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# *The Impact of Digital Economy on Foreign Direct Investment: A Perspective on Industrial Structure Rationalization and Upgrading*

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***Abstract.*** On industrial forward movement and balancing of dual nature, we are concerned with the digital economy being a kind of stimulant playing an essential yet intricate part in China's FDI environment; According to the provincial-level balanced panel data（2013-2022），it can be found that there's a non-linearity，digital increases initially boosts but finally decrease in FDI level. The inquiry is done with the help of fixed-effects and mediation model to look into if it's industrial refinement that matters, instead of just being correlated. From the empirical evidence we can see a general beneficial impact from the digital part of FDI which is described by an inverted U-shape. This means that there will be less appeal for foreign investment if digital ability surpasses a certain point. Importantly, in terms of the mediation analysis showing structural modernization is the main reason for the inflow. Furthermore, it is found that these benefits were not evenly distributed among various inland areas: Central Inland regions benefited the most from this digital economy, followed by Western and Eastern Coastal Regions. Therefore, flexibly timing digital is an important part of investment strategy.

***Keywords:*** Digital economy, Upgrading of industrial structure, Rationalization of industrial structure, Foreign direct investment

## 1. Introduction

And then it goes to digitalization and FDI: bring in new fuel China's high-quality development. To bring it together from fancy premium exteriors being amplified digitally, there's a big pull on aligning all those monies across the globe to what it is that China's making them modern. In terms of quantitative data on the 2024 financial period, it can be seen that there is this sort of linkage: China's digital sector has been rated at 59.2 trillion yuan, and it effectively drives about 44% of the overall economic structure, becoming the main network node in quality growth [1]: This digital rush has changed the way of money going around between different countries. About 60 thousand newly created offshore companies have hit a ten-year high [2]: This sort of road is the intentional consequence of institutional steering, and was particularly so after the 20th CPC Central Committee promoted the fusion of digital asset with tangible industrial base [3]. For betterment of those

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successes the year 2025 regulatory mandate will have more open digital border which focuses clearly on the telecom liberalization to improve capital circle and take full benefit of digital for stronger international economy [4]. Digital empowerment supports foreign investment inflows, while higher-level opening-up in turn demands stronger digital underpinnings. The digital economy also fosters modern industrial clusters in high-end manufacturing, digital services and high-tech support sectors. To improve the quality of foreign investment, we should make better use of data resources, speed up digital infrastructure and industrial digital transformation, reshape industrial patterns through digitalization, and strengthen the rationalization and advancement of industrial structure as a solid basis for attracting FDI. Against the background of high-level opening-up, this paper empirically explores the relationships among the digital economy, industrial structure and foreign direct investment.

## 2. Literature review

### 2.1. Research on digital economy and FDI

Theoretically, some scholars hold that the digital economy may weaken traditional motivations for FDI. Digital technological progress has reduced incentives for efficiency-seeking investment [5], as multinationals tend to outsource inefficient businesses and convert some R&D activities into service-oriented tasks, thus lowering the need for cross-border capital investments [6]. Empirically, conclusions are still inconsistent. Using provincial panel data, studies show that the digital economy attracts foreign investment by reducing transaction costs, strengthening intellectual property protection [7], and improving human capital [8]. In manufacturing, it boosts FDI through industrial agglomeration and lower tax burden [9]. Based on data from 261 Chinese cities, Cui et al. found that the digital economy promotes FDI and produces positive spatial spillovers that strengthen investment attraction in adjacent regions [10].

Nevertheless, other studies present different views. Cao et al. argued that the digital economy diminishes market-seeking and knowledge-seeking motives of foreign firms [11]. Sun et al. further noted that the impact of the digital economy on FDI varies over time and across regions: its significant positive effect on FDI inflows has only emerged since 2014; geographically, the effect is significant in eastern and western China but insignificant in the central region.

### 2.2. Research on industrial structure and FDI

Regarding previous work on industrial structure optimization, it mainly focused on the transformation of structural rationality and development. Rationalization is Industry Alignment with effective resource distribution, Progress is an advancement to a sector of the economy more valued than others and also technologically advanced [12]. Most studies now think that FDI helps with upgrading the industrial structure. Using regions for data shows us that it was due to FDI structuring up because they increased on research and development. That has then been observed at a city level with the digital inclusion of finances. Chen also used impulse response and VEC to show that the FDI had a good effect [13,14]. Chen et al., using impulse response and VEC models, similarly confirmed the positive effect of FDI. Some studies further identified a nonlinear U-shaped relationship: FDI only drives industrial optimization after crossing a threshold, as some regions cannot efficiently allocate FDI-related resources before that point [15].

