Industrial internet and the Value of Advanced Manufacturing Enterprises

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Abstract. Under the background of the rise of the digital economy, the industrial Internet has become a key breakthrough in the integration of data and reality, and an important driving factor to promote the value of advanced manufacturing enterprises. Based on the micro enterprise data of China's advanced manufacturing industry from 2008 to 2013, this paper constructs a differential model to empirically test the role and mechanism of industrial Internet on the enterprise value of advanced manufacturing industry. The study found that the industrial Internet platform can significantly improve the value of advanced manufacturing enterprises, and after a series of robustness tests, the above conclusion is still valid. The mechanism test shows that the industrial Internet promotes the value of enterprises by reducing trade costs and driving the growth of enterprises. The value enhancement effect is more significant in enterprises with high industrial agglomeration, eastern regions and capital intensive enterprises, and is positively correlated with export delivery value and regional industrialization degree. Therefore, this paper respectively puts forward countermeasures and suggestions at the level of platform, enterprise and government, and provides reference ideas for better playing the role of industrial Internet in promoting the value of advanced manufacturing enterprises.

Keywords: Industrial internet, advanced manufacturing industry, enterprise value.

1 Introduction

In 2022, the scale of China's digital economy has exceeded 50 trillion yuan, ranking second in the world, accounting for 41.5% of GDP. In the context of digital economy, industrial Internet services that promote industrial digital transformation are entering a new stage of large-scale development. The industrial Internet relies on a new type of infrastructure that extends vertically and horizontally, and uses next-generation information technologies such as big data, cloud computing, the Internet of Things, and artificial intelligence to build a digital platform connecting the entire industrial chain of

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production, trading, financing, and circulation, and promotes the quality and efficiency of manufacturing enterprises through efficient allocation of resources and integrated optimization of the value chain. And through innovative industrial ecology to enhance the sense of customer experience, efficiently create more economic and social value. In October 2022, China proposed to accelerate the development of the Internet of Things, accelerate the development of the digital economy, and promote the deep integration of the digital economy and the real economy, which pointed out new directions and proposed new propositions for vigorously developing the industrial internet and thus boosting the value of manufacturing enterprises. In September 2023, the New Industrialization Promotion Conference held in China further proposed that the construction of a strong manufacturing country should be organically combined with the development of the digital economy and industrial information technology, so as to build a strong material and technological foundation for Chinese-style modernization.

Advanced manufacturing industry represents the forefront of the development of manufacturing industry from large to strong. It shows the development speed of industrial technology level and management ability. And it has the characteristics of creativity, advanced nature and high added value. Through the new productivity empowerment of the industrial Internet, promoting advanced manufacturing enterprises to strengthen the accurate docking of supply and demand, achieve efficient production, and optimize operation and management methods is a key breakthrough in the deep integration of the digital economy and the real economy, and will also become an important new source of advanced manufacturing enterprise value enhancement and even high-quality industrial development. Therefore, this paper studies the influence mechanism and effect of industrial Internet on the enterprise value of advanced manufacturing industry, which not only provides theoretical support for the practice path of enriching the integration of data and reality, but also provides feasible decision-making reference for the advanced manufacturing industry to achieve quality upgrading in the digital transformation, which has strong academic and application value.

The economic essence of industrial internet is the virtual cluster formed by the digital reconstruction of industrial organization. Virtual cluster changes the trading place and way, refreshes the development path of the previous business model, and generates a new value creation mechanism. In terms of organizational form, Christina (2003) proposed that by participating in virtual clusters, the isolation mechanism for enterprises to participate in competition was transformed from technology to community. And the production organization mode was transformed from consumer-oriented flexible production to borderless development[1]. In terms of operation mechanism, Edward (2020) believed that virtual transformation of industrial clusters can shorten the interactive distance within clusters and upgrade industrial clusters into modular and associated enterprise communities[2]. Ma (2019) proposed that the development of the internet significantly produces inventory reduction and adjustment, which is an important transmission mechanism for the enterprise resource allocation optimization and high-quality economic development[3].

