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The Digital Economy, Factor Allocation and The Realization of Common Prosperity—An Empirical Study Based on Panel Data of 30 Provinces and Cities in China

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Abstract: ***The digital economy as a new economic form can both create prosperity and achieve sharing, which is in line with the concept of common prosperity, so how does the digital economy affect common prosperity? This paper adopts the panel data of 30 provinces (autonomous regions and municipalities) in China from 2013 to 2022, constructs the common prosperity index at the provincial level, incorporates the digital economy-capital and labour factor allocation-common prosperity into a unified analytical framework, and empirically examines the impact of the digital economy on the common prosperity and the mechanism of its action by using a two-way fixed model. The results of the study show that, firstly, the digital economy significantly promotes common prosperity. Second, the digital economy empowers the development of common prosperity by correcting the degree of mismatch of capital and labour resources. Third, there are regional differences in the promotion of the digital economy on the common prosperity, in which the central and western regions show obvious positive promotion, while the impact on the eastern region is relatively weak, there is a single threshold effect in the promotion of the digital economy on the common prosperity, in the case of the total amount of postal and telecommunication business is relatively low, the promotion of the digital economy on the common prosperity is significant, however, as the total amount of postal and telecommunication business reaches a However, as the total volume of postal and telecommunications business reaches a certain level, this positive promotion effect shows a decreasing effect. Accordingly, countermeasures are proposed to deepen the implementation of the digital economy strategy, promote the rational flow of capital and labour between regions and industries, improve the efficiency of resource allocation, and promote the realization of common prosperity.***

Keywords: Digital economy, Common prosperity, Factor mismatch, Regional differences**.**

1. Introduction

Common prosperity refers to the shared prosperity of all people, encompassing both material and spiritual well-being. It is not the prosperity of a privileged few, nor does it advocate for strict egalitarianism. Instead, common prosperity should be pursued in stages. In the context of China's current situation, while significant economic achievements have been made, there remain regions and groups that lag behind in development. This has resulted in a wide disparity between the rich and the poor, as well as imbalances between spiritual life and material development. Additionally, there are noticeable development gaps between regions, particularly between urban and rural areas, and between the eastern and central-western regions. General Secretary Xi Jinping has emphasized that "promoting common prosperity should focus on efficiency, fully leverage the decisive role of the market in resource allocation, enhance total factor productivity through an effective market, promote high-quality development, and lay a solid material foundation for the realization of common prosperity." One of the fundamental causes of the urban-rural and regional gaps—two prominent issues in socio-economic development—lies in the inequality of factor remuneration and the inefficiency of factor allocation. In the urban-rural gap, the low remuneration for rural labor and the inadequate allocation of resources have led to relative poverty in rural areas. Similarly, the regional gap is driven by disparities in the factors of production and resources available to different regions, resulting in uneven economic growth.by different regions have led to uneven economic growth. Resource allocation was crucial to the achievement of common prosperity, and effective resource allocation could not only raise total factor productivity but also optimise the distribution of social resources, enabling each region and each group to give full play to its potential. Through the intervention of science and technology and market mechanisms, the digital economy provides new possibilities for factor allocation, new ideas for the solution of the mismatch problem, and a new way of solving these structural problems, which triggers a more profound question: the development of the digital economy promotes economic prosperity, but it may also make the poor poorer and the weaker weaker, so in the present time when the digital economy is booming, what exactly will be the effect of the digital economy on the What exactly will be the impact of common prosperity? In addition, the digital economy, as an important force to promote China's economic growth, with the addition of data elements will affect the traditional allocation of factors, whether the digital economy has really achieved an effective allocation of resources, and thus promote the realization of common prosperity at the social level?

According to the existing literature, the impact of the digital economy on common prosperity and its role in factor allocation has become the focus of academic attention. Some researchers found through empirical analyses that the development of the digital economy has a significant contributing effect on the improvement of the level of common prosperity [1-3]. However, some researchers suggest that the impact of the development of digital economy on the

income gap between urban and rural residents may show a U-shaped characteristic of narrowing first and then widening [4], which means that the digital economy may have a driving effect on common prosperity in the initial period, but may have a dampening effect as time goes by. In addition, an empirical study from the perspective of spatial threshold effects shows that the impact of the digital economy on common prosperity is less significant in terms of both direct and mediating effects [5]. These studies provide an important reference for us to deeply understand the relationship between digital economy and common prosperity.