Meanwhile, regional heterogeneity is widely documented: FDI significantly promotes industrial structure in central and western China but shows no significant effect in the east [16]. When

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distinguishing between structural advancement and rationalization, scholars found that FDI supports advancement but may hinder rationalization [17]. Yet research on the Yangtze River Delta found that FDI has no significant effect on rationalization and may even suppress advancement [18].

## 3. Theoretical model and research hypotheses

The digital economy's development improves transaction efficiency and reduces corporate transaction costs. Digital technologies also lower costs in information search, negotiation, and contract execution. According to market-seeking FDI theory, foreign enterprises are attracted by larger market potential and lower transaction costs. In addition, the digital economy generates massive data resources. As an important production factor, data helps firms optimize decision-making and enhance competitiveness. From the perspective of resource-seeking FDI, foreign capital may also be drawn to pursue data resources.

Nevertheless, the digital economy cannot sustainably boost FDI. According to transaction cost theory, firms exist to reduce market costs through internalization. Yet as the digital economy matures, market transaction costs decline further, weakening incentives for cross-border investment. The promotional effect of the digital economy on FDI will therefore diminish and may eventually turn negative. Accordingly, Hypothesis 1 is proposed.

H1a: The digital economy exerts a positive effect on foreign direct investment.

H1b: As the digital economy develops to a certain level, its promotional effect on FDI shows diminishing marginal returns.

Driven by digital technology, the digital economy pushes industries toward higher technology and higher added value, thereby promoting industrial structure upgrading. Improved industrial structure brings better supply chains, upgraded consumption, and a more favorable business environment, all of which enhance regional location advantages. Based on the eclectic theory of international production, such location advantages help attract FDI. However, digital transformation may widen industrial gaps. Drawing on uneven development theory, the digital economy may impede industrial structure rationalization in the short run, making it difficult to stimulate FDI. Hypothesis 2 is thus proposed.

H2: The digital economy promotes FDI by advancing industrial structure upgrading, but not through industrial structure rationalization.

Regional development in China is unbalanced. According to the resource base theory, regional differences in resource endowments lead to gaps in digital economy development and FDI attraction. Economically developed regions already have large markets and sound infrastructure, which have long attracted considerable foreign capital, so the marginal contribution of the digital economy may be less noticeable. Hypothesis 3 is therefore put forward.

H3: The promotional effect of the digital economy on FDI differs across regions.

## 4. Model setting and description of variables

### 4.1. Research design

To examine the impact of digital economy on FDI, this study establishes a fixed-effect model as the benchmark regression framework, with the following specifications:

$$lnFDI_{it} = \beta_0 + \beta_1 DE_{it} + \theta X_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

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Here, the subscript i denotes provinces, and t represents years. $lnFDI_{it}$ is the dependent variable, representing the level of foreign direct investment; $DE_{it}$ is the independent variable, indicating the development level of the digital economy; $X_{it}$ is the control variable; $\mu_i$ denotes provincial fixed effects and $\varepsilon_{it}$ is the random error term.

To further investigate how digital economy affects FDI through the industrial structure, we developed a mediation effect model incorporating the industrial structure as mediating variables, as shown in Equation (2). Here, M is respectively the level of industrial structure rationalization and the level of industrial structure upgrading.

$$M_{it} = \alpha_0 + \alpha_1 DE_{it} + \delta X_{it} + \mu_i + \varepsilon_{it} \tag{2}$$

## 4.2. Variable selection

To show how economic sectors evolved, we used the industrial hierarchy index which was found like this: As for how to quantify the degree of FDI represented by the dependent variable, we adopt the natural log value of the year-end total number of newly registered foreign companies at the provincial level. Our method is similar to that in Huang and Chai [19] where the higher number reflects a better regional appeal from foreign money. Likewise for the main explanatory variable digital economic advance which is measured by means of a multidimensional aggregated index from Xia et al. [20], It is composed of 3 different dimensions: infrastructural IT expansion, digital commercial activity, and network accessibility. In order to ensure that the statistics are fair, the entropy-weighting approach has been adopted for assigning weights to all such diverse items and hence obtains an airtight provincial digital progress score.

The middle ones are industrial structure rationally (IS_RA) and upgrading (IS_UP). Yin [21]'s method is adopted for IS_RA with the industrial structure Theil index which is calculated as follows:

$$IS\_RA = \sum_{k=1}^{n=3}\left(\frac{Y_k}{Y}\right) ln\left(\frac{\frac{Y_k}{L_k}}{\frac{Y}{L}}\right) = \sum_{k=1}^{n}\left(\frac{Y_k}{Y}\right) ln\left(\frac{Y_k}{Y} \times \frac{L}{L_k}\right) \tag{3}$$

In this equation, $Y_k$ is the production output of sector k, $L_k$ represents the total workers in sector k, where n = 3 implies that k takes values of primary, secondary and tertiary sectors, Y and L stand for provincial total output value and total employed persons respectively. The nearer the Theil index figure is close to 0 then the higher amount of rationalization there has been within the structure of industry in that region, a closer to balanced state. Alternatively, the larger that number index, less is there for the degree of rationality and the move away from equilibrium.

