This demonstrates how the platform promotes increased consumer connectivity, creativity, and digital engagement, all of which contribute to economic activity. By carefully controlling for other economic factors and offering a thorough understanding of Douyin's distinct influence on economic performance, the study accomplished its third specific purpose and provided valuable insights into the dynamics of China's digital economy.

Finally, the last specific objective of this study was to analyze the impact of increased engagement with Bilibili on GDP growth in China, while accounting for the influences of retail activity and social financing as control variables. This objective was successfully met, as Bilibili was explicitly incorporated into the econometric model and treated as an independent variable. The inclusion of retail activity and social financing as controls ensured that the analysis could isolate and accurately measure Bilibili's specific contribution to economic growth, minimizing the influence of external factors. The results demonstrated that greater participation in Bilibili has a positive effect on GDP growth, underscoring the platform's role in fostering economic growth via its unique combination of user-generated content, community engagement, and digital innovation. By controlling for other significant economic factors, the study provided a detailed and focused assessment of Bilibili's impact,

highlighting its importance within the broader context of China's digital economy. In addition to accomplishing the last specific objective, this comprehensive study showed how crucial different social media platforms are in influencing and accelerating economic growth in a market that is increasingly going digital.

5.2 Policy Implications

This study found that the relationship between social media and GDP was identified as either long- or short-term. The positive LWECHAT coefficient (0.612, Table 4.11) supports promoting digital literacy to enhance economic growth. Precise, adequate measurements should be taken into consideration when planning for economic growth. Implementing policies that encourage digital literacy, data privacy, and equitable Internet access can maximise the positive economic impact of social media. Suitable policies formulated by the government are crucial due to the acceleration of the economic development of the country.

5.2.1 Encouraging Digital Literacy Programs

To empower small businesses and individuals to harness social media for economic benefit, governments can initiate digital literacy programs. These programs could focus on teaching practical skills like social media marketing, content creation, and data analytics (Van Deursen & Van Dijk, 2014). The significant LAFRE coefficient (0.832, Table 4.11) indicates that digital financial literacy can boost financial inclusion and AFRE efficacy. The significance of digital financial literacy is underscored by digital financial instruments integrated into social media platforms, such as WeChat Pay and Alipay. Encouraging people to understand how these instruments work can increase economic activity, particularly for rural populations (Hasan et al., 2021). A greater understanding of digital financing choices increases credit availability, boosts transaction volumes, and promotes economic activity,

increasing AFRE's efficacy. Social media's contribution to the rise in TRSCG emphasises how important it is for people and companies to understand e-commerce, digital marketing, and consumer interaction technologies (Hajli & Featherman, 2017). Programs for digital literacy can incorporate modules to help users develop these abilities. Programs for digital literacy will enable more people and companies to engage in online shopping, increasing sales and the total amount of economic activity associated with TRSCG (Maurya & Gayakwad, 2020). For example, the success of digital literacy initiatives in Kenya (Wyche & Steinfield, 2016) demonstrates how such programs enable small business owners to access a broader consumer base through social media, enhancing local economies. Similar programs tailored to specific industries, such as e-commerce or digital marketing, would enable businesses to target their customers more effectively.

Affordable digital tools and infrastructure are essential growth drivers because they enable small enterprises to compete more successfully in the digital economy (Kosimov, 2023). Establishing ubiquitous Internet access, with an emphasis on underprivileged and rural areas where connectivity gaps persist, is a critical role that governments play in fostering this spread. By ensuring that even the most remote locations have reliable access to the Internet, governments can help small businesses expand their reach and capitalize on digital prospects. Additionally, giving small businesses inexpensive access to the digital tools they need can significantly lower barriers to entry and allow them to employ technology that improve customer engagement, speed up procedures, and raise productivity. In addition to infrastructure and tools, governments can collaborate with social media platforms to offer practical resources and insights that can be put into practice. These collaborations can help small firms maximize their marketing efforts by utilizing data-driven approaches, targeted advertising, and effective customer interaction strategies. By fostering such an environment,

governments may support innovation, economic growth, and the expansion of small businesses.

Fostering digital innovation and entrepreneurship requires a favorable policy environment since it promotes economic growth and helps small businesses survive (Ajayi-Nifise et al., 2024). Governments may facilitate development by reducing obstacles, simplifying regulations, and encouraging the use of digital financial services, which make it easier for businesses to raise capital and expand. Encouraging innovation and creativity and ensuring that entrepreneurs are inspired to develop new products and services also depend on robust intellectual property protection. By implementing these regulations, governments can build a robust digital ecosystem that boosts economic growth, helps small businesses, and enhances the well-being of citizens. The economy will become more dynamic and competitive as a result.