In the process of promoting common prosperity, academics generally agree that factor structure mismatch is the main obstacle to achieving this goal. China has an obvious mismatch between urban and rural factor structures, in which every 1 per cent reduction in the degree of factor mismatch reduces the urban-rural income gap by 0.556 per cent [6]. In addition, the urban-rural dual structure has led to barriers to factor mobility, making it impossible for key factors such as labour and capital to move freely between urban and rural areas; such one-way mobility not only inhibits the vitality of the rural economy, but also further widens the gap between urban and rural areas, posing a serious constraint on the realization of common prosperity [7]. Achieving common prosperity is a long-term and arduous task, and in promoting this process, it is necessary to address and resolve the problem of mismatched factor structures, break the boundaries of the urban-rural dichotomy, and promote the free flow of factors.

In summary, scholars mainly focus on the relationship between the digital economy, factor allocation and common prosperity in the three variables to carry out research, few in-depth exploration of the links between the three, and even more lack of digital economic development impact on the common prosperity of the transmission mechanism identification. Therefore, this paper unifies the digital economy, factor allocation and common prosperity into the theoretical analysis framework, verifies the impact of the digital economy on common prosperity from the perspective of influencing the optimal allocation of resources, and further examines the differential impact of the digital economy on common prosperity in different regions.

2. Literature Review and Research Hypothesis

2.1 Digital Economy and Shared Prosperity

From the current stage of research results, firstly, the research believes that the development of the digital economy will significantly deepen the degree of income inequality, which is due to the fact that there is a certain threshold for the mastery and application of digital technology, which puts part of the population at a disadvantage in the development of the digital economy [8]. At the same time, the polarisation effect and echo effect of the digital economy on regional economic growth will widen the urban economic gap and exacerbate the imbalance of regional development, which, to a certain extent, weakens the role of the digital economy in promoting common prosperity [9]. Second, regarding the impact of the digital economy on the income gap between urban and rural residents, research has found that in the early stage of the development of the digital economy, it has a promotional effect on the common prosperity, but with the further development of the digital economy, it may inhibit the realization of the common prosperity, leading to the widening of the income gap between urban and rural areas, and even generating the problem of the digital divide [10]. Thirdly, the digital economy has given rise to new production modes such as online deployment of resources and capacity sharing, which promotes the advanced and rationalised industrial structure and has an obvious "bigger cake" effect [11,12]. Secondly, the digital economy reduces the cost of communication in different regions, highly connects the main bodies of economic activities, guides the rational distribution of upstream, midstream and downstream industries in various regions, promotes balanced regional development, solves the problem of unbalanced development, and helps to realise the "sharing of the cake" in the context of common prosperity [13].

This paper argues that the growth of the digital economy has potentially increased income inequality and widened the income gap between urban and rural areas. However, to a greater extent, the digital economy provides new opportunities for common prosperity. By breaking down geographical restrictions and resource factor limitations, the digital economy promotes the rationalisation and advancement of industrial structure and helps to "make the cake bigger". At the same time, by reducing communication costs and information fragmentation, the digital economy also contributes to the balanced development of regions, and facilitates the realization of "sharing the cake". Therefore, the digital economy provides both challenges and opportunities for the promotion of common prosperity, based on which this paper proposes hypothesis 1.

Hypothesis 1: The digital economy has a significant positive impact on shared prosperity.

2.2 Research on Factor Allocation and Shared Prosperity

With regard to the allocation of labour resources, the unbalanced allocation between urban and rural areas is a key factor leading to distortions in the allocation of labour. In particular, labour mismatches in China's agricultural sector can impede total factor productivity. In addition, distortions in labour prices will significantly reduce the income levels of agricultural households, and those with low incomes will be hit even more dramatically when faced with market imperfections. China's urban employment and economic development efficiency there is a significant non-linear "inverted U-shaped" curve relationship, but the proportion of labour force employment in urban areas compared to the optimal value of efficiency is still 10 to 19 percentage points lower, the allocation of more labour factors to urban areas is conducive to improving the efficiency of economic development [14]. With the development of the Internet in the digital context, the improvement of the efficiency of labour factor allocation will further strengthen the important role of the Internet in promoting the balanced development of the regional economy [15]. As far as the allocation of capital factors is concerned, capital flows in pursuit of higher returns, and only when the formation of "capital flows - economic development - optimisation of the business environment - further attracting capital flows - economic development" is