Industrial structure upgrading is represented by the industrial structure level coefficient, calculated as follows:

$$IS\_UP = \sum_{k=1}^{n=3} \varphi_k w(k) \tag{4}$$

In this stratified layering approach, the tertiary, secondary, and primary domains are weighted via coefficients $\varphi_k$ of 3, 2, and 1 respectively. The term $w(k)$ denotes the sectoral output share. Furthermore, to refine the precision of our estimates and counteract omitted variable distortions, the empirical model controls for: (i) the government's fiscal footprint (public expenditure normalized by GDP); (ii) the maturity of the financial system (represented by the ratio of outstanding loans to economic output); and (iii) the demographic pressure of senescence (the proportion of the population exceeding 65 years of age).

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### 4.3. Data source and descriptive statistics

Data for this investigation covers 30 provinces across mainland China (omitting Tibet, Hong Kong, Macau, and Taiwan) for the period 2013–2022. To ensure data integrity, the primary indicators were extracted from the China Statistical Yearbook and supplemented by provincial-specific yearbooks alongside the China Research Data Service Platform (CNRDS). A summary of the distributional properties and descriptive statistics for the finalized variables is provided in Table 1 for reference.

Table 1. Descriptive statistics of variables (N=300)

| Variable | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| lfdi | 8.990 | 1.296 | 12.152 | 5.894 |
| digeco | 0.180 | 0.133 | 0.808 | 0.039 |
| inshi | 2.401 | 0.123 | 2.836 | 2.194 |
| inshl | 0.160 | 0.118 | 0.843 | 0.000 |
| govexp | 0.260 | 0.110 | 0.753 | 0.105 |
| fin | 1.527 | 0.469 | 2.774 | 0.018 |
| age | 0.116 | 0.028 | 0.200 | 0.064 |

## 5. Analysis of empirical results

### 5.1. Benchmark regression

The baseline regression results in Table 2 show that as controls are gradually added in Column (2)-(4), the coefficient remains significantly positive, confirming the digital economy's promotional effect on FDI. In terms of controls: Financial Advance is positive, signifying an improved financial situation improves commercial condition which encourages FDI Inflow. Public Spending is very negative, it implies the state can take the place of FDI. Demographic aging has a positive but non-significant relationship with FDI.

The quadratic term of the digital economy which represents a non-linearity is also added. Column (5): It is an inverted u shape, where as digital tools lower down info asymmetry and improves the clarity of market which brings foreign currency. But with the development of digital economy, competition gets fiercer and earnings margin get smaller, which reduces people's willingness to take part in. Hence, it will lose its benefits and maybe even worse, it'll create another path that goes up at first but then drops off. And it does indeed support both H1a and H1b.

Table 2. Baseline regression results (N=300)

| VARIABLES | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| digeco | 1.712*** | 1.559*** | 1.343*** | 0.899** | 3.411*** |
| | (0.352) | (0.330) | (0.280) | (0.370) | (0.646) |
| govexp | | -1.553*** | -1.851*** | -1.573*** | -1.274** |
| | | (0.552) | (0.539) | (0.536) | (0.466) |
| fin | | | 0.109** | 0.088** | 0.055 |

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Table 2. (continued)

| | | | | | |
|---|---|---|---|---|---|
| | | | (0.042) | (0.036) | (0.032) |
| age | | | | 2.403* | -0.307 |
| | | | | (1.311) | (1.185) |
| digsq | | | | | -2.571*** |
| | | | | | (0.742) |
| Constant | 8.682*** | 9.113*** | 9.062*** | 8.823*** | 8.787*** |
| | (0.063) | (0.156) | (0.133) | (0.165) | (0.147) |
| Province Fixed | | | Yes | | |
| R-squared | 0.393 | 0.440 | 0.468 | 0.496 | 0.554 |

Note: Robust standard errors are in parentheses; ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively, as in the table below.

## 5.2. Robustness test analysis

In order to make sure it does not depend on certain things, there were 3 different sensitivity examinations carried out. First of all, the data set in 2020 is removed since we want to separate those results from some extraordinary disruptions on a global level due to the pandemic. Second, it is excluded from the four main municipalities: Beijing, Tianjin, Shanghai, and Chongqing and take into account its own structure and government. In the end, winsorization was performed on both sides of the first and 99th percentiles to address the influence of skewness on statistics. Through all the subsequent tries, it is seen that orientation and statistical significance of digital economy variables were still consistent; thus reinforcing the internal validity and dependability of the first set of estimates.