With the accelerated transformation of the internet economic model in recent years, the development trend and evolution law of the industrial internet have become a new hot spot of academic research. First, the connotation and function of the industrial

Internet. Sun (2022) believed that the ultimate goal of the industrial internet is to form a modern supply chain with intelligent decision making, ecological theme, activity service and visual management[4]. Menon et al. (2020) defined the industrial internet platform as a technological form that can provide additional value to user enterprises when the main body involves consumers and producers in the industrial chain[5]. Min (2021) believed that the new economic creation path promotes new changes in the industrial Internet era, especially the direct connection between producers and consumers from the perspective of supply chain. And it promotes the realization of the business model of information ecology[6]. Second, it is about the development model of the industrial internet. Martin (2021) proposed that industrial internet and consumer internet have different development priorities, with the latter emphasizing scale growth and the former focusing on efficiency improvement[7]. Wang (2023) explained the three-stage characteristics of the start-up, growth and expansion of the industrial internet platform, believing that it follows the development path of first improving quality and then expanding scale[8]. Zhao (2023) pointed out that when the business system takes the industrial internet as the core, it can effectively realize the accessibility of the industrial chain. And the innovation of the platform scene will promote the renewal and evolution process of the commercial system[9].

It can be seen from the above that it is the value ecosystem of "data connection, resource aggregation and service sharing" built on the basis of the industrial internet that provides a new driving force for the improvement of enterprise value represented by advanced manufacturing industry. Qu (2023) used empirical analysis to draw a conclusion that the industrial internet promoted the value creation of high-tech enterprises by improving the growth of enterprises[10]. Yi (2024) studied the industrial internet platform and found that the platform enabled manufacturers pursuing digital transformation to improve the efficiency of resource integration and resource reconstruction[11]. Zhang (2023) believed that the economic value of industrial internet technology enterprises is greatly affected by non-financial factors. And the comprehensive operation ability of enterprises can be effectively improved through the internal control of enterprises, the formulation of government laws and the supervision of social enterprises[12]. Wael (2023) took small and medium-sized science and technology manufacturing enterprises in Jordan as the research object and found that they could adapt to the rapidly changing environment by relying on the industrial internet, so as to achieve economic benefits[13].

Compared with the existing research, the marginal contribution of this paper mainly lies in two aspects. On the one hand, the theoretical mechanism of industrial internet affecting the value of advanced manufacturing enterprises is explored more deeply. The existing literature mainly analyzed the single factors of industrial internet affecting the enterprise value of advanced manufacturing industry, such as growth, resource allocation and so on. This paper grasps the frontier trend of virtual cluster development and enterprise value enhancement, and starts with the organic combination of the two. We sort out and summarize the impact mechanism of industrial internet on the enterprise value of advanced manufacturing industry, and build a "cost-benefit" comprehensive analysis framework to distinguish the two effects of trade cost reduction and enterprise growth. It is expected to enrich the theoretical research on value creation of advanced

manufacturing enterprises under the background of digital economy. On the other hand, a new design is made for the empirical study on the effect of industrial internet on the enterprise value of advanced manufacturing industry. A small number of relevant studies have been conducted based on the data of listed companies. But most of these companies are industry leaders or development benchmarks. The main body of the advanced manufacturing industry is still the majority of small and medium-sized enterprises, which are also the main service objects of the industrial Internet. Such enterprises generally do not have the ability to build their own platforms for digital transformation due to their own factors such as development conditions. They mainly join the industrial internet platform through participation and integration. Therefore, small and medium-sized advanced manufacturing enterprises will be more sensitive to the effects exerted by the industrial internet. Taking such enterprises as the object of empirical research will be more conducive to overcoming the identification difficulties caused by the use of listed company data. This paper uses micro enterprise data with small and medium-sized advanced manufacturing enterprises as the main body, considers the characteristics of them as unlisted companies. We use enterprises to log in to the industrial internet platform as the processing event, and construct the DID model to identify the causal effect of industrial internet on the value of advanced manufacturing enterprises. It is expected to improve the empirical research design of the relationship between industrial internet and enterprise value of advanced manufacturing industry.