achieved, will it be possible to achieve a balanced development of the regional economy. Only when a virtuous interactive cycle of "capital flow - economic development - optimisation of the business environment - further attracting capital flow - sustained economic growth" is formed can the efficiency of capital utilisation be improved, capital flow to regions and industries with high development potential and high efficiency be directed to improve the problem of mismatch between the supply of capital and the demand, and to promote the growth of the regional economy [16]. Distortions in the allocation of capital factors can affect a region's agricultural output further affecting agricultural total factor productivity. When farmers engage in agriculture, they may not have enough savings to purchase the required means of production and need to borrow from financial institutions. However, agricultural production and business activities are often subject to risks arising from changes in the natural environment, and farmers are difficult to obtain low-interest rate loans, so they often turn to high-interest rate informal institutions, increasing capital inputs and leading to distortions in the allocation of capital in agricultural production [17].

2.3 Digital Economy, Factor Allocation and Shared Prosperity

Research on digital economy, factor allocation and common prosperity. The deep integration of the digital economy and traditional industries has improved the efficiency of resource use [18][19], changed the traditional smile curve value chain division of labour model, prompted a flatter division of labour in the value chain, and provided a fairer distribution of benefits for various market players [20]. After in-depth research, it is found that the promotion effect of digital economy on common prosperity is particularly significant in regions with a higher degree of marketisation and factor market development [21]. For example, as the level of digital economy increases, its promotion of common prosperity first shows a double effect of inhibition and then promotion, but its effect will be weakened in the case of high labour factor mismatch [22]. In terms of resource allocation efficiency, the digital economy indirectly contributes to the realization of common prosperity by optimising resource allocation efficiency [23]. And through the transmission path of "digital economy - balanced allocation of inter-industry resources - common prosperity", it contributes to the realization of common prosperity at the meso level [24]. Based on this, this paper proposes hypothesis 2.

Hypothesis 2: The digital economy contributes to the realization of common prosperity by improving the degree of factor mismatch.

3. Common prosperity and Digital Economy Index Construction

3.1 Common prosperity Index

In order to verify the impact of digital economy development on the overall development of common prosperity, the explanatory variable is the common prosperity composite index (Cp), and this paper adopts the multidimensional construction method, based on General Secretary Xi Jinping's important article "Solidly Promoting the Common prosperity", and refers to the common prosperity comprehensive evaluation index established by Shandong Province's "Common Prosperity Monitoring and Research" research group. The index includes six aspects: material affluence, balanced development, fair income distribution, equal public services, spiritual affluence, and common prosperity in rural areas, and the entropy weight-Topsis method is used to measure the comprehensive common prosperity index.

Table 1: Indicators of shared prosperity in the provinces

Level 1 indicators	*Secondary indicators*	*Indicator design*	*norm causality*
Composite Index of Shared Prosperity	material prosperity	Ratio of disposable income per capita in urban and rural areas	negative direction
		Ratio of urban to rural minimum subsistence allowance	negative direction
		Gini coefficient (a measure of statistical dispersion)	negative direction
	balanced development	Fiscal expenditure per capita in the highest region/fiscal expenditure per capita in the lowest region	negative direction
		GDP per capita in the highest region/GDP per capita in the lowest region	negative direction
	Equity in income distribution (primary distribution)	Savings deposits (household deposits)/resident population	forward
		Net property income per inhabitant/per capita disposable income	forward
	Secondary distribution	Personal income tax revenue/tax revenue	forward
		Net transfer income per inhabitant/per capita disposable income in rural areas	forward
	triple distribution	Registered social organisations per 10,000 population	forward
		Welfare lottery sales/GDP	forward
	Equalisation of public services	Expenditure on education/GDP	forward
		Undergraduate and postgraduate students per 10,000 population	forward
		Practising physicians per 1,000 population	forward
		Beds per 1,000 population	forward
		Average price of housing/per capita disposable income of urban residents	forward
	spiritual abundance	Public library collection/resident population	forward
		Per capita consumption expenditure on education, culture and recreation/per capita consumption expenditure of the population	forward
	Rural affluence	Agricultural labour productivity	forward
		Engel's coefficient for rural households	negative direction
		Proportion of administrative villages with centralised water supply	forward
		Gas penetration rate	forward
		Percentage of length of hardened roads in rural areas	forward

3.2 Digital Economy Index

The core explanatory variable in this paper is the level of digital economy development, which is represented by the Digital Economy Index (Dige), which is borrowed from Liu Jun and calculated using the Entropy-Topsis method [25].

