land

MDPI

Article

Rural China Staggering towards the Digital Era: Evolution and Restructuring

Yitian Ren

Department of Planning and Environmental Management, Manchester Urban Institute, The University of Manchester, Manchester M13 9PL, UK; yitian.ren@manchester.ac.uk

Abstract: This research aims to explore how rural China evolves towards and how it is restructured in the digital era. Rooted in the systematically entrenched urban–rural duality, rural China was traditionally marginalised and received limited benefits from the country's urbanisation development. Digital technologies are thus highly expected to facilitate novel opportunities towards rural reinvigorating development in China. This research first investigates the trajectories of rural China's development via a retrospective lens, and argues that the evolution of rural China has the potential to transform from a *top-down*, *policy-driven* regime in the pre-digital era towards a *bottom-up* and *top-down*, *technology* and *policy jointly driven* regime in the digital era; and the digital era presents opportunities for rural in-situ urbanisation 2.0 in China, which is socio-economically and spatially distinct from the Township and Village Enterprise-based rural in-situ urbanisation of the reform era. This study further explores the possible restructuring of rural China in the digital era and argues that the digital force-enabled rural restructuring would be filled with dynamics and complexity and lie in multi-facets. This seminal research generates valuable references on the trajectory of rural society's development in China, and the findings can help comprehend both opportunities and challenges that rural China embraces amidst the digital era. These references are essential for crafting evidence-based policy instruments to facilitate rural communities better leverage lucrative opportunities brought by digital transformation to catalyse leapfrog development and shake-off the image of decline.

Keywords: rural evolution; rural restructuring; digital era; digital transformation; information and communications technology for development (ICT4D); China

check for updates

Citation: Ren, Y. Rural China Staggering towards the Digital Era: Evolution and Restructuring. *Land* **2023**, *12*, 1416. https://doi.org/10.3390/land12071416

Academic Editor: Dingde Xu

Received: 19 May 2023
Revised: 3 July 2023
Accepted: 10 July 2023
Published: 14 July 2023

Copyright: © 2023 by the author. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introdugction

The development of Information and Communications Technology (ICT) infrastructures has resulted in the digital era. ICT infrastructures typically include the internet, smartphones and online social networks [1]. The trajectories and patterns of ICT infrastructure development in Western countries suggest that this ICT-driven development process emerged and grew initially in urban areas and later on spread to rural areas [2]. As highlighted by the United Nations 2030 Agenda, growth and sustainable development are not confined to cities, but also to those living in rural and villages [3]; though ICT infrastructures emerged first in urban areas, they are increasingly becoming profound influencing forces for the development of rural society in tackling traditional deprivations such as geographical remoteness and information asymmetry. From this narrative, the digital era has brought opportunities for rural communities, even for those located in remote areas. Rural development has entered into the digital era [2], and rural society in developing countries is particularly being rapidly influenced by the emerging forces of ICT infrastructures [4].

China is an informative case for exploring the role of digital infrastructures in the trajectories of socio-economic development and transition in the developing world. With the massive amount of investment from the state government, China has achieved remarkable progress on the delivery of ICT infrastructure. By March 2020, the country owned

904 million internet users and the internet coverage achieved 64.5% at the national level [5]. According to the Speedtest Global Index, China ranks 6th internationally in terms of mobile broadband speed, with a monthly average value of 159.47 Mbps (see Figure 1). Moreover, China initiated the "new construction projects" scheme in late 2018, emphasising 5G networks, digital infrastructure construction, and particularly the role of digital infrastructures in bridging the gaps between urban and rural areas.

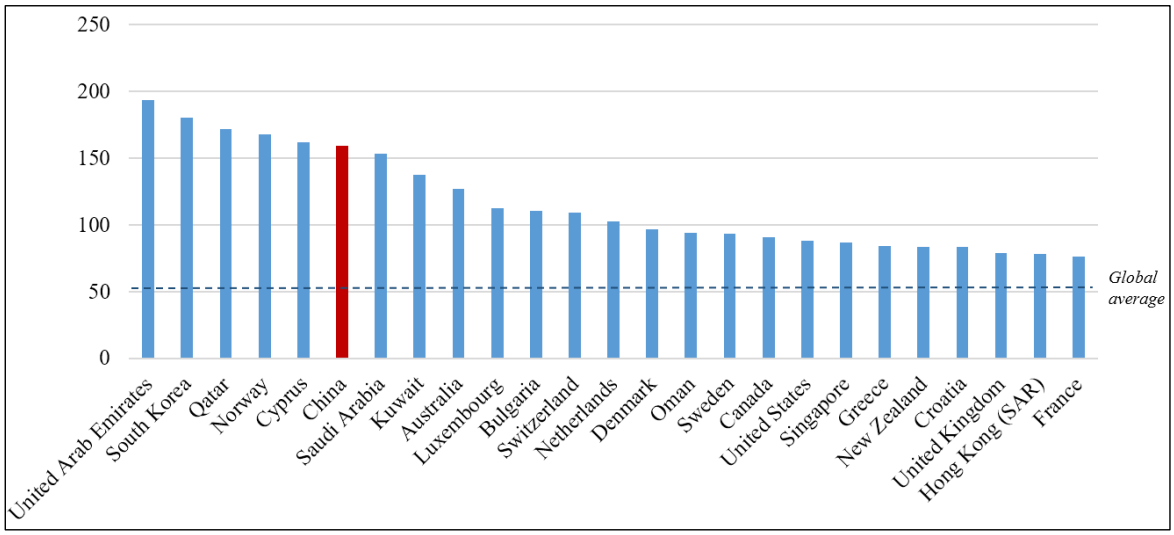


Figure 1. Top 25 countries (regions) in terms of mobile internet speed work (Source: Author, original data from: https://www.speedtest.net/global-index accessed on 31 December 2019).

However, the entrenched dual urban–rural administrative system has *de facto* shaped two societies in China, *viz*, urban and rural China [6]. Though the country has adopted the open-up policy and undergone various reforms and an urbanisation program at an unprecedented rate since the early 1980s, the process of urbanisation has been prevalently featured by rural–urban migration and the sprawl of mega and large cities. Rural China has been largely marginalised and received little benefits from the country's urbanisation progress [7]. The hollowing villages phenomena manifested rural decline has struck many rural areas in China [8,9].

Given this background, China is devoted to capturing the opportunities brought by digital development and emphasising its role in rural poverty alleviation and sustainable rural development. It is considered that ICT infrastructure and online platform technology enhance the inclusion of geospatially remote and socio-economically deprived communities into the modern economy, and provide villagers a new economic mode of transforming, restructuring and improving rural livelihoods without significant physical migration. From this narrative, rural development has stepped into a digital era, where these emerging technological forces are expected to help trigger novel "bottom-up" initiatives in rural communities.

It is important to gain a proper understanding of how rural China evolves towards the digital era and how it would be restructured and reshaped under digital transformation, which helps comprehend the challenges and opportunities that rural China faces in the digital era. Such comprehension is essential to formulate crafted measures to help those rural communities to better catch-up and leverage the opportunities brought by digital transformation while tackling the potential risks.

Rooted in the distinctive political, institutional, economic, social and cultural context of China, extant literature has attempted to investigate the restructuring of rural communities in China—for example, the theorisation of rural society's restructuring [10], the empirical investigation of rural restructuring under the evolving urbanisation in the suburbs of metropolitan [11], the examination of the interaction between regional urbanisation

strategy and evolving rurality in mountainous area [12], and the investigation of hollowing villages' restructuring manipulated by top-down land use policies [13]. Further, handful research works have attempted to focus upon the very recent digital development and transformation of rural communities in China, such as the assessment of digital rural development levels in the Yellow River Basin [14], the structural barriers and potential solutions of digital entrepreneurship in the rural context [15,16], and rural poverty alleviation driven by online-platform-based economic activities [17].

However, it appears that little research has systematically investigated the evolving development trajectories of rural society against different institutional settings and policy frameworks, and this inherent limitation of extant literature presents more explicitly in terms of rural China's evolution towards and amidst the digital era. Without an in-depth understanding upon rural China's evolving trajectory towards the digital era, the multi-faceted changes and transformation of rural society in the digital era cannot be captured and comprehended properly, thus the critical challenges cannot be addressed and proper policy instruments cannot be tailored to help rural communities better catch-up the opportunities brought by the digital era. Moreover, although it has been touched upon by a handful of academic works, compared with the academic works centred with rural development of Western countries, extant literature rooted in the restructuring of Chinese rural society present insufficiency in comprehending the roles and impacts of emerging digital and technological forces, which, however, are *de facto* among the most important exogenous forces that could reshape the contemporary rural territory [18,19].

Therefore, to fill the inherent gap of extant literature, this paper aims **to investigate the development trajectories of rural China from a retrospective lens, to comprehend the evolution of rural China across different stages and understand how it staggers towards the digital era, and to explore the multi-faceted restructuring of rural China that would be shaped amidst digital transformation**.

To fulfil the overarching research aim, a set of nuanced research questions have been proposed:

(a) What are the development stages, major changes in rural society in China, and key policy frameworks underpinning the changes and evolution of rural China?
(b) What are the latest policy frameworks and development trends of rural digital development in China?
(c) What are the evolving dynamics of rural China across different development stages in terms of policy contexts, governance regimes, villagers' identity and mobility, socio-economic morphologies, linkages with urban counterparts; and how the underpinning mechanism and driving factors of rural China's evolution would transform embracing the digital era?
(d) What are the potential (multi-faceted) restructuring of rural China driven by digital transformation?

2. Research Methodology

To address research question (a), a historical perspective is adopted, and academic and policy literature as well as official statistics from the establishment of the PRC has been reviewed and scrutinised to examine the development stages and major changes of rural China, as well as to unravel the underpinning key policy frameworks. To address research question (b), the recent academic works and policy documents centred on rural ICT delivery and online-platform-enabled rural development have been reviewed to comprehend the latest policy frameworks and development trends of rural digital development. To address research question (c), six key parameters of policy environment, governance regime, villagers' identity and mobility, rural economy, rural social morphology, and urban–rural linkages would be adopted to delineate rural China's performances and dynamics across different stages, and to unravel how the multi-factor delineated dynamism of rural China would transform embracing the digital era. To address research question (d), a theoretical framework would first be established to decipher the relationship between digital tech-

nologies and rural development, and then the potential multi-faceted restructuring of rural China driven by digital transformation would be explored based upon the comprehensive review of literature in the field.

The rest of this paper is structured as follows: Section 3 examines the development of rural China at different stages and in different institutional settings. On top of the examination of rural China's development, Section 4 delineates the evolving trajectories of rural society towards digital era from the perspective of multi-dimensional dynamics, investigates the underlying evolution mechanism of rural China as well as the changes in evolution drivers, and analyses the implications on broader urban–rural transformation and the urbanisation paradigm. Section 5 then explores the potential restructuring of rural society shaped by the forces of digital transition. Section 6 re-syntheses policy implications to help rural communities in the broader context of Global South to better tackle the challenges and leverage the opportunities for leapfrog development amidst the digital era, this section also delineates the avenues for future research in the field.

3. Understanding the Tale of Rural China at Different Development Stages

3.1. Rural Society in the Command Economy (1949–1977)

As a traditional agrarian civilisation, subsistence farming had been the primary mode of agricultural production as well as the pillar economic industry in China [20]. In 1949, the newly established PRC was plagued with prevalent and persistent rural poverty with low level of urbanisation at 10.6%. Under this historical background, it seemed that there were no other choices but industrialisation for advancing the national development in China [20,21], and this development strategy of industrialisation was actually echoed by the development experiences of many other agricultural nations who are land scarce and have to seek de-agrarianisation and non-farm income sources, such as Sub-Saharan Africa [22].

