

The Widening Role of the Digital Economy on Regional Income Differences - Evidence from the National Pilot Zone for Innovative Development of the Digital Economy

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Abstract. A growing body of research suggests that the digital economy may create opportunities to combat income inequality. However, these studies have focused more on the difference between countryside and city areas, neglecting the intervene of the state, regional differences and labour market in digital economy. Therefore, this paper collects data on the average income of different cities and the average wage of their digital economy workforce, and uses the Theil Index, DID and mediated-effects methods to study the setup of the National Pilot Zone for the Innovative Development of the Digital Economy as well as the status of income equality within the pilot zone. The paper also analyses heterogeneity based on geographic location, and uses a mediation effect model to measure the role of the income of digital economy practitioners in the impact of the National Pilot Zone for the Innovative Development of the Digital Economy on inter-regional income disparities. Study finds that the pilot zone widens the inter-regional income gap. This result is caused by the uneven spatial distribution between regions and industries. Labour wages in the relevant industries are also an important factor mediating the effect between developing the digital economy and the elimination of income inequality.

Keywords: Digital economy, Income inequality, DID, Mediating effects.

1. Introduction

The digital economy (DE) is a new-age production model built on network platforms and information resources, especially data [1]. DE emphasizes the promotion of total factor digitization, the provision of economic opportunities, and the enhancement of market efficiency in order to promote a fairer and more efficient distribution model [2].

In 2019, the National Pilot Zone for Innovative Development of Digital Economy (hereinafter referred to as the pilot zone or NPZIDDE) project was officially launched, Hebei, Zhejiang, Fujian, Guangdong, Sichuan and Chongqing Municipality, as the six pilot areas, focusing on the allocation of factors of production, infrastructure construction, digital governance and the integration of DE and real industries, with the expectation of promoting the construction of the DE in these areas [3]. It has been proved that the construction of the pilot zones has greatly promoted the economic development of these six provinces, however, the potential risks of the digital economy are also reflected in the development of the pilot zones in the past five years: the development of the DE has impacted the traditional industry, increasing the wage premium for high-skilled workers in the bargaining mechanism of the labour market [4]. Based on the differences in local infrastructures and economic development levels, the differences between the pilot zones are also gradually revealed, for example, in just two years, Chongqing Municipality quickly levelled up the gap with Hebei Province, showing a strong development momentum. However, these differences and changes are not reflected in conventional research.

Research on the establishment of pilot zones mainly focuses on the statistical level, including but not limited to the summary of the development of pilot zones at the current stage and the outlook for the future, which shows that the establishment of pilot zones is not very different from the general exogenous shocks [3]. Focusing on empirical studies, they mainly focus on the innovation capacity of DE and the development of productivity [5,6]. The above studies have discussed in detail the

mechanism from the view of industrial structure and factor allocation, but have not quantitatively analysed the role of macro policy in it. Second, in the study of DE and income imbalance, domestic and foreign researchers generally focus on the impact of the DE on the urban-rural gap, and believe that the urban-rural income imbalance has been widened based on the economy, infrastructure and other reasons [7]. Such clearly opposing studies of the urban-rural relationship only show that resources have become more concentrated in urban areas in the process of digitisation, and do not demonstrate the role of the DE in allocating resources on a spatial scale. Similarly, the digital economy has been shown to greatly expand the wage premium across industries through industrial intelligence, which seems to reflect the divisive effect of DE on industries in the short term, but does not take into account the fixed effects across regions and the specific mechanisms by which the digital economy, wage differentials, and regional income inequality interact [8].

Measuring the impact of pilot zones on regional income imbalances and identifying distortions in digital economy policies due to labour market wage changes based on differences in skilled trades are issues that need to be further explored. This study argues that research and explanation of these issues will expand current academic knowledge of DE and provide spatial and distributional perspectives for the future development of DE.

In this study, the building of the pilot zone will be selected, and its impact on the inter-regional income gap will be analysed with the data source, China Statistical Yearbook, trying to put the hot factors such as digital economy, regional income gap, and technological differences under the test of the DID method. In this study, the inter-regional income gap and technological differences are refined, and the Theil Index is selected to calculate the income disparity between prefecture-level cities, and the robustness test is conducted using the placebo test [9]. Second, the study will set up a base period to quantify the shocks based on the lead time for the construction of the pilot area. Finally, the study will prove the existing of the mediating effect of the wage level of DE related industries and the construction of the pilot zone as a way to test the specific mechanism by which the establishment of the pilot zone affects regional income imbalance [10].