Table 2: Provincial digital economy indicators

variant name (of a thing)	*Level 1 indicators*	*Secondary indicators*	*Indicator design*	*norm causality*
Digital Economy Index	Informatisation development indicators	information technology infrastructure	cable density	forward
			Density of mobile phone base stations	forward
			Percentage of Information Technology Employees	forward
		Informational impact	Total telecommunication services	forward
			Revenue from software operations	forward
	Internet Development Indicators	Fixed-end Internet infrastructure	Internet access port density	forward
		Mobile Internet Fundamentals	Mobile phone penetration rate	forward
		Fixed-end Internet impact	Percentage of broadband Internet subscribers	forward
		Mobile Internet Impact	Percentage of mobile Internet users	forward
	Indicators for the development of digital transactions	Fundamentals of Digital Trading	Percentage of corporate websites	forward
			Percentage of computers used by enterprises	forward
			Share of e-commerce	forward
		Impact of digital transactions	E-commerce sales	forward
			Online retail sales	forward

3.3 Factor Mismatch Index

Capital and labour mismatch index: capital mismatch index and labour mismatch index of provincial resource mismatch degree measured based on GDP, employees and capital stock of each region by drawing on the method of Hsieh & Klenow [26], Y.W. Chen [27], J.H. Bai, and Y.Y. Liu [28]. In order to make the direction of regression consistent, the method of S.H. Ji et al [29]. is referred to, and the absolute values of capital and labour mismatch indices are taken separately.

$$\gamma_{ki} = \frac{1}{1+kmis_i} \quad (1)$$

$$\gamma_{li} = \frac{1}{1+lmis_i} \quad (2)$$

$$\widehat{\gamma_{ki}} = \left[\frac{K_i}{K}\right] \backslash \left[\frac{s_i\beta_{ki}}{\beta_k}\right] \quad (3)$$

$$\widehat{\gamma_{li}} = \left[\frac{L_i}{L}\right] \backslash \left[\frac{s_i\beta_{li}}{\beta_l}\right] \quad (4)$$

$\frac{K_i}{K}, \frac{L_i}{L}$ denotes the actual proportion of elements used in province i in relation to the total, while $\frac{s_i\beta_{\mathrm{ki}}}{\beta_k}$, on the other hand $\frac{s_i\beta_{\mathrm{li}}}{\beta_l}$ measures the theoretical proportion of capital and labour used in province i at the time of efficient allocation, and the ratio of these two measures the extent of capital and labour mismatch in province i.

Drawing on the approach of J. Zhang [30] using the perpetual inventory method, where real fixed asset investment completions are obtained by deflating the nominal fixed asset investment completions with the provincial fixed asset price index (2013 = 100), with a depreciation rate of 9.6 per cent, where the formula for the perpetual inventory method is:

$$K_t = \frac{I_t}{P_t} + (1-\delta_t)K_{t-1} \quad (5)$$

whereK_t denotes the fixed capital stock for the current period, andI_t denotes the total investment in fixed assets for the current period, theP_t denotes the price index of investment in fixed assets, andδ_t is the depreciation rate of fixed assets, which is 9.6 per cent, andK_{t-1} denotes the fixed capital stock of the previous period.

Substituting Eqs. 3, 4 and 5 into Eqs. 1 and 2 yields the capital mismatch index (kmis_i) and labour mismatch index (lmis_i), which are calculated as follows:

$$kmis_i = \frac{1}{\widehat{\gamma_{ki}}} \text{-1} \quad (6)$$

$$lmis_i = \frac{1}{\widehat{\gamma_{li}}} \text{-1} \quad (7)$$

If the mismatch index is greater than 0 it indicates an under-allocation of resources and vice versa. The absolute value is taken, and the size of the absolute value directly reflects the degree of resource mismatch.