The subsequent contents of this paper are as follows. The second part puts forward the research hypothesis on the basis of analyzing the mechanism of industrial internet affecting the enterprise value of advanced manufacturing industry. The third part is empirical model and research design, introducing model construction, variable setting and descriptive statistics. The fourth part reports the empirical test results and carries on the robust and extended analysis. And finally we present the research conclusions and countermeasures.

2 Mechanism of Action and the Research Hypothesis

2.1 Trade Cost Reduction Effect

Part of the basic production activities of advanced manufacturing enterprises have been independently outsourced and formed independent circulation industries, such as trade, wholesale, transportation, operation and maintenance and other services, and instead, they have embedded relationships for the manufacturing industry to provide services in the form of externalization. As for the economic agglomeration and core agglomeration of the manufacturing industry in spatial agglomeration, it forms various regional combinations, and the emergence of industrial internet just breaks the geographical regional restrictions of the combination, and covers a more wide range of more diversified enterprise organizations. As a enterprise network service platform, industrial internet causes competition and cooperation between the enterprises, can make the enterprises step out of the original cluster boundary, realizing the interaction of high quality resources, so as to reduce the space transfer cost of advanced manufacturing sector and

industry between goods, technology, resources, which are called the advanced manufacturing trade costs in this paper.

2.1.1 Structural Embedding of the Value Chain.

Industrial internet platform can reduce the trade cost of enterprises through value chain embedding. In the industrial internet environment, the integration of artificial power and intelligence has become an important factor in the transformation and development of advanced manufacturing industry. Enterprises in the middle and lower reaches of the industrial chain integrate data chains through big data convergence, effectively opening up the front and rear links of the value chain, realizing the improvement and innovation of basic activities and supporting activities, and improving the touch efficiency while optimizing customer experience. In view of the action path, firstly, the industrial internet can embed the supporting activities of advanced manufacturing value chain to improve the smoothness of information exchange of enterprises, optimize the integration mechanism of internal and external value chain, make up for the blind area of the price system, and improve the allocation efficiency. Secondly, the industrial internet can embed in the basic activities of enterprises, then the enterprises can obtain the effective information of greater importance and which can hardly get from the market mechanism through a low cost and high efficiency way, and improve the operation efficiency by scale. For the embodiment, first of all, the industrial internet can reduce the production cost of the same industry enterprises through collaborative manufacturing and flexible manufacturing. Second, due to the vertical distribution of the platform, which formed a relatively completed across-regional industry supply chain, is an advantageous to save logistics costs of the enterprises from the industry upstream and downstream. Finally, based on the convenience and directness of industrial internet, enterprises can reduce the procurement cost of intermediate products or services.

2.1.2 Balance Between Cost and Economies of Scale.

Under the original conditions of not in industrial internet platform, trade cost is the main input factors in manufacturing cost control, by breaking the geographical location boundary, the cost of geographical spatial factors are controlled, such as trade policy cost, national border cost and distribution costs, although commodity storage, transportation and other necessary support is not reduced, but the whole trade link has been in a greater financing, and let the cost surplus, and enterprise economies of scale to achieve a positive balance. Industrial internet platform can reduce the trade costs of enterprises through center diversification. First, Realize the transition from field & time-limited physical services to virtual platform services, breaking the traditional time and place constraints in the real economy, Enterprises of different regions and modes can realize time varying and cross-regional transaction activities on the platform, reduce the trade costs of enterprises. Second, break through the monopoly trend of leading enterprises, optimize the transaction process, improve the transaction success rate, reduce non-technical expenditures during transactions, break the financial monopoly of

the traditional capital concentration side, accelerate the developmental competition among enterprises, reduce the product demand-side trade cost (Greenville, 2020)[14].

2.2 Driving Effect of Enterprise Growth

First, the industrial internet platform can realize the deepening of division of labor among enterprises and accelerate the positive cycle of division of labor. On the other hand, it can expand the market network and broaden the boundary of scale. The combination of the two can achieve a variety of positive effects, such as promoting enterprise financing, improving the level of human capital, increasing the added value of products, improving and optimizing the management process, enhancing the overall professional level, etc., to create an excellent environment to improve the value of enterprises, and finally achieve the effect of increasing enterprise remuneration. The whole action process is the driving effect of the industrial internet on the growth ability of advanced manufacturing enterprises.