During the 1950s, for the pursuit of the 'Big Push' industrialisation strategy building on the unequal exchange between industry and agriculture, a system of command economy was designed and established in China which required the meticulous planning and central control of macro and micro aspects of the society [23,24]. The state, therefore, siphoned off materials and resources from the rural sector for urban industry's capital accumulation via a trinity of institutional instruments (see Figure 2): compulsory procurement and monopolised farm product sales; the establishment of rural collective (commune) system; as well as the *hukou* system [23,25].

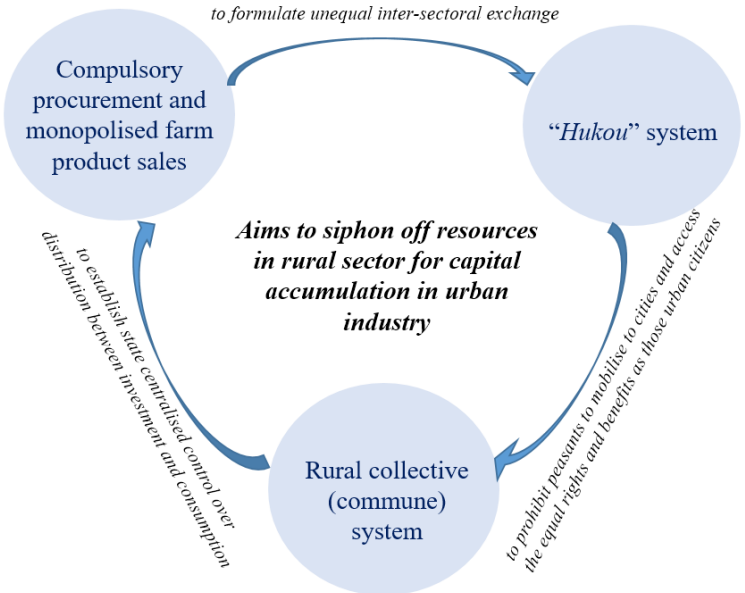


Figure 2. Interplay between trinity institutional instruments in the command economy era of China (Source: Author).

Compulsory procurement and monopoly sales policy were implemented in 1953. This policy requests farmers to sell a certain amount of their products to the state at government-set prices, which were deliberately compressed and even lower than the costs of purchasing necessary agricultural production materials such as pesticide and fertiliser [26]. An estimate of approximately 510 billion RMB was squeezed from rural China from 1950 to 1978; after that, China commenced the opening-up policy and the reform paradigm.

The second strategy adopted for operating urban–rural dual system was to control the production unit within the urban–rural dualism, for which state-owned enterprises (*guoyou qiye*) in cities and people's communes (*renmin gongshe*)[1] in rural areas were responsible for organising industrial and agricultural production, respectively. In August 1958, the Political Bureau of the Chinese Communist Party (CCP) Central Committee implemented a resolution to establish people's communes across rural society in China, and over 90% of rural households were incorporated into 24,000 rural communes [27]. The rural households were required to hand over all their private properties to the newly established people's commune, including land plots, farming instruments, and communal dining replaced private household cooking [27]. By 1959, there were approximately 25,500 communes and each included an average of 5000 households (approximately 22,000 people) [28]. The people's commune system was designed and implemented as an organisational tool to mobilise huge amounts of rural labour force and to establish state-centralised control over distribution between investment and consumption [28,29]. By implementing the rural collective commune system, all private ownership was scrapped and rationed consumption was imposed. Given the people's commune system, rural household income distribution was equalised to a large extent; therefore, individual rural labours' incentives and productivities were reduced significantly.

The third institutional instrument in the command economy, the *hukou* system, is the key governance instrument and played a role as a powerful tool of social exclusion by disallowing farmers from enjoying equal rights and welfares as urban citizens [26,30]. Since 1958, the *hukou* system has been employed to control free population mobility not only between villages and cities, but also across different locations (which means that all internal migration in China was subject to the approval from destination authorities). Urban and rural populations are therefore strictly labelled and categorised by their household registration (*hukou*) status, with each individual being classified as urban or rural and their new-borns following the mother's *hukou* [23]. The strict control of the *hukou* system before the 1980s formed a significant division between the urban and rural populations and their respective living space. Beyond the core built-up urban area was vast suburban area with little commuting between them [31]. By restricting the mobility of peasantry, they had to work on the farmland at subsistence levels and were excluded from social welfare access. Two "Chinas", urban one and rural one, have consequently been shaped in China in the pre-reform era—considering the immutable, hereditary nature of the *hukou* system, peasants at that time in Chinese society were the *de facto* 'underclass' [23].

Moreover, during the command economy era in China, the financial system is also distinct between urban and rural societies. The financial organisations operating in urban areas are state-owned banks (*guoyou yinhang*), whilst they are Rural Credit Cooperatives (RCCs) (*nongcun xinyong hezuoshe*) in rural areas. Under the urban–rural dual-track system, state-owned banks exclusively serve urban projects and Rural Credit Cooperatives exclusively serve agricultural production in rural areas [28].

In a nutshell, during the centrally planned period, these development strategies created a distorted system which disfavoured peasant, villages and agriculture to squeeze rural surplus to fuel the nation's industrialisation [32], and induced significant gaps between urban-industrial and the agricultural sectors. The entrenched urban–rural "dual system" in China placed rural villages in an "urban-biased" development context—politically, economically, and socially. Rural China was not only put in the disadvantaged position but was also positioned as the base of materials and capital to be supplied to cities and industries. Further, given the political environment, the development and investment

orientation of the country at that period placed an emphasis on the sector of national defence whilst socio-economic activities were jeopardised to a large extent, evidenced by the stagnated urbanisation development (see Figure 3, the national urbanisation rate stagnated at 17% for almost two decades during the 1950s–1970s).

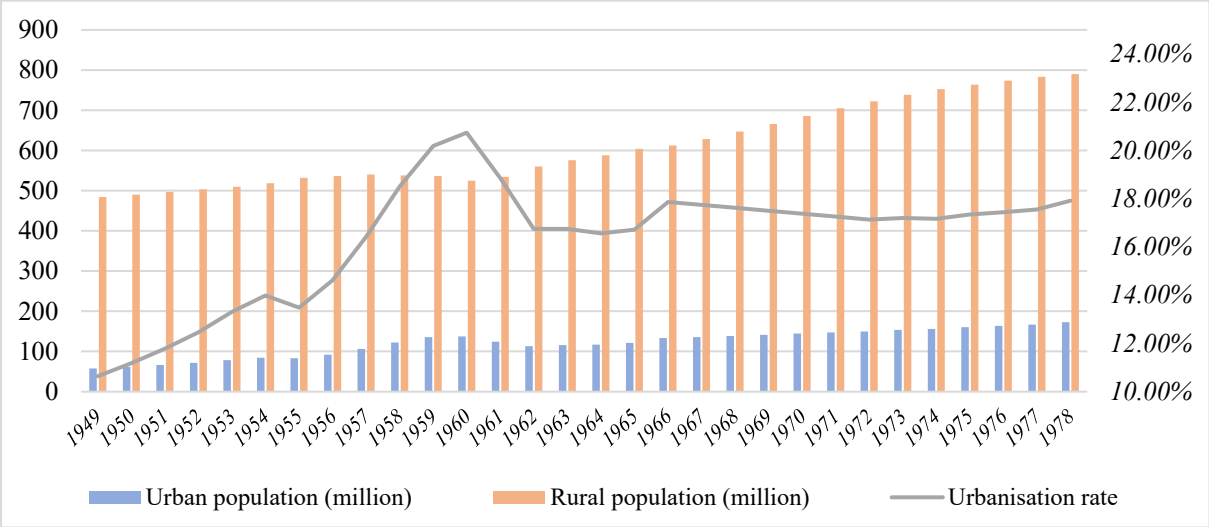


Figure 3. Urban–rural population and urbanisation rate in China during 1949–1978 (Figure made by the Author, with original data collected from NBSC across various years).

3.2. Rural China Amidst the Reform Era of the 1980s

The year 1978 was a landmark in the history of the PRC, when the pro-market economic reform was for first-time officially commenced by the state government. China has staggered towards a "socialist market" economy and first-ever opening-up to the world. For rural society, de-collectivisation of agriculture and the surge of rural industrial and commercial activities-based Township and Village Enterprises (TVEs) are two key made-ups for delineating rural China amidst the reform era.

De-collectivisation of rural agriculture

Rural areas are the pioneer of reform, and the de-collectivisation was a gradual process that took place within the rural people's commune system [28]. In fact, rural areas had always been a source of bottom-up initiatives not only because they are more far-away to the central state, but also because rural people received much less welfare from the state than urban residents and therefore had to take much more responsibility for their own benefits. This principle applied in the reform of rural China in the early 1980s, when the de-collectivisation of agriculture *de facto* began with peasants' "household responsibility" initiatives[2] instead of any formally implemented policy instruments issued by the Chinese central government. Until September 1980, the rural household responsibility system was officially sanctioned by the central government, though it had been secretly implemented in many places of the Chinese countryside. From 1978 to 1983, the commune system had been gradually repealed in rural China and instead a household responsibility system was introduced [33].

Further introducing and authorising the rural household responsibility system, a series of policies[3] have been implemented by the Chinese central government amidst the reform era to stimulate agricultural productivity and rural development, and the government procurement price of agricultural products has been improved several times to boost agricultural production [34]. Consequently, a system emphasising individual responsibility gradually placed a system of communal decision making. Thus, the price of major agricultural commodities increased, and the peasant's working enthusiasm and rural productivity improved greatly, with impressive output gains in rural China. According

to McMillan, Whalley, and Zhu (1989), from 1978 to 1984, the output of the Chinese agricultural sector boomed by over 61% [35].

Township and Village Enterprise (TVE) development and rural industrialisation

With the improvement of agricultural productivity, the over-employment problem in the rural agricultural sector became severe. Furthermore, in the early 1980s, the *hukou* household registration system was still tightly implemented by the Chinese government and rural–to–urban and inter-regional migrations were still strictly controlled. As a result, increasing labour surplus emerged from rural China's agricultural sector in the 1980s, and thus pressing demand turned up socio-economically and politically upon the non-agricultural employment provided for surplus rural labour forces in the countryside.

Under such circumstance in the early 1980s, a novel policy to promote rural industrial development was implemented, encouraging surplus labour in rural China to '*leave the farmland but still stay in the village, to enter the local factories rather than flow into the cities*' [33]. Enterprises set up by local township and village governments, and those enterprises set up by rural individuals, were then all named as Township and Village Enterprises (TVEs) [28]. Rural farmers were encouraged to involve into non-agricultural economic activities such as construction, manufacturing and retailing. Previous scholars have argued that TVEs' prosperous growth marked one of the most distinctive features of the reform and economic growth in China in the 1980s [36].

The added value of TVEs enables the countryside to step out of the conventional agriculture-driven growth mode to an alternative pattern of integrated growth, which involves the first, second and tertiary industries. The TVE-driven rural integrated development mode is an important facilitator for urban–rural economic structuring and transformation amidst reform-era China [37]. With TVEs moving forward in rural China in the early reform era, rural markets and service industries began to grow-up, and rural population and businesses activities began to present geospatial concentration, which further leads to the emergence and growth of many small townships (see the growing number of Townships in China amidst the reform era shown in Table 1).

Table 1. The increasing number of townships in the (post)reform China (1979–1992).

Year	Number of Townships	Year	Number of Townships
1979	2361	1986	10,718
1980	*NA*	1987	11,103
1981	2678	1988	11,481
1982	*NA*	1989	11,873
1983	2968	1990	12,084
1984	7186	1991	12,455
1985	9140	1992	14,539

(Source: Author, with original data collected from NBSC across various years.)