Table 3. Robustness test results

| | (1) | (2) | (3) |
|---|---|---|---|
| VARIABLES | Excluding Year 2020 | Excluding cities directly under control | Winsorize |
| digeco | 0.921**(0.355) | 1.419***(0.286) | 0.936**(0.378) |
| govexp | -1.756***(0.508) | -1.832***(0.542) | -1.455**(0.551) |
| fin | 0.086**(0.034) | 0.076(0.068) | 0.085**(0.038) |
| age | 2.043(1.285) | 1.914(1.339) | 2.431*(1.320) |
| Constant | 8.904***(0.163) | 8.764***(0.170) | 8.788***(0.163) |
| Province Fixed | | Yes | |
| N | 270 | 260 | 300 |
| R-squared | 0.502 | 0.536 | 0.492 |

## 5.3. Mechanism effect analysis

Contrastively evaluating from two sides on the issue of industrial development, there is an inspiration. As can be seen from the main section of Table 4 the digital economy has no statistical significance. Alternately, there is a huge change in result when looking at industrial advances. In terms of industrial structure, it is to pay more attention to the sector integration and reasonable

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allocation of resources, which needs long term institution improvement. On the contrary it is impossible for digital technology to improve the chaotic connections and asset misalignment of industry in a short time. And the various levels at which different parts of industry have integrated digitally could possibly hinder more immediate rationalizations of the industrial framework. However, with the development of digital tools, it will also prompt various industries to strive for more advanced and high-tech, value-added industries, which can improve the proportion of the tertiary industry, so as to further promote the refinement of the industrial structure. In other words, all in all it is Digital technology that helps to increase Foreign direct investments. Hypothesis 2 is true.

Table 4. Mechanism effect test (N=300)

| VARIABLES | (1) | (2) |
|---|---|---|
| | Structure Rationalization | Structure Upgrading |
| digeco | 0.067(0.143) | 0.238**(0.103) |
| Constant | 0.345***(0.076) | 2.169***(0.066) |
| Controls | Yes | |
| Province Fixed | Yes | |
| R-squared | 0.208 | 0.475 |

## 5.4. Heterogeneity analysis

Considering the diverse socio-economy across China's vast territory, it is expected that the advantages of digital transformation in terms of attracting outside capital will be very different. By way of using the geographical categorization framework provided by He [22], this paper partitions the domestic database into 3 different geographies. The empirical result table 5 shows that there is always an increase in FDI due to digital advance; however, it does not show a linear effect over all places. Main Recipient,The largest coefficient among all is 4.537 in the center of interior which are bigger than that of project values between west peripherals and eastern maritime areas: This support for Hypothesis 3 shows that during the current time, technology was being developed into becoming somewhat of a more crucial area that could also cut down on cost in order to get investments from other countries. On the contrary,west border is restricted with transport and industry,whereas eastern seashore though economically developed can still suffer from the bottleneck that extra value brought by digital resources to new fund is bound to fall as time goes on.

Table 5. Heterogeneity analysis

| VARIABLES | (1)<br>Eastern | (2)<br>Middle | (3)<br>Western |
|---|---|---|---|
| digeco | 0.837*(0.430) | 4.537**(1.800) | 1.758*(0.962) |
| Constant | 9.528***(0.178) | 8.545***(0.148) | 8.221***(0.259) |
| Controls | | Yes | |
| Province Fixed | | Yes | |
| N | 110 | 80 | 110 |
| R-squared | 0.505 | 0.549 | 0.626 |

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## 6. Conclusion and recommendation

### 6.1. Conclusion

In this article we based on a complete provincial scale balanced panel data from 2013-2022 to do an all-around examination about what effect does digital economy bring onto FDI framework in china It's sort of a no liner promote to FDI, it might be in an Inversed U form as return on Digital infra increases. More importantly, the structure of digital economy has unevenness; it is beneficial to attract FDI by industrial modernization and the improvement of industrial structure remains as a not important path. Moreover, it is found through regional diversity analysis that there are different levels of efficiency; the catalytic effect is best achieved in central provinces and much less so in western and eastern regions. And all these conclusions show how important it is to match our digital tricks with the local industry targets if we really want high quality global economic inclusion.

### 6.2. Recommendation

To make use of the digital economy as an enduring magnet for international capital, we should switch to exacting governance: First off, the country's digital strategy needs to change its emphasis - from expanding more people or things to focusing on a sector; it should have more chains. Secondly, in order for this research to promote the structural modernization aspect, policy should promote the combination of the digital and physical realms, through the formation of cross-sectorial ties which will speed up technology adoption. The 3rd requirement would be an investment blueprint that is scattered around the world. It's also to turn the midlands of this country from budding to a center for digital development, make western part as nascent area where logistics and infrastructure grows fast, make eastern area forefront of industry in digital services and forming world headquarters, build stratified opening up all over China.

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