On the one hand, based on the perspective of promoting the deepening of division of labor, advanced manufacturing enterprises have new comparative advantages, that is, they have product advantages based on the adaptation of their own division of labor level. That is to say, they are appropriate to choose products with more scale advantages and the possibility of increasing remuneration when making production decisions. Due to different stages of development and technical level, medium technical level of individual enterprises, medium technical level of manufacturing enterprises in industry can improve their industrial chain integration ability under the influence of the internet, and develop agglomeration threshold and appropriate related integration industry, not only have the dominance of division of labor cooperation, also can deepen the comparative interests of division of labor. By promoting optimization of division of positive cycle, the industrial internet form the value of independent framework, while manufacturing enterprises prefer stable status and relatively lack of motivation of independent evolution, the key to the optimization of industrial structure can cover this lack of motivation by improving the division of labor, industrial internet promote the positive cycle of deepening division through restructuring the value chain, and pay increasing effect, form the benefits of positive effect.

On the other hand, due to the size of the traditional market development, advanced manufacturing system has not reached the perfect condition so it is hard to avoid the disadvantages of insufficient power, high cost, in the industrial chain, for example, when the product production and sales optimization degree is not enough to offset the cost of supply chain, will produce such as tangible assets inefficient input which called waterfall effect, making the whole production sales process efficiency. As a new intelligent service infrastructure, industrial internet can greatly expand the market network while the marginal return is much higher than the average investment, and broaden the boundary of enterprises in the trading market.

2.2.1 Resource Integration and Allocation Improvement.

The industrial internet platform focuses on the harmonious theme of the interactive coupling process, and realizes the growth and empowerment process of the registered enterprises through the compound effect, that is optimization and upgrading of the two main factors of technical capital and human capital. In the initial stage of the platform development studied in this paper, during the period of basic platform construction and service mode innovation in the platform stage, the start-up platform guides enterprises to develop resources, use the core technology of the platform to attract angel resources and outstanding talents, and effectively connect the buyers and sellers, so as to realize the connection and empowerment. As the technology matures and management continuous optimization, platform in the development stage will do intelligent operation actively, to improve trading, logistics, risk control system of intelligence, power enterprise resources development, under the support of the platform resources and expert experience, reduce the cost of supply and demand matching and information linkage, so as to realize synergy enable (Kumar, 2022)[15]

2.2.2 Improve the Professional Level of Enterprises.

Industrial internet innovation and value creation path, to enhance the professional level of enterprises. The development of industrial internet realized the restructuring and re-engineering of the advanced manufacturing system, in the process of the continuous development of big data, market information improved more transparency, market atmosphere tends to the direction of more fair and synergy, the market main entities with the help of new technology, new applications to fully dig the potential value of data, product technology innovation become more flexibility. At the same time, with the enhancement of industrial internet coverage, the management structure of large advanced manufacturing industry tends to be flat, the adaptability and adjustment flexibility of enterprises are constantly improved, the innovation and R&D investment of small and medium-sized enterprises is constantly improved, the exploration and innovation of models are actively conducted, and the growth of enterprises is constantly improved. Advanced manufacturing enterprises not only become more high skilled, highly innovative organization, also become a knowledge network, through incentive competition and open cooperation, speed up the sharing of knowledge spillover, continue to promote value network reconstruction, thus improve efficiency of resource allocation, giving full play to the advantages of human capital, optimize customer response speed, expand product function, etc., with all these to improve the enterprise professional competence.