Therefore, in the reform era of China, the surplus rural labour forces were absorbed by TVEs and participated into the urbanisation program locally, rather than flouring into cities, where were not well constructed and not capable for receiving massive in-flow migrations, which saved the country from falling into "urban slums and fake urbanisation" as happened in Latin American countries [38]. Some scholars commented that market-driven rural industrialisation in the reform era demonstrated the arrival of urbanisation from below [20]. During the (post)reform era, built upon the dynamics of rural industries, urbanisation development in China achieved remarkable progress, which can be glimpsed by the continuously growing urbanisation rate (Figure 4).

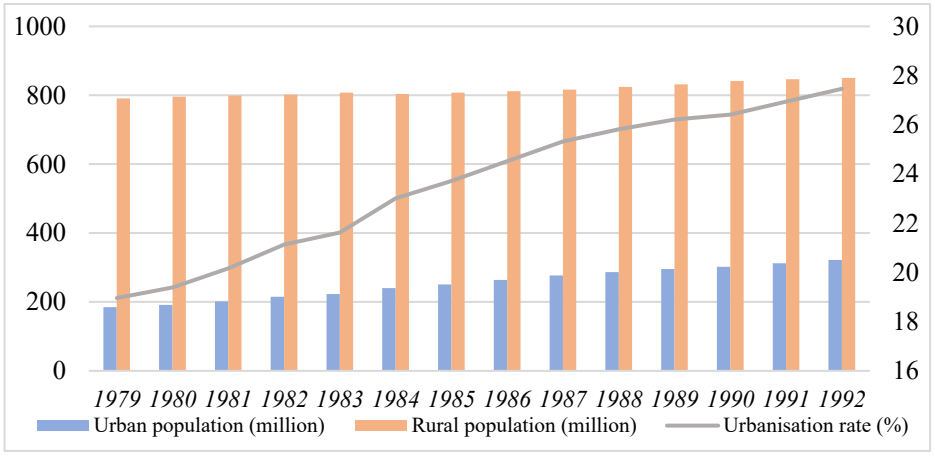


Figure 4. Urban–rural population, urbanisation rate in (post)reform China (1979–1992) (Source: Author, with original data collected from NBSC across different years).

3.3. Rural China Suffered an Unfavourable Policy Environment in the 1990s

Nevertheless, from the late 1980s, the reform policy in China reversed sharply and the foci of the central government's reform and development again shifted back to cities [33,36]. Policy makers in the Chinese central government favoured and prioritised cities in terms of investment devotedness and resource allocations and simultaneously taxed the rural sector heavily to further finance the state-led urban growth. Consequently, many innovative and productive rural financial experiments were discontinued since the 1990s [36].

From technocratic officials' stereotyped viewpoints, TVEs were rural-based, small-scale, low technology, and therefore incapable to generate high returns for investment [28]. Therefore, at that time, the Chinese central government chose to shut down some TVEs at the cost of jeopardising the jobs and livelihoods in rural society to benefit industrial development and state-owned enterprises in cities [36]. Meanwhile, the Rural Credit Cooperatives (RCCs), as the primary fund source for rural enterprises, were directed by the central government to allocate the majority of funds to the agriculture sector and restrict lending to rural manufacturing and service industries [28,36]. In addition to the unfavourable political environment, other reasons such as overlying relying on manufacturing, peasants simultaneously performing two distinct functions of farming and industry (which are supposed to be functionally and spatially separated), limited technical application and the lack of indigenous innovation, as well as environmental pollution, also eventually resulted in the decline of TVE-driven rural development pattern [37,39].

Different urban bias strategies were adopted in China in the 1990s. In hindsight, the 1980s was the only historical window conducive to rural collective industrialisation when the state-owned enterprises in cities were still shackled by the "central planning" regime. Embarked in the early 1990s, urban reforms have led to state-owned enterprise transformation and inward privately owned firms and have also taken their toll on rural collective industrialisation [20].

Criticisms were made upon the reversal of the reform practice occurred in rural China in the 1990s. Huang (2008, p. 112) commented that, "whereas Chinese Capitalism in 1980s was a *rags-to-riches* capitalism, the capitalism in the 1990s led to sharp income inequality, a reduction of social opportunities for the rural population, slower income growth and a heavy investment-dominated growth pattern" [36].

In a gradual and experimental manner, China's reform in the 1980s did not radically change the urban–rural dual system; instead, gradual reforms were undertaken within the urban–rural systematic dualism rather than replacing it. Insufficient rural development and rural urbanisation as a historical event was eventually replaced by and gave way to rural–to–urban migration [20]. Massive fluxes of migrants from villages to cities have been

taken place during the urban boom as well as the transition to the market economy since the 1990s [20].

Concurrently, a more released migration policy has been implemented in China since the mid-1980s. The State Council of the PRC issued a document in 1984 allowing farmers and their families to obtain permanent registrations in townships provided they engage in non-agricultural (industrial or commercial) activities. Further, rural–to–urban migrant peasants were also permitted to obtain temporary registration in small- and medium-sized cities, which allowed migrant peasants to earn more income via working in urban areas, though migrations to big cities remained strictly controlled. Therefore, one substantive change in the post-1984 period was the removal of obstacles to geographical mobility beyond the *hukou* conversion framework [23], although the *hukou* household registration system and dual urban–rural structure remained in effect [40].

3.4. Rural China as Policy Centre Issue in the New Millennium

The reform of the household registration system (*hukou* system) implemented in the midst of the 1980s, as well as the urbanisation of rural areas, was enforced since the early 2000s, which resulted in the accelerated expansion of rural–to–urban migration (see Table 2) and the gradual decline of rural population [41]. In 2000, approximately 54.1% of prefectures and 71.2% of counties in China saw their population decline because of out-migration, and both figures increased to 63.1% (prefectures) and 81% (counties), respectively, in 2010 [20]. Moreover, rural peasants also migrated over a longer distance in 2010 than the earlier generations migrated in 2000 by moving outside the county (see Figure 5). In particular, the top 1% large cites received 45.6% of all the rural migrants in the country in 2010 [42]. Consequently, since the new millennium, the patterns of population distribution between regions (i.e., *eastern–central–western*) and within regions (i.e., *urban–hinterland–rural*) became increasingly uneven in China.

Table 2. Rural–to–urban migration scale in China during 1982–2015.

	1982	1990	2000	2010	2015
Rural– to–urban migrants (million)	11.5	37.5	102.0	221.0	247.0
As % of national population	1.1	3.3	8.0	16.5	18.0

(Data source: [20,43].)

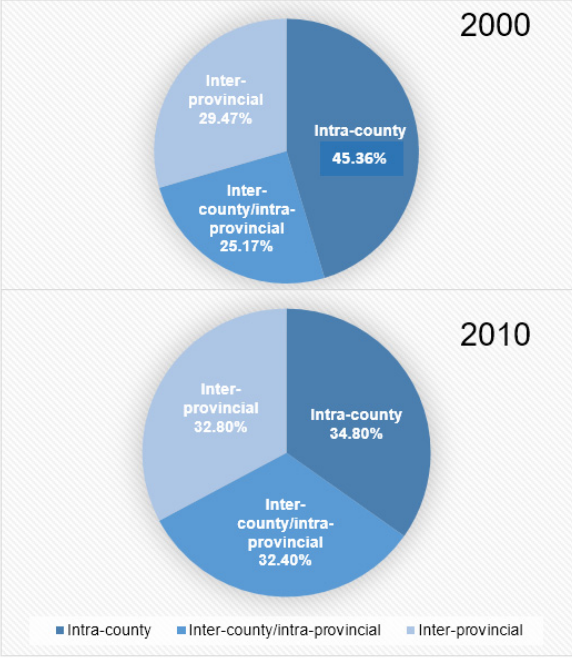


Figure 5. Types of rural–to–urban migration in China (2000 and 2010) (Data source: [20,42]).

Drastic urbanisation had significantly contributed to economic growth. Nevertheless, it seems that the significant economic development was achieved at the expense of social costs suffered by rural peasants who moved long distances at an unprecedented scale and speed from the poor countryside regions [20]. In fact, the urban-biased economic development strategy since the 1990s in China had caused devastating effects upon rural areas. "Three rural issues", namely, the issues of peasants, agriculture and rural areas, did not enter the Chinese central government's key policy agenda until the new millennium [24]. Since then, an increasing number of pro-rural policies have been introduced for improving rural livelihoods, and the typical pro-rural policies implemented since the new millennium are synthesised below:

- The "**No.1 Central Document**", centred on rural issues, published by the Chinese central government in 2004, the first after almost twenty years' absence since 1986, addressed income improvement and poverty alleviation among rural villagers [44].
- The pursuit of a "**Harmonious Society**" (*hexie shehui*) was introduced and this conception emphasised the coordinated and **integrated development of the urban and rural** sectors [45].
- The "**New Socialist Rural Construction Programme**", issued in the 11th National Economic and Social Development Plan (2006–2010), aimed to modernise the Chinese countryside and appreciated rural villages as a potential place to stimulate economic growth, under the rhetoric of narrowing urban–rural disparities [46].
- **The rural tax reform** was initiated to phase out the agricultural tax, and the agricultural tax was officially abolished in 2006, which was a major relief to peasants' tax burden in rural China (it used to be eight percent of a peasant's agricultural output) [47]. Additionally, the reinforcement of rural minimum living security system, the strengthening of rural welfare such as medical and educational systems, and the promotion of many transfer policies also helped to accelerate poverty reduction in rural China.
- **Urban-rural integrated planning:** the conventional urban-centred planning paradigm was reformed by the **2008 Urban and Rural Planning Act**, which demarcated a watershed as it was the first time in the PRC's history that rural territories were included in the master planning. Such a reform indicated that the state planning power has been extended into the largely "unplanned" rural areas [31].
- **Transformation of rural population**: in order to absorb the rural surplus population, the 2010 "No.1 Central Document" emphasised the **reform of the "*hukou*" system** and the important role of townships in receiving surplus rural population, to encourage and guarantee the rural transforming population to settle in small towns and enjoy the same social benefits of local township residents [48].

These pro-rural policy reforms implemented in the beginning of the new millennium marked a historic reversal of the long-standing urban-biased policy melody in the Chinese society, and the new century has seen a re-emphasis of governmental strategies upon the development of rural areas [33].

3.5. Rural China Embracing the Digital Era

Information and communication technology (ICT) infrastructures' deployment in rural communities is as an important catalyst and facilitator for the breakthrough development of rural areas [49], and China has been devoted to capturing the opportunities brought by digital infrastructure and online transformation in revitalising its countryside. Since 2006, the Chinese central government has implemented a series of policy programmes that aimed to "informatise" rural communities, such as the nationwide initiative of the "Village Informatisation Program" [50]. Major directions underpinning these rural informatisation policy schemes include two made-ups, "access" to and "application" of ICT infrastructures [49]:

- Improving rural society's ***access*** to communication infrastructures, with telephone, television, and the internet included;

- Providing ***applications*** of communication infrastructures across various aspects of rural development, such as the websites of local government, the services stations at the village level, and agriculture information-related websites and e-commerce portals at the township and village levels.

By implementing the "Village Informatisation Program", the Chinese central government aims to provide "broadband to the villages and information services to the rural households". Furthermore, the Ministry of Agricultural and Rural Affairs of the PRC initiated the "Demonstration Base" of Agriculture and Rural Informatisation in 2013, to encourage and promote the application of ICTs into rural sectors across the aspects of production, operation, management and public services.

These policy efforts upon digital infrastructures delivery in rural China have achieved remarkable progress. The number of internet users in rural China has reached 309 million by December 2020, taking the proportion of 31.3% of the overall internet users in the country. Additionally, the gaps in internet coverage between urban and rural China has been effectively narrowed under these efforts devoted by the state government, evident by the figure that rural China's internet coverage has reached 59.2% by June, 2021 (see Figure 6), and the speed of broadband has achieved equality between urban and rural sectors [51].