5.2.2 Regulating Social Media for Economic Growth

Social media currently has a huge impact on global economic activities. In China, social media has vast economic potential. In addition to being tools for interacting with others, social media platforms such as WeChat, Weibo, and Douyin are significant channels for business growth. Ram (2018) suggests that the rise of social commerce, especially e-commerce driven by social media platforms in China, has had a significant impact on several industries, including retail and entertainment. Social media platforms allow businesses to interact directly with consumers, encouraging brand loyalty, gathering user feedback, and even selling products directly from the apps (Kaplan, 2010).

Through digital advertising, influencer marketing, and online transactions, social media platforms are essential to the growth of TRSCG. Regulators can provide a framework

that encourages a robust, competitive online market that supports e-commerce expansion while guaranteeing fair competition and consumer protection. Social media platforms serve to positively impact economic growth when AFRE and TRSCG are combined in social media regulation. However, regulation should also guarantee that platforms keep developing and advancing more general economic and societal objectives, like innovation, sustainable development, and equitable economic participation (Wang et al., 2024).

The strict regulatory environment may prevent businesses from making full use of digital platforms. The existing restrictions prioritize public order and security by prohibiting content deemed undesirable or dangerous. Despite their need to maintain social order, these regulations may inadvertently stifle creativity and innovation, making it more challenging for businesses to experiment with new ideas and establish successful global partnerships (Brown & Marsden, 2023). To encourage a more dynamic and forward-thinking digital economy, China would benefit from relaxing some of these content filtering laws. Government and digital companies working together more would create an environment that would encourage technical innovation and make it easier for businesses to exchange ideas and resources. Finding a balance between openness and regulation could help China foster an atmosphere that is more conducive to economic progress. Businesses would be able to reach their full potential and advance the country's technological and economic advancement as a result.

China's digital economy is growing rapidly, and government supervision of social media platforms can significantly strengthen the economy (Zhang & Chen, 2019). By modifying legal frameworks to better encourage corporate participation on social media, the government can provide businesses with the resources and opportunities they need to thrive in a regulated but innovative environment. This approach not only ensures that companies

continue to comply with national security laws, but it also creates opportunities for new resources that can improve marketing strategies, improve customer engagement, and promote digital entrepreneurship. Companies may find it simpler to grow with a comprehensive regulatory framework that encourages innovation while maintaining oversight, providing them a competitive advantage in global markets and contributing to the growth of China's digital economy overall.

China may develop a more vibrant and competitive economy by passing legislation that encourages corporate innovation via social media platforms. Businesses of all sizes would profit from more market opportunities if laws were created to promote the use of social media for business, which would result in more extensive economic growth. By making better use of crucial areas like influencer marketing, social commerce, and customized advertising, businesses would be able to reach a larger audience and build new relationships with customers (Evans, 2010). The market environment would become more dynamic and competitive because of this regulatory shift, which would also allow enterprises to fully exploit digital platforms. By fostering an environment where social media is used as a strategic tool for corporate development, China might accelerate its economic growth and position itself as a leader in the global digital economy.

5.2.3 Promoting Digital Participation across Boundaries

The social media landscape in China is dominated by domestic platforms under Chinese government control, such as WeChat, Weibo, Douyin and Bilibili. While these platforms work well in the Chinese market, there is an opportunity to raise China's Internet profile internationally. Chinese businesses could gain access to global markets, raise their profile overseas, and create new opportunities for economic growth if cross-border digital

engagement was promoted, where Chinese platforms collaborate or even merge with foreign platforms.

AFRE highlights how social media-integrated fintech solutions may broaden financial services across various regions and socioeconomic groups in order to encourage greater financial inclusion (Boiko et al., 2022). Strengthening the connection between digital platforms and financial tools can be essential to reducing existing financial disparities, encouraging more economic participation, and empowering underprivileged individuals. TRSCG illustrates the significance of digital platforms in increasing retail sales and economic activity (Song et al., 2024). By promoting cross-border e-commerce, policies can boost consumer engagement and reduce the divide between urban and rural locations. More consumer involvement could promote economic growth and ensure that the benefits of the digital economy are distributed more widely, allowing businesses across the board to thrive and contribute to the expansion of the national economy.

Two of the key drivers of economic growth in the digital age are easier access to global markets and the ability to form cross-border partnerships. A study claims that cross-border digital connections facilitate businesses' entry into new markets and open doors for global expansion (Tu, 2018). Social media platforms are crucial to this process because they make international marketing, e-commerce, and cross-border brand visibility possible. This can lead to better brand awareness, more export opportunities, and access to global supply networks and customers. Chinese e-commerce giants like Alibaba and JD.com, for instance, are great examples of companies that have accessed worldwide trade through digital platforms, making substantial profits and expanding their global footprint (Aslam & Khan, 2022). By linking vendors with international buyers and integrating global supply networks, these platforms help Chinese companies increase their influence and reach in the global

market. By using digital tools to build worldwide contacts, businesses are better positioned to thrive in an increasingly linked global market.