4. Variable Selection and Model Design

4.1 Selection of Variables

In order to verify the impact of digital economy development on the overall development of common prosperity, the explanatory variable is the Composite Index of Common prosperity (Cp); the core explanatory variable is the level of digital economy development; the control variables are the level of urbanisation (Ur) expressed by the proportion of the urban population at the end of the year; the population density (Popund) is expressed by the ratio of the resident population at the end of the year to the administrative area of the provincial divisions, taking logarithms; the foreign direct investment (Fdi), expressed as the ratio of total investment by foreign-invested enterprises to GDP, taking logarithms; financial development level (Fia), selected as the ratio of the sum of deposit and loan balances to GDP, taking logarithms; unemployment status (Unem), expressed as the urban registered unemployment rate; and the threshold variable is the total volume of postal and telecommunication business, which reflects the informatisation level and the standard of living of the citizens of a country or region.

4.2 Modelling

4.2.1 Modelling the impact of the digital economy on shared prosperity

In order to test hypothesis 1, a panel data regression model is used to empirically verify that there is a positive impact of digital economic development on the realization of common prosperity in China, and the specific mathematical model is as follows:

$$\mathrm{Cp}_{\mathrm{it}} = \alpha_0 + \beta_1 \mathrm{Dige}_{\mathrm{it}} + \varphi \mathrm{X} + \varepsilon_{\mathrm{it}} \quad (8)$$

Where Cp and Dige denote the composite index of common prosperity and digital economy development, respectively, and the regression coefficient β1 reflects the degree of impact of digital economy on common prosperity.

4.2.2 Model of the digital economy to correct capital-labour factor mismatch for shared prosperity

Referring to the idea of testing the mechanism of action of Jiangboat (2022), the capital and labour mismatch indices are selected as the mechanism variables and the model is constructed as follows:

$$\text{kmis}_{it} = \gamma_0 + \gamma_1 \text{Dige}_{it} + \theta_1 X + \varepsilon_{1it} \quad (9)$$

$$\text{lmis}_{it} = \gamma_0 + \gamma_2 \text{Dige}_{it} + \theta_2 X + \varepsilon_{2it} \quad (10)$$

where kmis, lmis are the resource mismatch indices for capital, labour, respectively.γ_1,lmisγ_2 denote the degree of impact of digital economy on capital factor mismatch and labour factor mismatch, respectively.

4.2.3 Threshold effect modelling of the impact of the digital economy on shared prosperity

Drawing on the Hansen threshold test idea, the total volume of postal and telecommunications business is selected as the threshold variable and a single-threshold model is constructed to test Hypothesis 3.

$$\text{Cp} = \alpha + \beta_1 \text{Dige}_{i,t} \cdot I(\text{PT}_{i,t} \le \gamma_1) + \beta_2 \text{Dige}_{i,t} \cdot I(\text{PT}_{i,t} > \gamma_1) + \varphi X_{i,t} + \mu_i + \varepsilon_{i,t} \quad (11)$$

where I(·) is the schematic function; γ_1 is the first threshold.

This paper makes use of the panel data consisting of 30 provinces, autonomous regions and cities in China (excluding Tibet, Hong Kong, Macao and Taiwan) from 2013-2022, and the data are obtained from the statistical yearbooks of each province in the past years, the China Statistical Yearbook, the Statistical Yearbook of Urban and Rural Construction, the WIND database, and the Cathay Pacific database. For missing data values, this paper mainly uses linear interpolation to make up for them to ensure the accuracy, standardisation and completeness of the data.

Table 3: Descriptive statistics of the main variables

	variant	*average value*	*(statistics) standard deviation*	*minimum value*	*maximum values*
Common prosperity Index (CWI)	Cp	0.289	0.095	0.113	0.587
Digital Economy Development Index	Dige	0.129	0.114	0.211	0.576
Capital Mismatch Index	Kmis	0.211	0.187	0.001	0.983
Labour mismatch index	Lmis	0.351	0.306	0.001	1.322
urbanisation rate	Ur	0.609	0.115	0.379	0.896
population density	Popund	5.476	1.292	2.068	8.275
overseas foreign direct investment (OFDI)	Fdi	14.656	1.799	7.636	16.841
Financial development	Fia	2.841	0.280	2.133	3.480
unemployment rate	Unem	0.032	0.006	0.012	0.046
Total postal and telecommunication operations	PT	1914.13	2537.513	67.465	20833.11

5. Analysis of Empirical Results

5.1 Digital Economy Impact Test on Common prosperity

Table 4: Benchmark regression results

variant	*(1)* *Cp*	*(2)* *Cp*
Dige	0.511***	0.313***
	(0.030)	(0.033)
Ur		0.511***
		(0.0818)
Popund		-0.275***
		(0.077)
Fdi		-0.007**
		(0.031)
Fia		0.032
		(0.021)
Unem		-0.351
		(0.395)
area fixed effect	Yes	Yes
time fixed effect	Yes	Yes
sample size	300	300
F	293.06	106.55
R2	0.5422	0.7320