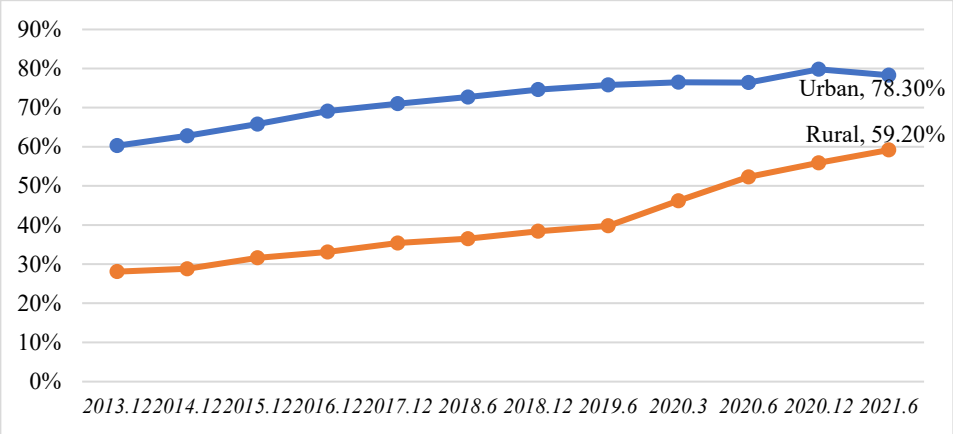


Figure 6. Internet coverage between urban and rural China (Figure made by author. Data source: [51]).

Furthermore, 2018 marked an important node pertaining to the digitalisation of rural China, being the year when the No.1 Central Document issued by the State Council of the PRC has first ever proposed the strategy of rural digital development, emphasising the delivery of broadband internet, the adoption of remote health and education services to narrow down the urban–rural "digital divide", and the application of digital technologies in agricultural production activities [52]. Furthermore, in 2019, the Chinese central government implemented the "Outline of the digital rural development strategy", highlighting rural digitalisation as a national-level development strategy [53]. Table 3 summarises the key policy strategies implemented by the Chinese central and sectoral governments pertaining to rural digital development.

Also, amidst the wave of ICT infrastructure delivery and digital transformation, some new forms of regional development based on online platforms emerged in rural China from the early 2010s. The most widely reported example is "Taobao" village, referring to rural villages carrying out online e-commerce activities based on the Taobao platform and having met certain criteria: (1) the basic unit of trading "venue" is an administrative village; (2) the scale of annual business sales is above 10 million RMB; (3) the number of active online stores within the rural village is over 100, or the proportion of active online store amount is more than 10% of the total number of local households. In line with the development of Taobao villages, Taobao townships have also emerged: a township includes at least three Taobao villages or, the township's annual e-commerce sale must be above 30 million RMB, and the number of active online stores needs to be over 300 [54]. The growth of Taobao

villages and townships has contributed to the socio-economic development of rural China, as evidenced by the figure that for the single year of 2019, "Taobao" villages and townships created more than 8.28 million job opportunities and achieved sales of over 1000 billion yuan, which was 50% of the total value of online retail sales in rural China [54]. It has been reported that in 2016, those rural households who operated online stores via e-commerce platforms improved their income levels by more than 20,000 yuan and their household fortunes by 213,000 yuan on average [55].

Table 3. Key policy instruments pertaining to rural digital development implemented by the Chinese central and departmental government.

Title, Published Governmental Body and Time of the Policy Strategy	Key Issues Addressed
2018 No.1 Central Document "Opinions on implementing the rural revitalisation strategy", by the State Council of the PRC (February 2018)[4]	• First ever proposed the strategy of rural digital development • To emphasise the delivery of broadband internet, the adoption of remote health and education services to narrow down the urban–rural "digital divide" • To emphasise the application of digital technologies in agricultural production activities
"*Outline of the digital rural development strategy*", by the State Council of the PRC (May 2019)[5]	• To develop rural digital economy, to enhance the application of digital technologies and online platforms in rural production and operation activities • To develop "smart" and "green" village via adopting digital technologies such as remote sensing, remote agricultural control system and remote ecological monitoring system
2020 No.1 Central Document "*Directives on the key tasks for the issues of agriculture, countryside, and farmers to achieve the moderately prosperous society in all aspects*", by CPC Central Committee and State Council of the PRC (January 2020)[6]	• To support rural communities to utilise local characteristic resources for the integrated development of primary, secondary, and tertiary industries, and to establish a sound mechanism for farmers to share the value-added income of the industrial chain. • To enhance rural logistic service network by supporting rural products (supple and market) cooperatives as well as rural postal express companies, to set up village-level e-commerce service centres, and to accelerate mutual exchange between rural and urban products. • To cultivate digital knowledge and skills towards rural labour forces with the aim of improving and stabilising rural employment. • To promote the establishment of rural big data centres and to accelerate the application of the internet and 5G in rural communities. • To launch a "digital village" pilot program at the national level.
2021 No.1 Central Document "*Opinions on comprehensively promoting rural revitalization and accelerating agricultural and rural modernization*", by the State Council of PGR (January 2021)[7]	• To implement the development of digital villages, particularly the integrated planning and construction of broadband network, 5G mobile communications, the mobile Internet of Things (IoT) between urban and rural areas. • To promote the ICT infrastructure deliveries in rural and remote areas • To enhance the application of digital approaches such as remote satellite and agrometeorological monitoring to develop smart agriculture • To enhance rural public services and rural governance capabilities via adopting digital approaches

Table 3. *Cont.*

Title, Published Governmental Body and Time of the Policy Strategy	Key Issues Addressed
"*To ensure the last mile delivery of rural logistic system in China*", by the Ministry of Commerce of the PRC (February 2021)[8]	• By 2050, to ensure all counties have logistic service centres, all townships have market service centre, and that all rural villages are connected via logistic services, based upon the last mile delivery of system in rural China. • To establish a mature commercial system, and ensure the "county-township-village" tertiary commerce logistic system, for which the free flow of agricultural products and industrial products between urban and rural areas can be guaranteed.
"*A guidance upon rural digital development*", by the State Council of the PRC (July 2021)[9]	• To provide comprehensive guidelines upon the multiple aspects of the construction of digital villages, spanning across ICT infrastructure deliveries, public services platforms, digital economy (smart agriculture, rural e-commerce, rural digital finance), culture (such as the digitalisation of rural cultural resources), digital governance (platform-based rural services, informatisation of grass-root governance)

(Source: policy documents reviewed and synthesised by the author.)

4. Delineating Rural China's Evolving Trajectories across Different Stages

Above sections examine rural China's torturous evolution against different stages. Based upon the above examination, this section delineates the evolving trajectories of rural China by addressing the dynamism of six perspectives—namely, the policy context rural China lies in, the governance regime of rural society, rural economy, rural residents' identity and mobility, the morphology of rural society, and the linkages between the urban and rural sectors (see Figure 7). This section further investigates the underlying evolution mechanism of rural China as well as the changes of evolution drivers, and analyses the implications upon broader urban–rural transformation and the urbanisation paradigm.

Evolution of rural development in China: from top-down to the emergence of top-down and bottom-up drivers

Above analysis shows that, before entering the digital era, rural China's evolution is predominantly manipulated by the central government's macro policy, which is a ***top-down, policy-driven evolving trajectory***. For example, in the command economy era, rural society in China was positioned by the state as the resource origins for urban industry's capital accumulation. To serve this overarching policy orientation of the central government, a set of governance regimes was designed and implemented. The coercive and meticulous designed rural governance regime in the command economy era shaped a scenario of heightened urban–rural segregation, under which rural entities had no other choice but to host agriculture with rural residents as farmers. Later on, at the start of the 1980s, the Chinese central government began to conduct pro-market reforms and started to develop towards a socialist market economy. Driven by this macro policy environment, de-collectivisation of rural agriculture and state support for rural industries were adopted as the key tongs of rural governance in the reform era. Under the macro policy and rural governance regime, rural residents in the early reform era could work as farmers or TVE workers, but could not migrate to cities given the *hukou* restriction. This *top-down, policy-driven rural evolution* over different rural development stages has been threading through the command economy era, the early reform era, the post-reform era and the new millennium, **shaping a long-standing regime that resources of rural residents are fully dominated and relied upon the state policy**. **Rural residents' identity, rural economic development and rural social morphology are closely tied up with the state's macro policy**, which used to be unstable and rural-disfavoured.

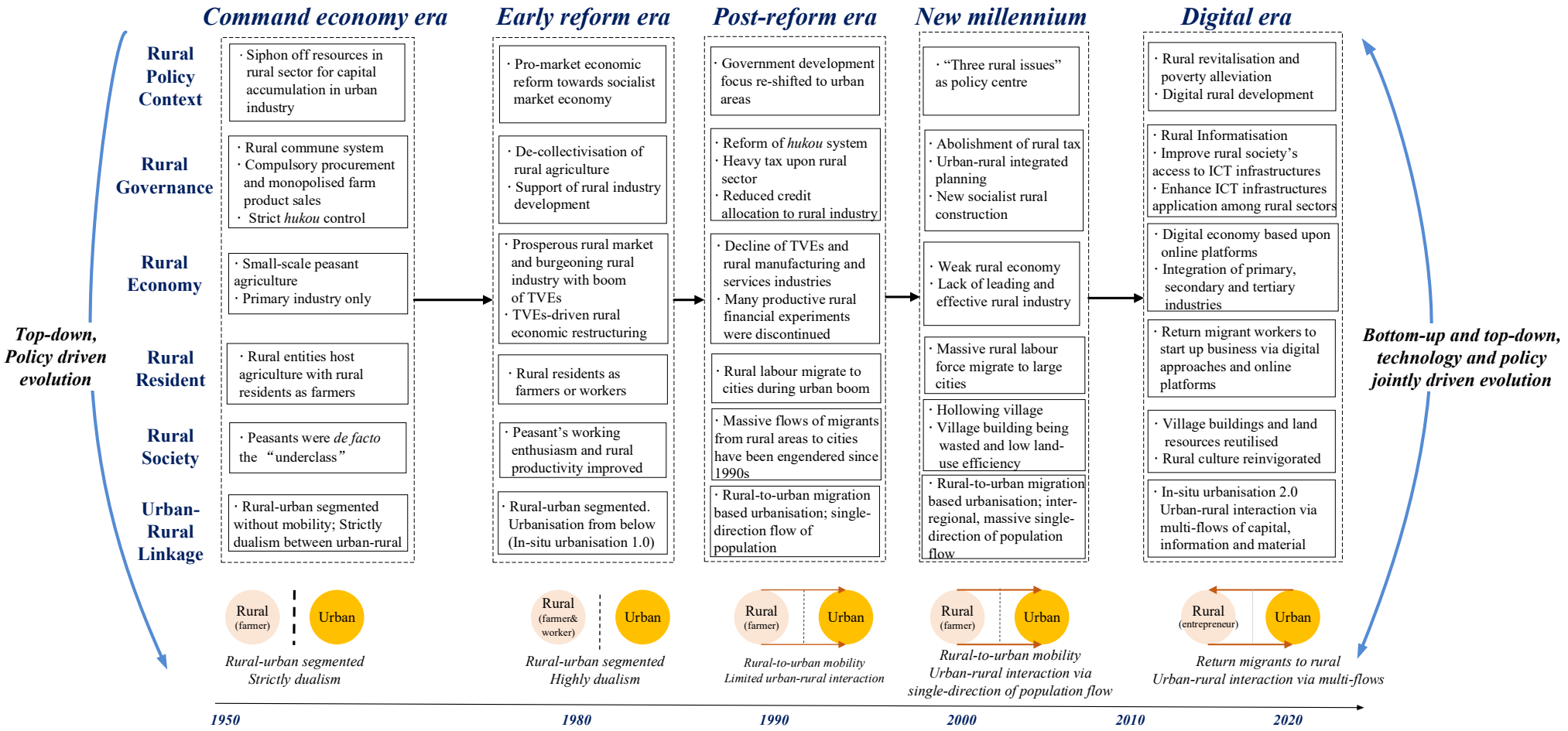


Figure 7. Evolving development trajectories of rural China (Source: Author).