2. Institutional Background

Since 2012, the Chinese government has repeatedly stressed the importance of building DE with data as the vital element, promote digital industrialization and industrial digitization under the guidance of the new concept of innovation, coordination, greenness, openness and sharing, and promote the integration of DE with the real economy [11]. Driven by the G20 Digital Economy Development and Cooperation Initiative and the 2017 proposal of accelerating the construction of a network country, China has carried out a series of high-quality digital economy industrial layout [12,13]. Against this backdrop, the 6th World Internet Conference was held in 2019, in which NPZIDDE was officially approved and established. Each zone has also released its respective work programmes one after another. These programmes include a series of measures ranging from smart governance for smart cities, clustering and development of digital industries, coordinated and common development of regions, digitization of industries to external cooperation, providing a basic framework for the development of DE in six zones.

Based on above basic framework, this study focuses on the pilot zone's guidance on regional cooperative development and industrial digitization, and relates the goal of establishing the pilot zone to regional income imbalances: first, regional cooperative development can help solve the problem of unbalanced distribution of resources, and the development of the DE can help improve the productivity and rightness of factor allocation and information transparency, thus driving up the supply-side premium in the labour market. In addition, the region, represented by Fujian, Guangdong, Chongqing and Sichuan, has vigorously promoted inter-city digital linkages and assisted in the development of enterprises, which partially reduces enterprise costs and spreads employment opportunities within the relevant regions, thus contributing to the enhancement of labour welfare. Second, in the process of industrial digitization, regions with a better-qualified workforce and

industries that are more relevant to the digital economy will inevitably become more competitive. The process of industrial urbanization will be significantly intensified in regions with uneven development, such as Sichuan Province, and regional income will have different effects in different pilot zones. In summary, the system still has much room for discussion on the heterogeneity dimension of regional income distribution.

3. Research Hypotheses

NPZIDDE was initially established to promote the industrialization of digital and the digitization of industries, and to facilitate the integration of DE with the real economy. Data will be fully integrated with the real industry as the main body to improve production efficiency and reduce production costs. Past research has also concluded that, in addition to the positive effect of expanding production and reducing costs, DE also has a substitution effect on low-skilled labour. These groups will shift to jobs with high substitutability and low bargaining power, leading to lower incomes [14]. Therefore, in DE pilot zones, an increase in skill differentials is almost inevitable. Spatially, the pilot zones have different spatial orientations in different provinces. In the face of the development of extremely different provinces and cities, such as Sichuan, Chongqing, the establishment of the pilot zone will undoubtedly guide the digital economy enterprises to the resources of better quality, more complete infrastructure, the quality of the labour force is more excellent provincial capitals, central urban areas closer, so that the scale of the aggregation effect for the non-industrial agglomeration area of the siphon effect cannot be ignored, but also lead to the inter-regional distribution of income to expand again [15]. And time-wise, the scale effect and productivity enhancement of DE lacks the development to expand to the under-constructed regions. For these reasons, regional income imbalances are likely to become more dramatic. Therefore, this paper proposes hypothesis H1.

H1 The establishment of the NPZIDDE has widened income gaps between regions.

In previous research, study notes that the knowledge spillover and aggregation effect have an increasing effect on the skill premium. As for DE, such an increase enhances the demand of enterprises for high-skilled labour, and also improves the bargaining power of high-skilled labour in the labour market [16]. Considering the differences in economic development, education level, infrastructure and welfare level between regions, the establishment of pilot zones based on the integration of real industry and DE will also be subject to the restrictions of location, transportation, labour force, etc., so that the skill premium will be expressed in the space. To sum up, DE, as the main orientation of employment of high-skilled labour, will change the industry distribution structure of the existing labour force, and its spatial manifestation will, to a certain extent, contribute to the aggravation of regional income imbalance. As a result, pilot zones will lead to a development in the wage premium for the group of digital economy-related employees, thus concretely manifesting the skill premium in the labour market, and similarly driving the widening of regional income gap. In view of this, this study proposes the hypothesis H2.

H2 Digital economy-related labour market changes mediate the impact of widening regional income gaps in NPZIDDE.