Based on the combined judgement of F-test, Hausman test and LM test results, the two-way fixed effect model is more suitable for this paper. Table 4 reports the basic regression results of digital economic development on common prosperity, where columns (1) and (2) present the effect of digital economy on common prosperity after no control variables are added and control variables are introduced, respectively, and the regression coefficients are both significantly positive at 1% level, which preliminarily suggests that the development of digital economy has a significant positive effect on common prosperity in the provinces, and thus theoretical hypothesis 1 is valid. After adding the control variables and time and location fixed effects, R2 is higher than before and the regression coefficients are still significantly positive, indicating that there is a significant positive effect of digital economy on common prosperity when considering the differences in the impacts of different provinces' urbanisation levels, population densities, and levels of foreign direct investment.

5.2 Digital Economy Corrects for Capital-Labour Factor Mismatch Impacting Common prosperity Tests

The development of the digital economy has improved the operational efficiency of capital, reduced the cost of information acquisition, and made investment decisions more precise and rapid, which helps optimise capital allocation. Secondly, the digital economy has created new forms of capital markets, such as the application of digital currencies and blockchain technology, which provide a more convenient and secure way for capital flows, and this decentralised financial system helps to reduce the barriers to capital flows and expand the capital allocation efficiency boundary. Therefore, the impact of digital economy on capital mismatch index is tested next. The results are shown in column (1) of Table 5, where the coefficient of the digital economy is significantly negative, i.e., the digital economy can significantly correct the degree of capital mismatch.

The widespread application of digital technologies has changed the way work is done, promoting the popularity of

telecommuting, providing the labour force with more choices and autonomy, and improving its adaptability and flexibility, so that it can better meet market demands. The rise of the digital platform economy has created more independent work opportunities, such as the sharing economy and e-commerce, increasing the prevalence of employment opportunities, reducing the pressure on traditional employment models and prompting a more rational distribution of labour resources. To this end, the potential impact of the digital economy on the labour mismatch index is directly examined and the corresponding test results are reported in column (2) of Table 5, which shows that the coefficients of the digital economy are significantly negative, implying that the digital economy can significantly improve the allocation efficiency of labour factors. The digital economy contributes to the realization of common prosperity by reducing the degree of capital and labour mismatch, i.e., hypothesis 2 holds. It shows that in the era of digital economy, the network externalities generated by the platform-based bilateral and multilateral markets break the vertical organizational structure under the traditional economy, and through the speed of the diffusion of digital technology and the endogenous power of technology, it promotes the resourceful allocation of capital and labour factors, and realizes the optimal allocation of factors of production in accordance with the principle of comparative advantage, so as to promote the realization of common prosperity.

Table 5: Regression results of mechanism of action regression analyses

variant	*(1)* *Capital Mismatch Index*	*(2)* *Labour mismatch index*
Dige	-0.396***	-0.358***
	(0.081)	(0.082)
Ur	1.216***	0.272
	(0.199)	(0.202)
Popund	-0.370*	0.304
	(0.189)	(0.191)
Fdi	-0.022***	-0.026***
	(0.008)	(0.008)
Fia	-0.119**	-0.048
	(0.052)	(0.053)
Unem	5.558***	2.967***
	(0.961)	(0.976)
area fixed effect	Yes	Yes
time fixed effect	Yes	Yes
sample size	300	300
F	15.72	8.05
R2	0.2873	0.1710

5.3 Regional Heterogeneity Tests

Considering the obvious regional heterogeneity of China's economic development, there are obvious differences between regions in terms of geographic location and the distribution and allocation of resource factors. As a result, there are also obvious differences in the construction of digital economy infrastructure and digitalisation inputs in different regions, which in turn leads to differences in the impact of digital economy development on the realization of common prosperity in different regions. Therefore, this paper will be divided into three groups of East, Central and West to examine the existence of regional variability in order to test Hypothesis 3, and the results are shown in Table 6.