With the emergence and application of ICT infrastructures, rural China's development drivers have changed and it is now more of a mix of a ***bottom-up and top-down, technology and policy jointly driven trajectory***, rather than the traditional evolution predominantly manipulated by the central government's macro policy. With the facilitation of digital infrastructure, grass-root rural residents can obtain knowledge, information, skills, capital and other resources via online platforms and simultaneously conduct farming activities and online entrepreneur business [15,16]. As a result, urban–rural linkages are not solely reliant upon the mobility of the population. The grass-root revolution triggered by digital technologies has, in turn, driven the central government to formulate policy measures to further facilitate the digital transformation and reinvigoration of rural communities.

This *technology and policy jointly driven* evolution of rural China is evidenced by the mix of *bottom-up* rural grass-root digital initiatives and the *top-down* implementation of state policy instruments (see Figure 8).

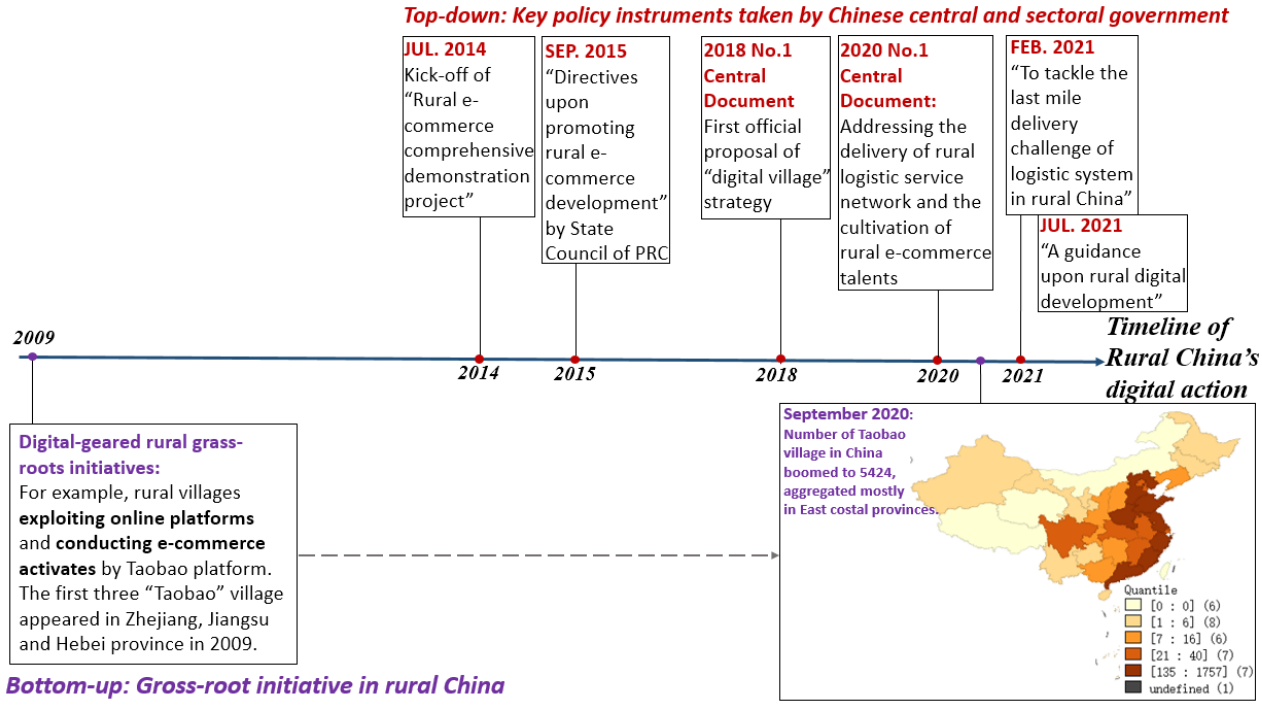


Figure 8. Timeline of the *bottom-up* and *top-down* rural digital actions in China[10] (Source: Author).

Gross root-wise, as mentioned in Section 3.5, some new forms of regional development patterns and digital entrepreneurship based on online platforms have emerged in rural China in the recent decade. For example, since the emergence of the three Taobao villages (in Jiangsu, Zhejiang and Hebei provinces) in 2009, the total amount of Taobao villages has increased to 5425 (appropriately 1% of the overall villages number in China) by September 2020 [54].

Compared to the grass-root initiatives exploiting digital forces of platform economy and also e-commerce, policy makers in China recognised the importance of leveraging digital transformation in rural China's development modes at a later time. Since 2014, the Chinese central and departmental governments have begun to implement policy instruments to promote rural digital development and have particularly highlighted the role of digital approaches in helping address both rural poverty alleviation and rural revitalisation. Later on, more policy instruments targeted at rural digital transformation have been further crafted and delivered—for example, the first official proposal of rural digital development in the No.1 Central Document implemented by the State Council of the PRC in 2018. Furthermore, amidst the COVID-19 pandemic, the 2022 No.1 Central Document particularly highlights the construction of digital villages, which emphasises digital skills cultivation

upon peasants, online delivery of public services in rural areas, and internet-empowered rural governance transformation.

Therefore, embracing digital technologies, the evolution and development of rural society in China have transformed from the pattern of *singly (passively) manipulated by the top-down policy frameworks* to a pattern of *top-down policies and bottom-up technology forces jointly driven*.

Evolving trajectory of rural resident's engagement in urbanisation

Figure 7 also spells that across the different development stages of rural society in China and its relationship with urban counterparts, rural residents can be involved in the urbanisation programme by either migrating and in-flowing to existing cities for the pursuit of urban employment opportunities, living standards and lifestyle; or by geographically staying in a local rural territory and engaging in non-agricultural activities and creating urbanised settlements on the site [56]. In the former approach, villagers move away from their home rural communities to work and live in cities; whilst in the latter, the rural in-situ urbanisation (RISU) approach, urbanisation can be achieved from the industrialisation of local rural territory (such as county territory) in which no far-distance physical population mobility is needed [57].

Rural–urban migration and the sprawl of existing cities have overwhelmingly dominated the urbanisation process in many regions of the Global South, including China. This, in turn, has given rise to a series of challenges pertaining to urban sustainability, such as demographical pressure, ecological deterioration, over-burdened resources and environment carrying capacity [58]; all have resulted in severe decline in rural territories [7]. Under this context, RISU has become an indispensable approach for urbanisation practices in the developing world. Actually, the experiences from some developed countries, such as Germany and the USA, have generally demonstrated that RISU is an important pathway to promote healthy and sustainable urbanisation [59]. However, RISU has tended to be marginalised in urbanisation literature, and has been particularly overlooked in academic research rooted in the Global South [60].

As shown in Figure 7, rural in-situ urbanisation in the Chinese context first emerged in the early 1980s. A historical window cultivated in-situ urbanisation, market-driven local dispersion, to prosper in rural China; although spatially concentrated, temporally brief, and institutionally restricted, it indeed presented a promising prospect for in-situ urbanisation to the rural peasantry [20]. This historical window of rural in-situ urbanisation was created via the implementation of the "household responsibility system" and the gradual dismantlement of people's communes, which significantly promoted agricultural productivity and brought the increase of rural surplus labour force. Additionally, the *hukou* household registration system was still strictly implemented in the early 1980s as an essential instrument of the state government to control rural–urban inter-regional mobility. Township and village enterprises (TVEs) were then surged particularly at the densely populated coastal areas to absorb the surplus rural labour force, under favourable supports from government policies and external economic investments. In line with the driving forces of TVEs in the eastern coastal region in China, three typical types of rural in-situ urbanisation modes, namely, the "*Sunan model*", the "*Wenzhou model*", and the "*Pearl River Delta (PRD) model*", were synthesised by academic research (see, for example, [7,60]). The emergence and development of TVE-driven rural in-situ urbanisation, labelled as "rural in-situ urbanisation 1.0" in Figure 7, promoted rural industrialisation, rural economic restructuring and prosperity in China in the reform era, though aggregated in the eastern coastal region. Nevertheless, as discussed in Section 3.3, due to both external and internal problems, the TVE-driven rural development mode turned out to an inevitable dénouement of decline in the 2000s as it comes out eventually to be unsustainable politically, economically and environmentally.

The delivery of digital infrastructures and the application of digital technologies have brought inclusion, efficiency and innovation to support regional development, and the online-platform-based rural development mode has been triggered. The online-platform-

based business model predominantly involves and relies upon the multi-actor ecosystem, which involves a diverse set of interdependent actors working on variegated aspects [17]. This mode of online-platform-based rural development in the digital era is expected to stimulate the development of various activities specialised across the sectors of manufacturing, retailing, processing, logistics, etc. The aggregation of these workshops in the rural territory would harness towards the intensified division of labour and small-sized rural business. Rural socio-economic transition is expected to be achieved spontaneously via this online-platform-based development pattern, which would further contribute to rural revitalisation and rural in-situ urbanisation 2.0 in China.

Online technology-enabled rural in-situ urbanisation 2.0 in the digital era is expected to present distinctive institutional, social, economic, and spatial features compared to TVE-based rural in-situ urbanisation 1.0 in the reform era, as shown in Table 4.

Table 4. China's rural in-situ urbanisation 1.0 in the reform era versus rural in-situ urbanisation 2.0 in the digital era: comparison of key features based on existing literature.

Key Features	Rural In-Situ Urbanisation 1.0 in the Reform Era	Rural In-Situ Urbanisation 2.0 in the Digital Era
✧ Triggering/enabling factor ✧ Mobility between rural and urban sectors ✧ Prerequisites and relying factors ✧ Roles of peasants ✧ Roles of local state ✧ Spatial distribution	• Triggered by the improvement of agricultural productivity and the surplus of labour force in rural areas. Township and Village Enterprise (TVE) based • Rural surplus labour were not allowed to flow into cities given the restrict *hukou* control • Largely relying upon manufacturing and external factors (macro policy and foreign investment) • Peasants as farmer and factory worker • (passively assigned) • Local state (township official) played the *de facto* role of managers of TVEs • Spatially aggregated in the eastern coastal provinces, where enjoy foreign investments	• Triggered by digital technology adoption, application and proliferation. Online platform enabled • Some migrants return to rural communities to start-up digital entrepreneur businesseses • Relies upon the entrepreneurship of grass-root communities and the state's policy guidance and support • Peasants as farmers and online entrepreneurs (actively choose) • Local state plays the role of regulator (conventional) and enabler (novel) • Can be dispersed in different regions of the country

(Source: Author.)

5. Restructuring of Rural Society Amidst the Digital Era in China

5.1. The Interplay of Digital Technologies and Rural Development: A Theoretical Understanding

Information and communication technology (ICT) infrastructures, encompassing mobile phones, digital telephone networks, internet capability, internet servers and fixed broadband, and other technologies, has become a powerful growth and development accelerator in countries that have recognised its importance [1,2]. The emergence and proliferation of Web 2.0 have altered the way people produce and process information, enabling ICTs as a platform for inclusive, collaborative and innovative development [61]. ICT infrastructures thus play an important role in stimulating economic growth in nowadays' era of internet and mobile telecommunication [62]. Particularly, ICT infrastructures hold promise in driving rural development and facilitating rural poverty reduction in developing countries [63]. Different from traditional engines, the network technology can embed rural society into the external market and alter the circulation modes of commodity, the structure and network of commercial space, as well as the pattern of industrial activities, and is therefore able to restructure the rural territory from multiple perspectives such as employment patterns, industrial structure and household economy [4].