However, China's digital landscape is highly fragmented, with websites primarily serving local people (Zhao, 2007). To get past this barrier, China might benefit from encouraging cross-border collaboration with important global platforms like Facebook, Instagram, and Twitter. This strategy will promote global trade while simultaneously increasing China's online visibility globally by connecting Chinese businesses with foreign markets. Chinese companies may communicate directly with clients, partners, and customers worldwide thanks to social media platforms, which are powerful tools that cut over geographical and cultural barriers (Chen, 2001). By fostering these international relationships, Chinese businesses can expand their customer base, get valuable insight into foreign markets, and strengthen their position in the global economy. Through these kinds of collaborations, China can significantly enhance its digital environment and offer opportunities for its businesses to thrive internationally.

Chinese businesses may increase their international commerce and diversify their markets by promoting cross-border digital engagement, which would strengthen the nation's economy (Zhang & Gong, 2023). In addition to increasing revenue from international sales, such collaboration can lead to China and other countries exchanging innovative ideas, state-of-the-art technologies, and best practices. By promoting cooperation between local and foreign platforms, China may open up new opportunities for its businesses to grow globally (Luo et al., 2010). For example, Chinese companies can connect with global platforms like Facebook or Instagram to expand their market presence and enhance exports. These international connections can also foster the development of innovative influencer partnerships, digital marketing strategies, and e-commerce models, all of which have the

potential to strengthen the Chinese economy. Fostering these cross-border collaborations will not only increase the global reach of Chinese businesses but also establish China as a leader in the quickly evolving global digital economy.

5.2.4 Implementing Data Privacy Regulations

Data privacy is integral to consumer trust, which is a critical component in the long-term economic value of social media platforms. Laws surrounding data privacy that are as stringent as the GDPR (General Data Protection Regulation) in the European Union would impede the collection, storage, and sharing of personal information by companies. This keeps users secure in online economic activities.

GDPR approach has proven effective in boosting trust and transparency, and it is a good model for other areas seeking to protect consumer data while fostering a safe and responsible digital environment (Tikkinen-Piri et al., 2018). The framework of the GDPR offers a comprehensive approach to data protection, which helps build a foundation of trust between users and digital platforms as countries and businesses throughout the world become more concerned about safeguarding user privacy. Research indicates that more trust in these platforms can lead to increased user involvement, which in turn can inspire more individuals to engage in e-commerce and online marketing (Acquisti et al., 2016). By improving the efficiency of digital transactions, boosting consumer confidence, and encouraging more online spending, this increased user engagement benefits not only specific businesses but also the economy as a whole. Using models like the GDPR, regions can create safer digital ecosystems that will boost economic growth and ensure that consumers and businesses can interact with more security and confidence.

Clear and concise data privacy laws are essential to ensure privacy. These laws should outline specific rules for data controllers and processors. They must maintain a

balance between privacy and innovation. Regulators should strive to create a regulatory environment that fosters innovation while protecting privacy. Educating consumers about their rights and how to protect their personal information is essential. By empowering individuals to make informed choices, we can foster a digital literacy and privacy awareness culture.

5.2.5 Supporting Equitable Internet Access

To ensure that social media's economic advantages reach all regions, particularly underserved areas, governments can invest in broadband infrastructure and provide subsidies for Internet access in rural or economically disadvantaged communities. Research (Brogan, 2008) suggests that expanded broadband access correlates with increased economic growth, especially in rural areas where Internet access can significantly improve market reach and economic participation. Policies should include financial incentives for telecommunications companies to expand infrastructure in remote regions and programs offering low-cost Internet for low-income households.

For example, the "Digital India" initiative has made significant strides in increasing Internet accessibility across rural regions while contributing to a more inclusive digital economy (Tenhunen, 2008). Social media platforms and other essential digital tools are now more easily accessible to individuals and businesses worldwide because to the initiative's emphasis on strengthening connections in neglected areas. This expanded access promotes broader participation in the digital economy by enabling people from diverse regions to engage in economic activities and contribute to national growth. These programs have the potential to reduce regional economic disparities by providing new opportunities for entrepreneurship, job creation, and access to global markets. By promoting digital

inclusivity, programs like "Digital India" empower rural residents and create a more equitable and balanced economic environment.