4. Methodology

4.1. Theil Index

In this paper, the Theil index of cities (districts) within provinces (municipalities) is selected as a measure of regional income differences, and this index is calculated as formula 1.

$$\text{Theil}_{it} = \frac{1}{n} \sum_{m=1}^n \frac{y_{mt}}{\bar{y}_{it}} \log \left(\frac{y_{mt}}{\bar{y}_{it}} \right), m \in i \quad (1)$$

In this formula, i represents sample province (municipality) with the identification of code i , and m represents the prefecture-level cities (districts) within the province (municipality). y represents the

average disposable income of whole residents within the region. The larger the absolute value of the index is, the greater the regional income disparity is and the more uneven the distribution in the province (municipality) is.

4.2. Model Setting and Main Variables

With the objective of studying the impulse of the establishment of the experimental area on regional income differences, this paper abstracts the study of H1 to the policy impact on the indicators, consulting the existing literature, first of all, the parallel trend test is conducted on the existing data in order to determine that there exists no significant difference in the regional income differences from the provinces in the experimental group to the provinces in the control group, and that there is no advancement trend. This paper takes the building year of the policy zones in 2019 as base year, and constructs the Model as formula 2 [17].

$$\begin{aligned} \text{Theil}_{it} = & \lambda_1 \text{treat}_i * \text{post}_{-4} + \lambda_2 \text{treat}_i * \text{post}_{-3} + \lambda_3 \text{treat}_i * \text{post}_{-2} + \\ & \lambda_4 \text{treat}_i * \text{post}_0 + \lambda_5 \text{treat}_i * \text{post}_1 + \lambda_6 \text{treat}_i * \text{post}_2 + \lambda_7 \text{treat}_i * \text{post}_3 \\ & + \sum_{k=1}^4 \lambda_{k+7} \text{CV}_{itk} + \mu_i + v_t + \varepsilon_{it} \end{aligned} \quad (2)$$

In the formula, the dependent variable Theil_{it} represents the level of difference in disposable income per capita of whole residents among the prefecture-level cities (districts) in the sample provinces (municipalities), which is represented quantitatively by Theil in this paper; post_m is a series of dummy variables, which takes the value of 1 if the sample is in the m th year of the implementation of the policy (the negative value is the pre-implementation data), otherwise it takes the value of 0. The test removes the data from the year before the base, post_{-1} ; treat_i is the same as the dummy variable, which takes the value of 1 if it is the sample province where the policy is implemented, and 0 otherwise; CV_{itk} stands for the series of control variables, μ_i stands for the fixed effect of province, v_t stands for the time fixed effect, and ε_{it} stands for random term. In this test, this paper focuses on the trend of λ_1 to λ_7 , which reflects the trend of the experimental group and the control group. Under the assumption of passing through parallel trends, the following model is developed as a benchmark regression with reference to existing literature in formula 3 [8].

$$\text{Theil}_{it} = \alpha + \beta_1 \text{treat}_i * \text{post}_t + \sum_{k=1}^4 \beta_{k+1} \text{CV}_{itk} + \mu_i + v_t + \varepsilon_{it} \quad (3)$$

Among them, the dependent variable Theil_{it} , the dummy variable treat_i , the control variable CV_{itk} , the fixed effects μ_i and v_t , and the random perturbation term ε_{it} are the same as those in the parallel trend test; post_t is also a dummy variable, which takes the value of 1 if the year is the base year and the subsequent years and the other way round, 0; α is the intercept term, β_1 is the coefficient of the impact of NPZIDDE; β_{k+1} is the coefficient of the series of control variables. In the regression results, if β_1 is greater than 0, it means that the establishment of the test area has exacerbated disparities, and vice versa, it means that the establishment of the test area has reduced regional income disparities.