Extant literature has devoted efforts to decipher the relationship between ICT infrastructure and rural development and restructuring—for example, in the analysis upon the

impact of ICT application on poverty eradication, for which three-dimensional (economic, livelihoods and capabilities) impacts are incorporated [64]. Further, previous research at the intersection of ICT infrastructure and poverty alleviation studies argued that: at the macro level, ICT infrastructures link the poor and enable and enhance their access to essential services of health, education, banking, business, and governmental information; at the micro level, ICT-enabled solutions empower low-income rural individuals and communities via including them into online market places, improving the information transparency of the market, and supporting them to join or self-organise communities of practice and business ecosystems [17], so that digital entrepreneurship and grass-root innovations can be stimulated [65].

Existing studies have also investigated the impacts of ICT implementation upon rural resilience, particularly in the context of developing countries [66,67]. According to studies, an analytical framework has been established for demonstrating how ICT interacts with and influence the resilience and capacities of rural communities (rural livelihood system), as shown in Figure 9. The analytical framework demonstrates that ICT infrastructure and digital technologies have become essential components for rural resilience-building and key driving forces for rural society development.

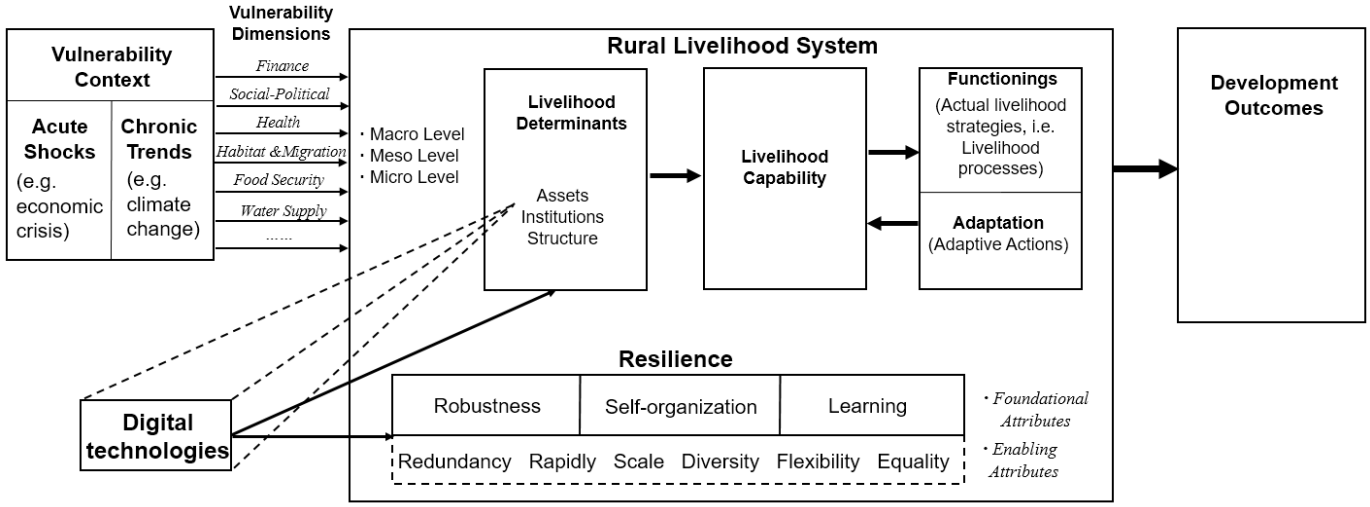


Figure 9. Interplay between ICTs and the resilience of rural livelihood system. (Source: Adapted from [66,67].)

5.2. The Restructuring of Rural China amidst the Digital Era: An Explorative Analysis

In the specific context of China, online platforms such as "Taobao", "JD.com", and "Pinduoduo" promote the inclusion of remote and poor areas into the modern economy. Online e-commerce platform engaged development patterns in rural China, such as the widely reported "Taobao village" (see, for example, [68,69]), illustrate how the internet stimulates inclusion, efficiency, and innovation for regional development, and all of this happened within a decade.

Consequently, the implications of the evolving dynamics of rural China delineated in Figure 7 are perceived to be reshaped amidst the digital era. It is considered important to understand how the dynamism of rural society would be restructured in the digital era so that underlying challenges can be addressed and emerging opportunities can be better exploited. Figure 10 delineates the potential restructuring of rural China across the facades of social, economic, environment and cultural morphologies and rural society's linkages with urban counterparts.

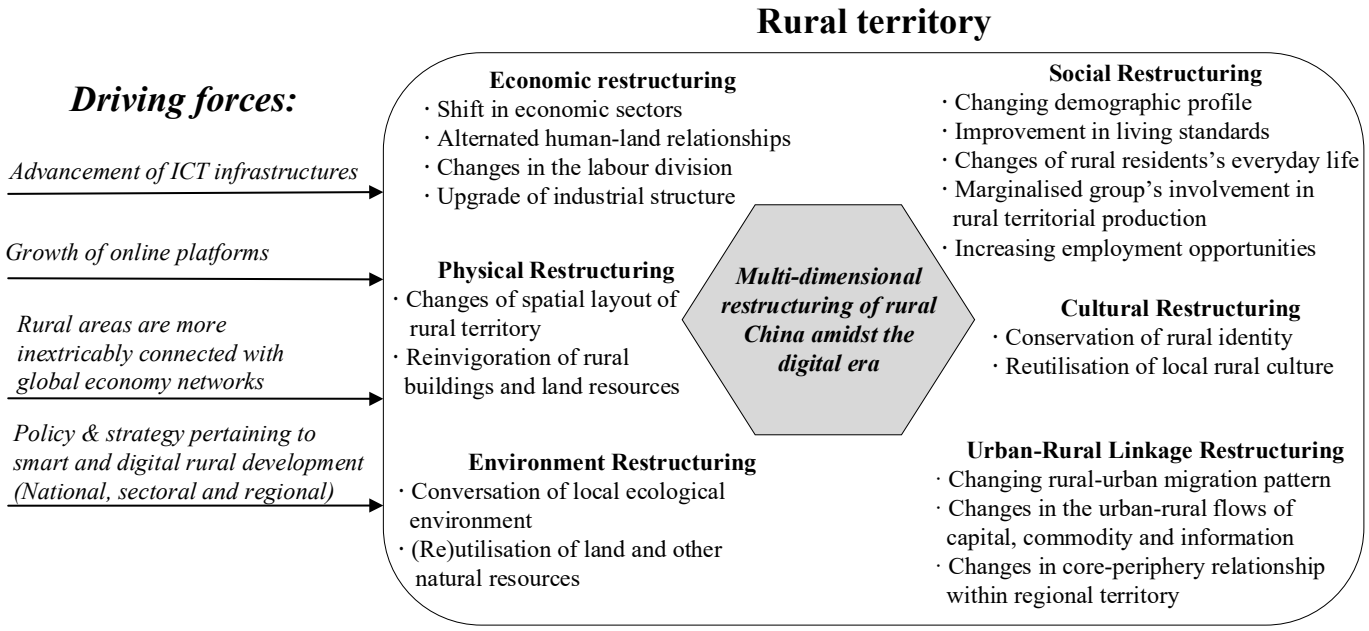


Figure 10. Multi-dimensional restructuring of rural China amidst the digital era (theoretical exploration) (Source: Author).

Economically, internet technology and more specifically the online-platform-based development mode would contribute to the shift in rural economic sectors across primary, secondary and tertiary industries; accelerate the exchange and mobility of urban and rural elements; and reconfigure labour division, so that the human–land relationship would be altered in the rural territory under digital transformation. These aspects of online-platform-driven rural economic restructuring have already been captured by recent studies. For example, by conducting an empirical study in a village of central China, previous studies revealed that digital forces such as e-commerce have become an emerging technical catalyst for the transformation and upgrading of rural industries, the de-agriculturalisation of rural employment, and the increase in household economy [4]. Additionally, the adoption of digital approaches such as e-commerce has been demonstrated to be effective in enabling a significant increase in the selling prices of rural products [69].

Socially, the development of rural online-platform-based activities is expected to improve rural residents' living standards, and villagers' everyday life would also be altered. Furthermore, by appreciating the benefits of rural online-platform-based business, an increasing number of migrants would be attracted to return to their rural villages to start-up their own online shops or engage in existing rural online-platform-based business. Thus, digital entrepreneurship would be triggered and developed in the rural context, which makes the entrepreneurial activities less spatially bounded [15]. Further, the nature of online shops or small enterprises—largely rural household-based—provides opportunities for marginalised groups in the rural community, such as female villagers and the elderly, to be involved in rural territorial production, thus the social morphology of rural villages in the digital era would also be altered accordingly. Via empirical investigations, extant literature has demonstrated to some extent the restructuring of rural social morphology shaped by emerging digital forces. For example, network technology development has altered the common values held towards countryside life and reconstructed the living and production "rhyme" of the everyday life of local rural people, where both positive and negative transformations are captured [70]. The increasing popularity of the online-platform-based development model has also steered more equal opportunities in terms of human resources and economic entities in the villages of rural China [71]. With a particular perspective of feminist political economy, digital economic activities are found effective in

enabling rural women's socio-economic participation as exemplified by the tale of Taobao villages in China [72].

In line with the evolving development of rural online-platform-based economic activities, the physical forms and spatial layout of rural villages would also be expected to transform to better meet the needs of online-platform-based activities. For example, the reinvigoration of the dilapidated rural landscape [73], as well as altered forms and layouts of buildings to better accommodate the production and consumption demands of digital platform-driven business can be perceived.

Moreover, with less rural residents outflowing to cities to make a living and an increasing number of returning migrants, the local rural culture and rural identity can be better protected, re-invigorated and re-utilised. For example, unique local crafts can be exploited as valuable resources to develop rural online-platform-based business. Environmentally, the specific restructuring impacts that online-platform-based activities made upon the local rural ecology appear to be unclear, which calls for further investigations. Further, one of the potential positive impacts from an environmental perspective would be that, in line with the reutilisation of rural land and cultural resources, tourism could be developed in the previously depilated rural villages [73].

Consequently, the development of rural online-platform-based activity contributes to the changing migration pattern and changes in capital, commodity and information flows between urban and rural areas [4], further impacting the core–periphery relationship of regional territorial development.

It should be noted here that given the significant differences under economic development, the socio-entrepreneurial background, eco-environment conditions and institutional settings, grass-root communities and the local state of rural society in different regions in China would respond and act very differently in facing the opportunities brought by prevalent ICT adoptions and digital transformations. The triggering factors and operation mechanisms of rural digital development approaches in different regions (for example, the east, central, southwest and northeast regions; coastal and mountainous regions) would be distinct [74]. Thus, more ***local-context*** and ***empirical evidence-based*** investigations are needed to further decipher the variegated restructuring of rural China triggered by the digital era.

6. Challenges, Policy Responses and Future Research Avenues

Tackling the challenges of the "digital divide" between urban and rural areas

Digital forces are embraced as lucrative opportunities by the Chinese central government and rural communities to help achieve leapfrog development in rural China amidst the digital era. The role of ICTs has been particularly emphasised in creating effective solutions for poverty reduction, rural invigoration and rural sustainability-building. Nevertheless, the critical challenge of the "digital divide" would emerge in line with the development and application of ICT infrastructures. Paradoxically, the dilemmas of geospatial fringe and service provision shortage could largely be addressed by enhancing digital connectivity as an alternative approach for many of those essential services; however, a deadlocked situation is that rural communities in remote regions particularly lack the required digital connectivity, which *de facto* heightens the risk of rural areas of falling even further behind in terms of service accessibility. Salemink et al. (2017) commented that the disparities of ICT infrastructure adoption and application between well-served, largely urban areas and underserved, rural areas are significant, which resulted in the "digital divide" in the spatial narrative [2]. It appears that the research and innovation to date on the fourth industrial revolution and digitalisation are largely centred on cities and urban areas, while digital transformation can exert both positive and negative effects upon rural areas [75].