2.2.3 Enterprise Transformation and Upgrading

Advanced manufacturing industry also has obvious characteristics of spatial agglomeration. Geographically, it can not only form a cooperative concentration with adjacent industries, but also obviously concentrate in the cities and more developed regions of the provinces with good economic development. In the context of this regional concentration, Advanced manufacturing industry can be gathered into a structural form with high technical level and sufficient innovation power. To realize the increasing

scale effect, The nature of the enterprise itself also needs to draw close to the knowledge-based innovation. In the industrial internet platform agglomeration, advanced manufacturing enterprises can improve the spread spreed of professional technology and knowledge, accelerate the transformation and upgrading of enterprises in the value network, so as to achieve the improvement of resource allocation efficiency, reduce financing costs and improve financing efficiency, to the direction of high level and high socialized human capital, increase the product added value and optimize the enterprise management process, with these many elements as a link of development, to discover and appropriately capture new productive opportunities, to realize the transformation and upgrading of enterprises through the industrial internet platform.

Based on the above analysis, the following hypothesis is proposed.

Hypothesis 1: Industrial internet has enhanced the value of advanced manufacturing enterprises.

Hypothesis 2: The industrial internet can enhance the value of advanced manufacturing enterprises by reducing trade costs and driving the growth of enterprises.

3 Empirical Model and Study Design

3.1 Measurement Model

The purpose of this paper is to investigate the effect of industrial Internet platform on the enterprise value of advanced manufacturing industry, and further reveal the mechanism and characteristics of its impact on the enterprise value of advanced manufacturing industry. By constructing DID model to evaluate and analyze policy event decision making, this paper uses DID model to evaluate the net effect of industrial Internet policy on enterprise value of advanced manufacturing industry. By comparing the value difference before and after the development of the registered industrial Internet platform between those enterprises (processing group) and non-registered enterprises (control group), this difference is the impact of intervention of policy events or decision-making events on individuals, which can more accurately estimate the role of industrial Internet in enhancing enterprise value. Therefore, the following staggered DID model is established:

$$EV_{it} = \alpha_1 + \beta_1 IIP_{it} + \gamma_1 control_{it}^{jp} + \mu_i + \lambda_t + \varepsilon_{it}^{jp} \quad (1)$$

Among them, i, j, p and t represent individual enterprises, industry, region and time respectively. EV_{it} is the explanatory variable, also the measurement indicator of enterprise value. IIP_{it} is the core explanatory variable of this paper, it reflects whether the enterprise accepts the processing of logging into the industrial internet platform. $control_{it}^{jp}$ is a series of characteristic control variables of the individual company and province which it stays. μ_i is the fixed effect of the enterprise, it can eliminate unobservable factors that do not change with objective factors over time but with the individual sample. λ_t is used to control the missing variables in the fixed effect of the enterprise, including related variables that change over time but not with the individual. ε_{it}^{jp} is the random error item. In equation (1), the coefficient β reflects the causal

relationship of the influence of the industrial internet platform on the enterprise value, and its value is estimated to be positive according to the proposed research hypothesis.

3.2 Study Variables

3.2.1 Explained Variables.

In most current studies, the measurement methods of enterprise value are mainly divided into three categories. First, the professional method of asset appraisal is used to evaluate enterprise value. Second, using market indicators, such as Tobin Q. Third, using enterprise financial indicators, such as return on total assets, equity. Because of the sample size is large, so the first method is not applicable. Because most of the enterprises settled in the industrial internet platform are unlisted enterprises, there is no market index information such as Tobin Q, and the second method is not applicable. Therefore, this paper adopts the third method, considering the availability of data, and selects the return on total assets (ROA), the ratio of net profit to total assets, as the measure of the explained variable, namely enterprise value.

3.2.2 Core Explanatory Variables.

According to whether advanced manufacturing enterprises log in to the industrial internet platform, they are divided into experimental group and control group, and the core explanatory variable IIP is constructed. The specific setting is as follows. If enterprise i logs in the industrial internet platform in year t, then the IIP in year t and later years is 1, and the rest is 0.