In addition to investing in infrastructure, governments may play a critical role in promoting programs for digital literacy and skills training that help individuals use social media and other digital platforms effectively. These courses are essential for equipping people with the knowledge and skills necessary to create engaging web content, engage in meaningful client communication, and conduct secure online transactions. By enhancing their digital skills, governments can help people from different backgrounds navigate the digital economy. They will be more employable and able to make the most of digital platforms as a result. Additionally, such programs can promote entrepreneurship when individuals get the confidence and skills necessary to start their own online businesses, communicate with clients globally, and conduct e-commerce. Ultimately, ensuring that everyone, regardless of background, has the opportunity to benefit from the expanding digital economy requires promoting digital literacy.

In order to create innovative solutions that will aid in bridging the digital divide, governments should also promote collaboration between the public and commercial sectors. By encouraging collaborations, government agencies, telecom companies, and IT firms can work together to deploy reliable and affordable Internet infrastructure, especially in underserved areas. These partnerships may also include providing digital literacy training programs to ensure that individuals develop the skills necessary to participate effectively in the digital economy. Together, we can remove obstacles to digital inclusion, make technology more accessible, and ensure that everyone has the opportunity to benefit from the opportunities provided by the digital world, irrespective of socioeconomic status or place of residence. By working together, governments can create a more creative and inclusive

digital environment that not only improves digital access but also drives social and economic progress.

5.3 Study Limitations

The study limitations are as follows. It is challenging to compare the impact of social media on China's economic growth to that of other countries due to China's policies that block foreign social media platforms like Facebook, Instagram, and Twitter. It is more challenging to assess the impact of these platforms on China's economic growth compared to other countries where they are extensively utilised. Furthermore, it is difficult to apply the study's findings to a global context because it focuses on domestic social media platforms like WeChat, Weibo, and Douyin. China's regulatory environment poses a unique challenge for cross-country comparisons since it makes it impossible to assess how international platforms contribute to economic growth in China relative to how they function in other nations. Additionally, the reliability of data sources, such as platform usage statistics from Chinese social media companies, may be limited by potential underreporting or regulatory influence, necessitating caution in interpreting results.

Another limitation of the study is the lack of financial and human resources to conduct a comparative analysis of social media's impact on GDP development across countries. To generate such a comparison, the study would require additional data from other global markets and the capacity to investigate how differing levels of social media usage impact GDP in various legal, cultural, and economic situations. Budgetary constraints prevented this more thorough analysis from being conducted within the constraints of the current study. Moreover, the analysis omits variables like technological infrastructure and

education levels, which could influence social media's economic impact and potential biases in data collection, such as inconsistent platform usage reporting may affect the findings.

5.4 Suggestions for Future Research

Future studies should further expand the focus on China's unique social media ecosystem and how it relates to economic growth. This study has provided innovative and invaluable insights into how localised platforms drive GDP growth by analysing a unique context where domestic platforms such as WeChat, Weibo, and Douyin dominate the digital scene. By revealing platform-specific processes and their effects on economic development, this method provided the study with a profound and nuanced understanding that would be missed by global analysis.

One of the key benefits of this study is its focus on China's unique social media ecosystem and its intricate connection to economic growth. By examining the specific context in which domestic platforms such as WeChat, Weibo, and Douyin dominate the digital landscape, the study provides significant insights into how localized platforms directly effect GDP development. This approach provides a more comprehensive and nuanced picture of social media's economic influence than a worldwide analysis would. By concentrating on the unique processes of these platforms and showing how they drive economic development in China, the study uncovers platform-specific dynamics that are usually overlooked in more generic, cross-country studies. In addition to improving our comprehension of China's digital economy, this localized viewpoint provides guidance for other countries wishing to use social media for economic expansion in their own particular settings.

A more thorough and focused analysis of the specific cultural, economic, and regulatory factors that affect social media's influence within a single, crucial market is made possible by this study's successful avoidance of the challenges and limitations that are commonly present in cross-country comparisons by concentrating on local platforms in China. This customized approach makes it possible to better understand how various factors combine to propel economic growth through digital platforms. The findings are particularly relevant and immediately applicable to China's emerging digital economy because of how different the country's social media landscape is. This study offers knowledge that may be applied right away to better understand and develop China's digital environment, rather than relying on general concepts that might not apply to China's particular circumstances.

Finally, this study focused scope and planned resource allocation allowed for a comprehensive and in-depth examination of the relationship between social media use and GDP in China. By restricting the analysis to this specific context, the study ensures that all relevant factors, including cultural, economic, and regulatory issues, are thoroughly investigated inside China's unique digital environment. Insightful information about the dynamics of China's rapidly evolving digital economy is provided by this targeted method, which provides a level of clarity and detail that more general, broad comparisons would likely overlook. The findings from this study are shielded from the complexities of cross-national comparisons by focusing solely on China, which makes it easier to understand how social media platforms directly affect the country's economic growth.

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