Rural digital development is becoming an emerging while critical challenge for both developed and developing countries [76], and governmental efforts (policy frameworks, guidance, subsidies) and public investment towards narrowing the urban–rural "digital

divide" are essential. Given the fact that remote rural communities featured with population sparsity lead to a higher unit cost for ICT service and infrastructure delivery, those remote rural communities are less attractive to ICT provider investment from the private sector. An important point that needs to be noted here is that in designing policies to support rural digital transformation, initiatives, and leapfrog development, the regional governments should closely incorporate local specific needs and contexts; otherwise, those generic policies would turn out to be fail [77].

Concluding remarks and future research avenues

To better understand how rural China has been staggering towards and would be restructured amidst the digital era, this research first adopts a retrospective lens to examine rural China's development trajectories, and five development stages have been identified in terms of the policy framework, institutional setting, as well as the socio-economic context against which rural society has been developing. Via delineating rural China's evolution trajectory across different stages, this study argued that the evolution of rural China has transformed from a *top-down, policy-driven* regime in the pre-digital era towards a *bottom-up and top-down, technology and policy jointly driven* regime amidst the digital era; and the digital era has presented lucrative opportunities for enabling rural in-situ urbanisation 2.0 in China, which is socio-economically and spatially distinct from TVE-based rural in-situ urbanisation presented in the reform era. This paper further explores the potential restructuring of rural society shaped by emerging digital forces, and found that such restructuring manifests in the aspects of economic, social, cultural, and environmental morphologies as well as the urban–rural relationship. This study argues that the digital force-harnessed restructuring of rural China would be filled with dynamics and complexity and lie in multi-facets.

This research is the first attempt and a seminal work to examine and thread the evolution of rural China's development from different development stages towards the contemporary era of digital transformation. This study conducts a novel investigation upon the underlying mechanism and driving factors of rural China's evolution before and amidst the digital era. This paper moves a further step to deciphering how rural communities would reshape and restructure during digital transformation. This study provides valuable references upon the development trajectories of rural China, and unravels the underlying mechanism and driving factors of rural evolution have transformed in the digital era. The lucrative restructuring opportunities and potential challenges that rural China would embrace in the digital era analysed in this study provide references to policy makers to tailor and implement favourable instruments to help rural communities to capture and leverage the opportunities brought by the delivery of ICT infrastructures, the adoption of online platforms and digital transition, to promote rural poverty reduction and rural revitalisation.

The digital era-triggered multi-dimensional restructuring of rural China is theoretically discussed in this study, and more local context-based empirical evidences from rural villages across different regions of China are expected, as great disparities exist in the geospatial, socio-economic and institutional settings between different provinces and municipalities across east, central and west China. Future researchers are recommended to further explore how ICT infrastructures and e-commerce are embedded into rural territories and to what extent the multi-facets of rurality are restructured amidst the digital era. Particularly, rural restructuring in the aspects of social and cultural morphologies should be highlighted in future research agendas, as it appears that the current trends of smart villages and rural digital development research put a relatively narrow focus on technology-driven approaches, while the dimensions of society, services, and culture have been largely neglected [78]. Additionally, the construction of the digital village requires the joint participation of multiple stakeholders, such as the government, enterprises, villagers, and academic and financial institutions. Only through the interaction between different stakeholders can rural sustainable development be achieved, and future research is thus recommended to investigate the partnership between various actors during rural digital

development. Furthermore, the emergence, growth, development and operation modes pertaining to rural China's variegated digital experiments should be more widely investigated and reported, so as to draw insightful implications to help inspire breakthrough development of rural communities in other regions of Global South.

Funding: This research was funded by SEED PGR Scholarship of The University of Manchester. The APC is funded by the Gold Open Access Fund of The University of Manchester, UK.

Data Availability Statement: The research data are available upon request.

Acknowledgments: This research is supported by the SEED Scholarship, and the Gold Open Access Fund of The University of Manchester, UK. I am grateful for the advice received from Cecilia Wong and Tao Zhou. I would also like to thank the four anonymous reviewers.

Conflicts of Interest: The author declares no conflict of interest.

Notes

1 State-owned enterprises, *guoyou qiye*; Rural people's commune, *renmin gongshe*.

2 One archetypal case of rural household responsibility initiatives being widely reported is Xiaogang village in Anhui province.

3 For five consecutive years of 1982 to 1986, the State Council of China has published the "No.1 Central Document" to approve multi-reform policies for rural society.

4 Available via: http://www.moa.gov.cn/ztzl/yhwj2018/ (accessed on 1 January 2021) (In Chinese).

5 Available via: https://www.gov.cn/zhengce/2019-05/16/content_5392269.htm (accessed on 1 January 2021) (In Chinese).

6 Available via: http://www.moa.gov.cn/ztzl/jj2020zyyhwj/2020zyyhwj/202002/t20200205_6336614.htm (accessed on 1 May 2021) (in Chinese).

7 Available via: http://www.moa.gov.cn/ztzl/jj2021zyyhwj/2021nzyyhwj/ (accessed on 1 January 2022) (In Chinese).

4 Available via: http://www.moa.gov.cn/ztzl/yhwj2018/ (accessed on 1 January 2021) (In Chinese).

5 Available via: https://www.gov.cn/zhengce/2019-05/16/content_5392269.htm (accessed on 1 January 2021) (In Chinese).

6 Available via: http://www.moa.gov.cn/ztzl/jj2020zyyhwj/2020zyyhwj/202002/t20200205_6336614.htm (accessed on 1 May 2021) (in Chinese).

7 Available via: http://www.moa.gov.cn/ztzl/jj2021zyyhwj/2021nzyyhwj/ (accessed on 1 January 2022) (In Chinese).

8 Available via: http://www.gov.cn/xinwen/2021-02/25/content_5588715.htm (accessed on 1 March 2022) (In Chinese).

9 Available via: http://www.moa.gov.cn/hd/zqyj/202301/P020230104556857814615.pdf (accessed on1 March 2022) (In Chinese).

8 Available via: http://www.gov.cn/xinwen/2021-02/25/content_5588715.htm (accessed on 1 March 2022) (In Chinese).

9 Available via: http://www.moa.gov.cn/hd/zqyj/202301/P020230104556857814615.pdf (accessed on1 March 2022) (In Chinese).

10 Information of Taobao village in China is collected from AliResearch (2020). Policy documents of Chinese central and sectoral government are collected via government website of State Council, CPC Central Committee, Ministry of Commerce, Ministry of Industry and Information Technology of PRC, available at: http://www.gov.cn/zhengce/content/2015-11/09/content_10279.htm (accessed on 1 Janurary 2021), http://www.moa.gov.cn/ztzl/jj2020zyyhwj/2020zyyhwj/202002/t20200205_6336614.htm, http://www.gov.cn/xinwen/2021-02/25/content_5588715.htm, (accessed on 1 March 2021) http://www.cac.gov.cn/2021-09/03/c_1632256398120331.htm (accessed on 1 March 2022).

References

1. Pradhan, R.P.; Mallik, G.; Bagchi, T.P. Information communication technology (ICT) infrastructure and economic growth: A causality evinced by cross-country panel data. *IIMB Manag. Rev.* **2018**, *30*, 91–103. [CrossRef]
2. Salemink, K.; Strijker, D.; Bosworth, G. Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas. *J. Rural. Stud.* **2017**, *54*, 360–371. [CrossRef]
3. Malik, P.K.; Singh, R.; Gehlot, A.; Akram, S.V.; Das, P.K. Village 4.0: Digitalization of village with smart internet of things technologies. *Comput. Ind. Eng.* **2022**, *165*, 107938. [CrossRef]
4. Zhang, Y.; Long, H.; Ma, L.; Tu, S.; Li, Y.; Ge, D. Analysis of rural economic restructuring driven by e-commerce based on the space of flows: The case of Xiaying village in central China. *J. Rural. Stud.* **2018**, *93*, 196–209. [CrossRef]
5. China Internet Network Information Center. *The 45th China Statistical Report on Internet Development*; CNNIC: Beijing, China, 2020.
6. Taylor, J.R. The China dream is an urban dream: Assessing the CPC's national new-type urbanization plan. *J. Chin. Polit. Sci.* **2015**, *20*, 107–120. [CrossRef]
7. Shen, L.; Ren, Y.; Xiong, N.; Li, H.; Chen, Y. Why small towns can not share the benefits of urbanization in China? *J. Clean. Prod.* **2018**, *174*, 728–738. [CrossRef]