According to the regression results in Table 6, although the regression coefficient of the digital economy development index is not significant in the eastern region, the digital economy's driving effect on common prosperity is significant in the central and western regions, and shows regional heterogeneity. Specifically, digital economic development has the most obvious driving effect on the central region, followed by the western region, while in the eastern region, its impact does not reach a significant level. This indicates that the role of the digital economy in the eastern region is relatively weak, that is, as the level of common prosperity development rises, the promotion of the digital economy will gradually weaken, which is in line with the economic law of diminishing marginal effect. From a practical point of view, the western and central regions are usually relatively underdeveloped, so the promotion effect of the digital economy is more significant, which can help narrow the development gap between regions. The eastern region usually has more mature infrastructure and a higher level of economic development, the application of digital technology already has a higher level of development results, the digital economy on the common prosperity of the promotion effect is relatively small.

Table 6: Results of heterogeneity analysis in different regions

variant	*(1)* *eastern part*	*(2)* *Central Region*	*(3)* *Western Region*
Dige	0.066	0.314***	0.305***
	(0.101)	(0.033)	(0.033)
Ur	0.699***	0.516***	0.656***
	(0.109)	(0.085)	(0.098)
Popund	-0.344***	-0.282***	-0.265***
	(0.081)	(0.084)	(0.077)
Fdi	-0.006*	-0.007**	-0.007**
	(0.003)	(0.003)	(0.003)
Fia	0.024	0.033	0.0144
	(0.021)	(0.022)	(0.022)
Unem	-0.461	-0.368	-0.253
	(0.392)	(0.404)	(0.392)
area fixed effect	Yes	Yes	Yes
time fixed effect	Yes	Yes	Yes
sample size	300	300	300
F	94.51	90.96	94.48
R2	0.7395	0.7321	0.7395

5.4 Analysis of Threshold Effects

The results of the study show that in the central and western regions, the promotion of the digital economy on common prosperity is obvious, however, in the eastern region, its effect is not significant. We speculate that this phenomenon may be related to the differences in the level of regional economic development, i.e., the effect of digital economy on common prosperity gradually diminishes with economic development. To verify this speculation, we chose the total volume of post and telecommunications business as the threshold variable for regression analysis, and the results of the threshold effect test are shown in Table 7.

Table 7: Threshold effect test results

variant	*modelling*	*F-value*	*P-value*	*10%*	*5%*	*1%*
Dige	single threshold	12.40	0.03	9.248	10.699	14.946
	double threshold	8.97	0.18	10.285	12.101	15.264

According to the data in the table, the total volume of post and telecommunications business fails to meet the standard in the double-threshold test, but performs well in the single-threshold test. After further verifying the single-threshold effect, we adopted a single-threshold regression model and took the digital economy development

index as a threshold variable for regression analysis, and its results are detailed in Table 8.This is consistent with the previous conclusion that the impact of the digital economy on the common prosperity in the eastern region is not significant, which again explains that the developed regions have already gained a greater advantage in the digital economy, and the new growth momentum may be relatively limited, so that the effect of the digital economy on the overall promotion of the common prosperity has been weakened.

Table 8: Threshold regression results

variant	*single-threshold model* *Cp*
Ur	0.475*** (0.081)
Popund	-0.271*** (0.076)
Fdi	-0.007** (0.030)
Fia	0.030 (0.021)
Unem	-0.490 (0.389)
PT≤2256.963	0.420*** (0.045)
Dige>2256.963	0.343*** (0.034)
N	300
F	96.84
R2	0.7442

5.5 Robustness Tests

In order to ensure that the results of the previous empirical regression are reliable, this paper adopts four methods for robustness testing. First, the level of digital economy development was recalculated using principal component analysis and re-analysed using the fixed effects model. According to the results in column (1) of Table 9, the effect of digital economy on common prosperity is still positive at the 1% significance level. Second, in order to verify the robustness of the estimation results, we test them by replacing the explanatory variables. In this paper, we chose the Tel Index and disposable income per capita of all residents as the new explanatory variables, and the results, as shown in column (2) of Table 9, show that the regression coefficients of the digital economy variables are significantly positive. Thirdly, we adopt the instrumental variable method and choose the level of digital economy development with one period lag as the instrumental variable, and the regression results are shown in column (3) of Table 9, and the results are consistent with the findings of the benchmark regression. Considering that extreme values may interfere with the accuracy of the sample regression process, resulting in regression coefficients deviating from the true values and overestimation or underestimation, we tested this phenomenon by shrinking the tails. Specifically, we have applied 1 per cent tailoring to the variables and re-estimated them, and the results are shown in column (4) of Table 9. The impact coefficients before and after the tailoring are generally consistent with the benchmark regression and are significant at the 1% significance level. In summary, the results of the benchmark regression are generally robust.