With the objective of studying the mediating effect of the wage premium for high-skilled labour, this paper introduces a mediated double-difference model for the empirical study of H2, in which the total regression equation is changed to formula 4

$$\text{Theil}_{it} = \delta_1 + \gamma_1 \text{treat}_i * \text{post}_t + \gamma_2 \text{High}_{it} + \sum_{k=1}^4 \gamma_{k+2} \text{CV}_{itk} + \mu_i + v_t + \varepsilon_{it} \quad (4)$$

In this equation, High_{it} is the mediating variable, which represents the average wage level of the DE related industry (dominated by data transmission, computer services and software engineering, etc.), and the rest of the variables are consistent with the benchmark regression. On this basis, this paper establishes the following mediating effect in formula 5.

$$\text{High}_{it} = \delta_2 + \theta_1 \text{treat}_i * \text{post}_t + \sum_{k=1}^4 \theta_{k+1} \text{CV}_{itk} + \varepsilon_{it} \quad (5)$$

Among them, the variable selection is consistent with formula 3. Bootstrap method is used to test the mediating effect based on the traditional three-step method under the regression parameters. If

both direct effect and indirect effect are significant in test results, average wage level of the DE (changes in the labour market related to the digital economy) plays the role of mediating effect in H1, i.e. H2 holds.

4.3. Control Variables and All Variables Descriptive Statistic

In addition to the important variables already mentioned in the model setup, this paper draws on previous studies and selects the following variables as control variables: economic level (Eco), the logarithm of the average wage of labours in the province; industrial structure (Ind), the proportion of the output value of the secondary industry in the province to the GDP; degree of openness to the outside world (Fdi): the proportion of the province's net exports in the FDI industry to the GDP of the region; Degree of governmental economic participation (Gov): the proportion of governmental financial expenditure in the province to the regional GDP [18, 19].

Data summary of all variables is in table 1.

Table 1. Descriptive Statistic

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	Mean	Sd	Min	Max
Year	128	2,019	2.300	2,015	2,022
Province	128	8.500	4.628	1	16
Theil	128	0.0343	0.0502	9.40e-07	0.325
Treat	128	0.375	0.486	0	1
Post	128	0.500	0.502	0	1
Fdi	128	0.00802	0.00816	1.04e-05	0.0446
Gov	128	0.228	0.115	0.105	0.753
Ind	128	0.416	0.0420	0.319	0.512
Eco	128	4.888	0.100	4.657	5.110
High	128	119,148	41,985	60,353	287,088

4.4. Data Pool

In this study, the data for 2015-2022 are selected as the main sample from six provinces (Fujian, Guangdong, Zhejiang, Sichuan, Chongqing, and Hebei), the experimental group, which were designated as the experimental area in 2019, and ten provinces (Anhui, Guangxi, Henan, Hubei, Jiangsu, Jiangxi, Liaoning, Qinghai, Shaanxi, and Yunnan), the control group, for which the data can be collected in a geographically close proximity to the experimental provinces. Due to the poor availability of the Theil Index data, this data is calculated from the disposable income per capita of residents in each city (district) of the above sixteen provinces. The municipal disposable income per capita required for the calculation of the Theil Index in this paper comes from government reports and statistical yearbook of each province; the control variables and mediating variables mainly can be found in China Statistical Yearbook and the data published by National Bureau of Statistics of China.

5. Empirical Study

5.1. Parallel Trend

Before the benchmark regression experiment, this paper develops a parallel trend test to verify the assumption of impact effectiveness, and Figure 1 shows the trend of λ_1 to λ_7 and their confidence intervals. The test proves that the coefficient of the interaction term of $treat_i * post_t$ is not significantly different from 0 before the benchmark year, and after the benchmark year, it is significantly different from 0. This result indicates that before the establishment of the experimental area, the experimental provinces are not significantly different from the control provinces, and after

the establishment of the experimental area, there is a significant difference at 5% level between the two groups of samples, i.e., it passes the test.