8. Cao, S.; Lv, Y.; Zheng, H.; Wang, X. Challenges facing China's unbalanced urbanization strategy. *Land Use Policy* **2014**, *39*, 412–415. [CrossRef]
9. Li, Y.; Westlund, H.; Zheng, X.; Liu, Y. Bottom-up initiatives and revival in the face of rural decline: Case studies from China and Sweden. *J. Rural. Stud.* **2016**, *47*, 506–513. [CrossRef]
10. Tu, S.; Long, H. Rural restructuring in China: Theory, approaches and research prospect. *J. Geogr. Sci.* **2017**, *27*, 1169–1184. [CrossRef]
11. Tu, S.; Long, H.; Zhang, Y.; Ge, D.; Qu, Y. Rural restructuring at village level under rapid urbanization in metropolitan suburbs of China and its implications for innovations in land use policy. *Habitat Int.* **2018**, *77*, 143–152. [CrossRef]
12. Peng, L.; Liu, S.; Sun, L. Spatial–temporal changes of rurality driven by urbanization and industrialization: A case study of the Three Gorges Reservoir Area in Chongqing, China. *Habitat Int.* **2016**, *51*, 124–132. [CrossRef]
13. Long, H.; Li, Y.; Liu, Y.; Woods, M.; Zou, J. Accelerated restructuring in rural China fueled by 'increasing vs. decreasing balance' land-use policy for dealing with hollowed villages. *Land Use Policy* **2012**, *29*, 11–22. [CrossRef]
14. Ren, J.; Zheng, C.; Guo, F.; Zhao, H.; Ma, S.; Cheng, Y. Spatial differentiation of digital rural development and influencing factors in the Yellow River Basin, China. *Int. J. Environ. Res. Public Health* **2022**, *19*, 16111. [CrossRef]
15. Gerli, P.; Whalley, J. Digital entrepreneurship in a rural context: The implications of the rural-urban digital divide. In *Handbook of Digital Entrepreneurship*; Edward Elgar Publishing: London, UK, 2022; pp. 291–305.
16. He, X. Digital entrepreneurship solution to rural poverty: Theory, practice and policy implications. *J. Dev. Entrep.* **2019**, *24*, 1950004. [CrossRef]
17. Li, L.; Du, K.; Zhang, W.; Mao, J.Y. Poverty alleviation through government-led e-commerce development in rural China: An activity theory perspective. *Inf. Syst. J.* **2019**, *29*, 914–952. [CrossRef]
18. Gerli, P.; Whalley, J. Fibre to the countryside: A comparison of public and community initiatives tackling the rural digital divide in the UK. *Telecommun. Policy* **2021**, *45*, 102222. [CrossRef]
19. Bryant, C.R. Entrepreneurs in the rural environment. *J. Rural. Stud.* **1989**, *5*, 337–348. [CrossRef]
20. Zhu, J.; Zhu, M.; Xiao, Y. Urbanization for rural development: Spatial paradigm shifts toward inclusive urban-rural integrated development in China. *J. Rural. Stud.* **2019**, *71*, 94–103. [CrossRef]
21. Fei, H.T. *Peasant Life in China: A Field Study of Country Life in the Yangtze Valley*; Routledge: London, UK, 1939.
22. Bryceson, D.F. Deagrarianization and rural employment in sub-Saharan Africa: A sectoral perspective. *World Dev.* **1996**, *24*, 97–111. [CrossRef]
23. Chan, K.W. The Chinese hukou system at 50. *Eurasian Geogr. Econ.* **2009**, *50*, 197–221. [CrossRef]
24. Naughton, B. The new common economic program: China's eleventh five year plan and what it means. *China Leadersh. Monit.* **2005**, *16*, 1–10.
25. Chan, K.W.; Wei, Y. Two systems in one country: The origin, functions, and mechanisms of the rural-urban dual system in China. *Eurasian Geogr. Econ.* **2019**, *60*, 422–454. [CrossRef]
26. Li, Y.; Jia, L.; Wu, W.; Yan, J.; Liu, Y. Urbanization for rural sustainability–Rethinking China's urbanization strategy. *J. Clean. Prod.* **2018**, *178*, 580–586. [CrossRef]
27. Wong, S.W.; Tang, B.S.; Liu, J. Rethinking China's Rural Revitalization from a Historical Perspective. *J. Urban Hist.* **2020**, *48*, 565–577. [CrossRef]
28. Qiao, M. *Economic Linkages of China's Small Towns: Urban-Rural Integration in a Learning Economy*; The University of Manchester: Manchester, UK, 2016.
29. Nolan, P. De-collectivisation of agriculture in China, 1979–1982: A long-term perspective. *Camb. J. Econ.* **1983**, *3*, 192–220.
30. Liu, Z. Institution and inequality: The hukou system in China. *J. Comp. Econ.* **2005**, *33*, 133–157. [CrossRef]
31. Wu, F. Planning centrality, market instruments: Governing Chinese urban transformation under state entrepreneurialism. *Urban Stud.* **2018**, *55*, 1383–1399. [CrossRef]
32. Schultz, T. *Distortions of Agricultural Incentives*; Indiana University: Bloomington, IN, USA, 1977.
33. Qian, H. Towards the Development of a Spatial Planning Framework for Rural Development in China: A Case Study of Jiangsu Province. Ph.D. Dissertation, University of Manchester, Manchester, UK, 2011.
34. Shen, J. Rural development and rural to urban migration in China 1978–1990. *Geoforum* **1995**, *26*, 395–409. [CrossRef]
35. McMillan, J.; Whalley, J.; Zhu, L. The impact of China's economic reforms on agricultural productivity growth. *J. Polit. Econ.* **1989**, *97*, 781–807. [CrossRef]
36. Huang, Y. *Capitalism with Chinese Characteristics: Entrepreneurship and the State*; Cambridge University Press: Cambridge, UK, 2008.
37. Liang, X. The evolution of township and village enterprises (TVEs) in China. *J. Small Bus. Enterp. Dev.* **2006**, *13*, 235–241. [CrossRef]
38. Ministry of Agriculture and Rural Affairs of PRC. The History Will Not Forget the Great Contribution of TVEs. 2018. Available online: http://www.moa.gov.cn/xw/bmdt/201807/t20180731_6154959.htm (accessed on 1 January 2021).
39. Zhao, S.X.; Wong, K.K. The sustainability dilemma of China's township and village enterprises: An analysis from spatial and functional perspectives. *J. Rural. Stud.* **2002**, *18*, 257–273. [CrossRef]
40. Li, Y.; Westlund, H.; Cars, G. Future urban-rural relationship in China: Comparison in a global context. *China Agric. Econ. Rev.* **2010**, *2*, 396–411. [CrossRef]

41. Hoken, H.; Sato, H. *Public policy and long-term trends in inequality in rural China, 1988–2013 (No. 2017-16)*; CHCP Working Paper; The University of Western Ontario, Centre for Human Capital and Productivity (CHCP): London, ON, Canada, 2017; Available online: http://hdl.handle.net/10419/180861 (accessed on 5 May 2020).
42. Liu, T.; Qi, Y.; Cao, G.; Liu, H. Spatial patterns, driving forces, and urbanization effects of China's internal migration: County-level analysis based on the 2000 and 2010 censuses. *J. Geogr. Sci.* **2015**, *25*, 236–256. [CrossRef]
43. Department of Service and Management of Migrant Population, National Health and Family Planning Commission of China (DSMMP/NHFPCC). *Report on China's Migrant Population Development*; China Population Publishing House: Beijing, China, 2016. (In Chinese)
44. State Council of China. No.1 Central Document. 2004. Available online: http://www.gov.cn/test/2006-02/22/content_207415.htm (accessed on 7 May 2020).
45. Central Government of PRC. Decision of the CPC Central Committee on Several Major Issues Concerning the Construction of a Harmonious Socialist Society. 2006. Available online: http://www.gov.cn/gongbao/content/2006/content_453176.htm (accessed on 9 May 2020).
46. Qian, H.; Wong, C. Master planning under urban–rural integration: The case of Nanjing, China. *Urban Policy Res.* **2012**, *30*, 403–421. [CrossRef]
47. Li, S.; Zhan, P.; Shen, Y. *New Patterns in China's Rural Poverty (No. 2017-17)*; CHCP Working Paper; The University of Western Ontario: London, ON, Canada, 2017.
48. Ministry of Agriculture and Rural Affairs of PRC. No.1 Central Document. 2010. Available online: http://www.moa.gov.cn/ztzl/yhwj/wjhg/201202/t20120215_2481486.htm (accessed on 10 May 2020).
49. Xia, J. Linking ICTs to rural development: China's rural information policy. *Gov. Inf. Q.* **2010**, *27*, 187–195. [CrossRef]
50. Ministry of Agriculture and Rural Affairs of PRC. No.1 Central Document Upon the Promotion of Socialist New Villages by CPC Central Committee and State Council of PRC. 2006. Available online: http://www.moa.gov.cn/ztzl/yhwj/wjhg/201202/t20120214_2481239.htm (accessed on 1 October 2020).
51. China Internet Network Information Center. *The 48th China Statistical Report on Internet Development*; CNNIC: Beijing, China, 2021.
52. State Council of PRC. Opinions on Implementing the Rural Revitalization Strategy. 2018. Available online: https://www.gov.cn/zhengce/2018-02/04/content_5263807.htm (accessed on 1 November 2020).
53. Zhang, X.; Zhang, Z. How do smart villages become a way to achieve sustainable development in rural areas? Smart village planning and practices in China. *Sustainability* **2020**, *12*, 10510. [CrossRef]
54. AliResearch. *Development Report of China's Taobao Village*; 2020. (In Chinese)
55. China Family Finance Investigation and Research Center. Rural Online Business Development Report. 2016. Available online: http://www.cbdio.com/BigData/2017-01/17/content_5433226.htm (accessed on 1 November 2020).
56. Zhu, Y. In situ urbanization in rural China: Case studies from Fujian Province. *Dev. Change* **2000**, *31*, 413–434. [CrossRef]
57. Li, B.; Shang, X.; Cui, Y.; Blaxland, M. *Migration, Urbanisation, Climate Change and Children in China—Issues from a Child Rights Perspective*; UNSW Social Policy Research Centre: Sydney, Australia, 2020.
58. Wang, J.; Ren, Y.; Shen, L.; Liu, Z.; Wu, Y.; Shi, F. A novel evaluation method for urban infrastructures carrying capacity. *Cities* **2020**, *105*, 102846. [CrossRef]
59. Zhou, T.; Jiang, G.; Zhang, R.; Zheng, Q.; Ma, W.; Zhao, Q.; Li, Y. Addressing the rural in situ urbanization (RISU) in the Beijing–Tianjin–Hebei region: Spatio-temporal pattern and driving mechanism. *Cities* **2018**, *75*, 59–71. [CrossRef]
60. Zhu, Y.; Qi, X.; Shao, H.; He, K. The evolution of China's in situ urbanization and its planning and environmental implications: Case studies from Quanzhou municipality. In *Urban Population-Environment Dynamics in the Developing World: Case Studies and Lessons Learned*; Committee for International Cooperation in National Research in Demography: Paris, France, 2009; pp. 213–245. Available online: http://www.ciesin.columbia.edu/repository/pern/papers/urban_pde_zhu_etal.pdf (accessed on 1 May 2020).
61. Heeks, R. CT4D 2016: New Priorities for ICT4D Policy, Practice and WSIS in a Post-2015 World. Development Informatics Working Paper 2014. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3438431 (accessed on 1 May 2020).
62. World Trade Organization (WTO). *World Trade Report 2008: Trade in a Globalizing World*; World Trade Organization: Geneva, Switzerland, 2008.
63. Best, M.L.; Maier, S. Gender, culture and ICT use in rural south India. *Gend. Technol. Dev.* **2007**, *11*, 137–155. [CrossRef]
64. Heeks, R. ICTs and Poverty Eradication: Comparing Economic, Livelihoods and Capabilities Models. Development Informatics Working Paper 2014. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3438433 (accessed on 1 March 2020).
65. Ng, B.K.; Wong, C.Y.; Santos MG, P. Grassroots innovation: Scenario, policy and governance. *J. Rural. Stud.* **2022**, *90*, 1–12. [CrossRef]
66. Hanson, W.; Heeks, R. Impact of ICTs-in-Agriculture on Rural Resilience in Developing Countries. Development Informatics Working Paper 2020. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3517468 (accessed on 1 March 2020).
67. Ospina, A.V. Climate Change Adaptation and Developing Country Livelihoods: The Role of Information and Communication Technologies. Ph.D. Dissertation, The University of Manchester, Manchester, UK, 2013.
68. Li, X.; Guo, H.; Jin, S.; Ma, W.; Zeng, Y. Do farmers gain internet dividends from E-commerce adoption? Evidence from China. *Food Policy* **2021**, *101*, 102024. [CrossRef]

69. Liu, M.; Min, S.; Ma, W.; Liu, T. The adoption and impact of E-commerce in rural China: Application of an endogenous switching regression model. *J. Rural. Stud.* **2021**, *83*, 106–116. [CrossRef]
70. Lin, G.; Xie, X.; Lv, Z. Taobao practices, everyday life and emerging hybrid rurality in contemporary China. *J. Rural. Stud.* **2016**, *47*, 514–523. [CrossRef]
71. Xu, C.; Lv, B.; Wen, T. New Patterns of County In-Situ Urbanization and Rural Development Based on E-Commerce. *Urban Plan. Int.* **2015**, *1*, 14–21. (In Chinese)
72. Yu, H.; Cui, L. China's e-commerce: Empowering rural women? *China Q.* **2019**, *238*, 418–437. [CrossRef]
73. Wang, Z.; Marafa, L. Tourism Imaginary and Landscape at Heritage Site: A Case in Honghe Hani Rice Terraces, China. *Land* **2021**, *10*, 439. [CrossRef]
74. Li, X.; Singh Chandel, R.B.; Xia, X. Analysis on regional differences and spatial convergence of digital village development level: Theory and evidence from China. *Agriculture* **2022**, *12*, 164. [CrossRef]
75. Cowie, P.; Townsend, L.; Salemink, K. Smart rural futures: Will rural areas be left behind in the 4th industrial revolution? *J. Rural. Stud.* **2020**, *79*, 169–176. [CrossRef]
76. Li, W.; Zhang, P.; Zhao, K.; Chen, H.; Zhao, S. The Evolution Model of and Factors Influencing Digital Villages: Evidence from Guangxi, China. *Agriculture* **2023**, *13*, 659. [CrossRef]
77. Salemink, K.; Strijker, D. The participation society and its inability to correct the failure of market players to deliver adequate service levels in rural areas. *Telecommun. Policy* **2018**, *42*, 757–765. [CrossRef]
78. Wang, Q.; Luo, S.; Zhang, J.; Furuya, K. Increased Attention to Smart Development in Rural Areas: A Scientometric Analysis of Smart Village Research. *Land* **2022**, *11*, 1362. [CrossRef]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.