Table 9: Robustness test results

variant	*(1) principal component analysis*	*(2) Substitution of explanatory variables*	*(3) lag one phase*	*(4) shrinkage treatment*
Dige	0.383*** (0.020)	0.432*** (0.025)	0.349*** (0.034)	0.296*** (0.033)
Ur	10.132*** (0.521)	1.418*** (0.061)	0.491*** (0.083)	0.546*** (0.082)
Popund	-4.080*** (0.467)	-0.136** (0.058)	-0.285*** (0.083)	-0.264*** (0.078)
Fdi	-0.004 (0.019)	0.002 (0.002)	-0.007** (0.003)	-0.009*** (0.003)
Fia	-0.371*** (0.128)	-0.043*** (0.016)	0.027 (0.023)	0.026 (0.022)
Unem	4.518* (2.467)	0.417 (0.296)	-0.321 (0.408)	-0.235 (0.399)
area fixed effect	Yes	Yes	Yes	Yes
time fixed effect	Yes	Yes	Yes	Yes
sample size	300	300	270	300
F	552.14	637.98	71.31	102.18
R2	0.9340	0.9424	0.6995	0.7238

6. Conclusions and Recommendations

6.1 Conclusions of the Study

This paper analyses the impact of the digital economy on the common prosperity by combing and summarizing the literature related to the digital economy and the common prosperity, then constructs the respective comprehensive evaluation index system based on the connotative characteristics of the two, and adopts the entropy value-Topsis method to calculate the index of the digital economic development and the common prosperity in 2013-2022, and then this paper makes use of the index that measures the impact of the digital economy on the common prosperity to carry out empirical research and validate the existence of the threshold effect. index to carry out empirical research on the impact of the digital economy on the common prosperity, and verified the impact of the digital economy on the common prosperity, the analysis of the mechanism of action, and the existence of the threshold effect, and came to the following conclusions: firstly, the digital economy has a positive enabling effect on the common prosperity; secondly, the digital economy facilitates the realization of the common prosperity through the improvement of the degree of resource mismatch. Third, there is regional heterogeneity in the facilitating effect of digital economy on common prosperity, the positive facilitating effect of the central and western regions is significantly stronger than that of the eastern region, and there is a single threshold effect of the facilitating effect of digital economy on common prosperity, in the case of the relatively low total volume of postal and telecommunication services, the facilitating effect of the digital economy on common prosperity is significant, however, as the total volume of postal and telecommunication services reaches a certain level, this positive facilitating effect shows a diminishing effect.

6.2 Recommendations for Countermeasures

Based on the above findings, this paper puts forward the following recommendations: First, improve the construction of digital infrastructure. First, improve the construction of digital infrastructure, especially for those remote and backward areas, increase the improvement of network supply capacity, and accelerate the layout of 5G and fibre-optic

broadband "double gigabit" networks. At the same time, rational planning and layout of cloud computing, edge computing and other computing infrastructure to ensure that residents in these areas can more easily access the digital economy. Secondly, we will actively explore the diversified paths of the digital economy in promoting common prosperity. With the help of digital technology to break down information barriers between regions and urban and rural areas, ensure that all citizens can enjoy high-quality and efficient public services. As a weak link in the development of the digital economy, rural areas urgently need to strengthen the construction of digital infrastructure, upgrade the level of digital applications, and help farmers achieve a high level of product docking and sharing through the promotion of smart agriculture, rural e-commerce, and other new modes, so as to improve the market competitiveness of agricultural products, thereby increasing the income of farmers and narrowing the gap between urban and rural areas. Third, give full play to the resource allocation role of the digital economy and optimise capital allocation. Accelerate the construction of a digital labour platform, combine the traditional labour market with digital technology, break geographical and time constraints, achieve optimal allocation of labour resources and improve the efficiency of the labour market. Fourth, follow the relative comparative advantages of regions and formulate differentiated digital economy development policies. The central and western regions have strengthened digital infrastructure construction, including improving network coverage and upgrading network speed. Second, promote digital science and technology innovation, support enterprises in digital transformation, and foster digital economy clusters. The eastern region must actively take advantage of digital technology and focus on overcoming the research and development challenges of core digital technology.

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