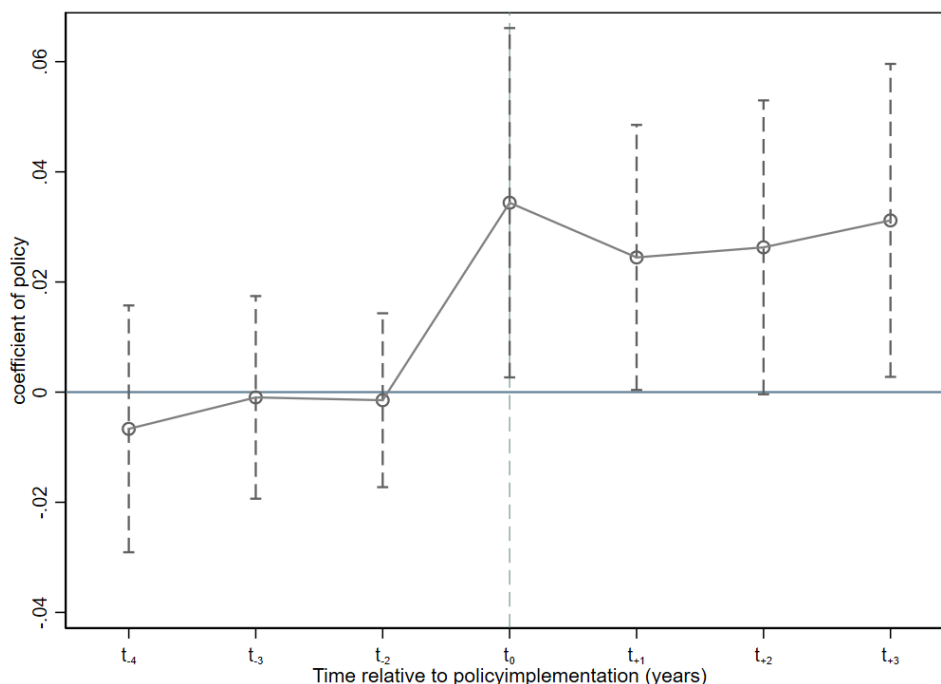


Figure 1. Parallel trend test coefficients graph

5.2. Benchmark Study

Table 2 presents the series of benchmark regressions developed from formula 3. The results in column (1) include all control variables accounted for and column (2) does not control for any control variables. Columns (3) to (6) are regressed on one of the control variables in turn, with this replacement variable demonstrating the robustness of the results. Based on the experimental requirements of equation (3), all regressions are conducted to control for all fixed effects and province. According to the coefficients and significance of the variable did in the following table, all the coefficients of this variable are significantly positive and all of them are at the 5% level, meaning that the establishment of the pilot zone and the Theil index show a positive correlation, which proves that the establishment of zones widens the income disparity between regions, and H1 is confirmed. In table 2, Y means that the variable or fixed effect has been controlled for.

Table 2. Benchmark Regression Results

VARIABLES	(1) Theil	(2) Theil	(3) Theil	(4) Theil	(5) Theil	(6) Theil
DID	0.0313** (0.0126)	0.0294** (0.0140)	0.0323** (0.0133)	0.0295** (0.0140)	0.0284** (0.0128)	0.0293** (0.0141)
Treat	Y	Y	Y	Y	Y	Y
Post	Y	Y	Y	Y	Y	Y
Fdi	Y		Y			
Gov	Y			Y		
Ind	Y				Y	
Eco	Y					Y

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

5.3. Placebo Test

By drawing on existing studies, in order to exclude the randomness of above empirical studies, this paper also introduces a placebo test with randomly selecting the experimental group and randomly replacing the time of establishment of the experimental area [20]. Since there are 6 experimental group provinces in a total of 16 provinces, 6 of the 16 randomly selected provinces will be used for the sham experimental examples, and the provinces left will be used like the sham control ones. Also, the year of the establishment of the experimental area was randomly generated in the test, thus constructing a randomized spurious test in both the province and time dimensions. This random test will yield 500 random regression coefficients after 500 repetitions, and comparing the difference between the random regression coefficients and the baseline regression coefficients is the principle of this test. This random test will control for all variables.

Figure 2 presents the collection of the random test results. It can be seen that coefficients of 500 random test marked in red are distributed around 0 in the form of a convergent normal distribution. Comparing with the benchmark regression coefficients marked by the dotted line, this study found that the random test and benchmark regression coefficients are distributed farther away from each other, which indicates that the benchmark regression results are more reliable and less likely to be affected by other factors other than observation. Due to the small order of magnitude, the statistical software does not fully display the horizontal scale in figure 2, which from left to right is: -0.0375, -0.0300, -0.0225, -0.0150, -0.0075, 0.0000, 0.0075, 0.0150, 0.0225, 0.0300, 0.0375.

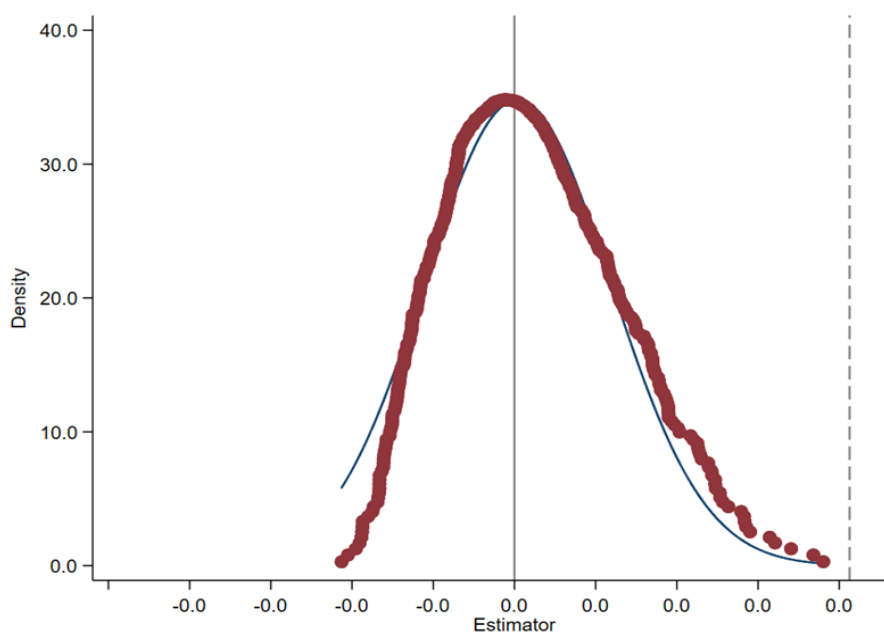


Figure 2. Coefficients distribution of the placebo test

6. Extensive Study

6.1. Mediating Effect

In order to prove H2 and the establishment of a specific mechanism affecting regional income disparity in the test area, this paper conducts an experiment on the indirect impact of the average wage of DE related industries based from formula 4 and formula 5. Under the condition of no a priori information, this paper conducts repeated random sampling with put-back based on the original sample capacity, and then calculates the estimation value of the mediating effect based on the extracted samples, i.e., $\theta_1\gamma_2$. After repeating the process of calculating the estimation value for 5,000 times, this study takes the mean value of these 5,000 estimation values as the point estimation value of the mediating effect and arranges the 5,000 estimation values according to the size of the value, so

as to have the sequence located in the 2.5% and 97.5% of the values to estimate the confidence interval of the mediating effect, i.e., the three-step bootstrap method [21].

Table 3 shows the final results of the three-step bootstrap method for calculating the direct and indirect effects, Indirect means the indirect effect, and Direct shows the coefficient of the direct effect. Both sets of coefficients are significantly positive at less than 10% level, which indicates that the average wage level of the DE industry plays a positive indirect influence in the process of H1, and the changes in the labour market related to the DE play an intermediary role in the process of expanding the inter-regional income disparity in the NPZIDDE, i.e., H2 is established. For the mechanism of the DE pilot zones affecting the regional income gap, this paper makes the following judgments, development of the pilot zones raises the demand of the DE related labour market, which causes a rise in the average wage of the relevant industries in a short time, and a rise in the supply of labour in the relevant industries in the medium term, and the distribution of this process spatially that is, the labour of the relevant industries is converging in the area where the scale of DE is more concentrated and powerful, thus changing the original spatial distribution of income distribution. As a result, the mechanism makes the marginal cost of absorbing labour in the region with a larger scale of the original digital economy diminish due to the aggregation effect, and the marginal welfare of the labour force in the region increases, thus leading to an increase in regional income gap.

Table 3. Mediating Effect

VARIABLES	Theil
Indirect	0.0102*
	(0.00615)
Direct	0.0211*
	(0.0116)

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

6.2. Heterogeneity Test

The scale of the DE in coastal areas and inland areas, the uneven development space tends to differ greatly, which leads to the establishment of the experimental area, the development of DE on the two have different impacts. Differences in gross regional product in recent years indicate that inland provinces such as Sichuan, Hebei, and Chongqing in the experimental group preferred a monocentric city cluster development model, while provinces such as Zhejiang, Fujian, and Guangdong preferred the development of polycentric city clusters [22]. Theoretically, resources are more concentrated in monocentric city clusters and more evenly distributed in polycentric city clusters, so the regional income differences of polycentric city clusters, i.e., coastal cities, are more significantly affected by the thrive of DE on the basis of the original. According to this situation, this paper divides provinces into two groups according to the difference between inland and coastal cities, and regresses the inland group and the coastal group separately. Column 1 of Table 4 shows the result for the inland group, and column 2 shows the regression result for the coastal group. The regression results show that, in the case that the establishment of the test area in both groups is significantly positive at the level of 5% and the regression coefficient of the coastal group is obviously higher than that of the inland provinces, proving that regional income imbalances in coastal cities are more strongly affected by the pilot zone.

Table 4. Heterogeneity test results

	(1) Inland	(2) Coastal
VARIABLES	Theil	Theil
Did	0.0261**	0.0322**
	(0.0120)	(0.0143)
Treat	Y	Y
Post	Y	Y
Fdi	Y	Y
Gov	Y	Y
Ind	Y	Y
Eco	Y	Y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

7. Conclusion

This paper empirically assesses the impact of the construction of the pilot zone on regional income disparities by using the national establishment of the NPZIDDE in 2019 as a quasi-natural experiment, constructing a DID and mediating DID model, and using data on the income of a control group of provinces close to the experimental provinces and regional districts in the period 2015-2022. The study proves that, conditional on the establishment policy of the experimental area meeting the parallel trend hypothesis, the establishment of the experimental area widens the inter-regional income disparity, and the establishment of the experimental area raises the Theil index among prefecture-level cities (districts) within the province (municipality) by 3.1% compared to the province that does not have the pilot zone, and passes the robustness tests of replacing the control variables, placebo test, and so on. Subsequent mediating effect tests for average wage levels in digital economy-related industries show that the establishment of the pilot zone led to further regional expansion of income by affecting the labour market in digital economy-related industries, specifically by raising the overall price of the labour market in the industry. At the same time, the study of geographic location heterogeneity shows that the development model of polycentric urban agglomerations represented by coastal cities is more affected by digital economy policies than the development model of monocentric urban agglomerations represented by inland cities, a result that is based on the fact marginal effects of the construction of DE infrastructures and industrial agglomeration effect are more pronounced in the case of polycentric urban agglomerations.

Based on the above findings, this paper also proffers some suggestions on how to mitigate the current situation where digital economy policies exacerbating regional income imbalances.

First, accelerate the construction of domestic DE infrastructure. According to the theoretical analysis and the empirical results of this paper, the mechanism of DE to exacerbate regional income imbalance mainly works in the labour market. Therefore, it is particularly important to optimize the construction of DE infrastructure, so as to reduce the hiring cost on the demand side of the labour market. Strengthening the infrastructure of the DE will not only reduce the cost of labour on the demand side, but also reduce the cost of search and work on the supply side. The uneven construction of infrastructure in the digital economy is the main reason why enterprises and labour force are concentrated in local areas instead of being dispersed.

Second, the market price of labour in digital economy-related industries should be appropriately controlled. Due to the scarcity of resources and labour required for the production of digital economy and the uneven spatial distribution, the labour market price of the digital economy industry tends to show a high premium and high variability, which greatly raises the cost of production, and at the same time reduces the enthusiasm of the DE enterprises to form positive externalities. In this paper's research, the digital economy related industry wage level for regional income imbalance accounted for one-third of the total effect, so it should not be eliminated in the principle of the economy of

production, control the wage level of the industry, reduce its wage premium, so as to control the status quo of regional development imbalance.

Third, guide the positive spillover of the DE to the traditional economic production mode. The empirical analyses conducted in this paper mainly focus on a short period and the observation of long-term data is not sufficient. At this stage, based on productivity constraints, the DE pilot zone reduces the fairness of regional income distribution, which is confined to the high premium and cost of the digital economy industry, the fast rate of capital flow in the digital economy, and the mismatch between the DE industry and the traditional economy industry model. This paper argues that positive spillovers from the DE to the traditional production model in terms of production relations and knowledge and technology should be channelled in order to reverse in the long run the observed short-to medium-term widening of regional income disparities by the digital economy.

This paper adopts a small sample size for the reasons of the limitations of low availability of some data, large policy coverage area and limited time for the establishment of the experimental area. In terms of experimental design and extended research, there is limited analysis of regional heterogeneity. The researcher can collect data at the prefecture-level city level for more in-depth research, and can also collect more samples to explore the characteristics of digital economy development in single-centre and polycentric city cluster. In addition, it is still worthwhile for researchers to select a longer observation window for empirical analyses of the impact of DE on regional income imbalances in the long run.

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