3.2.3 Control Variables.

The selection of control variables uses the sets of the reference literature. The control variables at the enterprise level are selected. Enterprise scale (lnasset), measured as the logarithm of the total assets of the enterprise after the reduction. Capital density (PFA), expressed by the proportion of the total fixed assets in the total assets. Financial leverage (lev), measured by the asset-liability ratio of the enterprise. Operating capacity (ATO), expressed by the turnover rate of total assets. In addition, the level of economic development (GDP), foreign investment (FDI), human capital (HC), and internet penetration rate (internet) variables are also controlled at the regional level. Among them, the economic development level is expressed by the logarithm of regional (province) per capita GDP, foreign investment is expressed by the logarithm of regional (province) foreign investment, and human capital is measured by the number of full-time teachers of university per 10,000 universities in the province. The internet penetration rate comes from the table of main internet development indicators in the Statistical Yearbook released by the National Bureau of Statistics of China.

3.3 Research Data

3.3.1 Data Sources.

Industrial internet platforms are divided into three categories. First, industrial interconnection platforms, such as General Electric (GE), Siemens in Germany and Haier in China. Second, B2B internet platforms they can be divided into comprehensive and vertical platforms according to the transaction categories. Third, intelligent customization platforms, such as SHEIN, a clothing global e-commerce customization platform. Based on the availability of sample source data and the degree of information flaws, this paper selects B2B platform as the research subject of the value promotion effect of advanced manufacturing enterprises.

On the one hand, this paper considering information of the Chinese industrial internet platform function by representative, network ranking, and with the advanced manufacturing enterprises join the platform, choose that the SG560.com (B2B online trade platform), Made-In-China.com (B2B domestic and cross-border trade platform), youboy.com (manufacturing supply chain products trading platform), mysteel.com (commodity service) for sample. Furthermore, it merges and matches with the database of Chinese industrial enterprises to obtain various index data. On the other hand, define the subdivision of advanced manufacturing industry: oil processing, coking and nuclear fuel processing, chemical raw materials and chemical products manufacturing, pharmaceutical manufacturing, general equipment manufacturing, dedicated device manufacturing, automobile manufacturing, railway, shipping, aerospace and other transportation equipment manufacturing, electrical machinery and equipment manufacturing, computer, communications and other electronic equipment manufacturing, instrument manufacturing.

Based on the characteristics of the industrial internet platform, such as the year of establishment and development speed, and the latest available enterprise data from Chinese industrial enterprise database and take into account the integrity and quality level of data disclosure, the advanced manufacturing enterprises from 2008 to 2013 are selected as the research samples.

3.3.2 Data Processing.

The data was treated as follows. Excluding the missing samples of total assets, fixed assets and other key variables. Excluding extreme samples with total assets of 0, paid-up capital less than 0, profit margin greater than 99%, fixed assets greater than total assets, current assets greater than total assets, and the number of employees less than 8. At the same time, due to the staggered DID model processing effect heterogeneity will lead to estimation bias, subsequent robustness test will use heterogeneity-robust estimation method, with this method, this paper excluded samples log in platform in 2008(5 companies), in 2009 and after for the experimental group, including a total of 413 experimental group and 22083 control group samples. All continuous variables were tailed with the upper and lower 1% level extreme values. All variables calculated in nominal prices are reduced using the factory gate price index to eliminate the influence of inflation factors. Table 1 reports the described statistical results for each variable.

Table 1. Descriptive statistical results for the variables

variable	Obs	Mean	SD	Min	Median	Max
IIP	134976	0.008	0.088	0.000	0.000	1.000
ROA	134976	0.105	0.256	-7.844	0.050	37.639
lnasset	134976	8.847	1.464	4.151	8.668	16.815
PFA	134976	0.296	0.197	0.000	0.259	1.000
lev	134976	0.528	0.254	-0.581	0.532	7.916
ATO	134976	2.233	3.382	0.006	1.330	212.988
GDP	134976	10.546	0.359	9.182	10.597	11.215
FDI	134976	13.909	0.979	7.894	14.448	14.876
HC	134976	11.650	4.555	5.016	10.186	31.617
internet	134976	0.471	0.137	0.115	0.482	0.752

4 Analysis of Empirical Result

4.1 Benchmark Regression Results

Table2 reports the estimated results for the model (1). The coefficient of the core explanatory variable IIP is significantly positive, indicating that the enterprise login to the industrial internet platform has a significant positive effect on its value enhancement. The economic effect is based on the estimated results listed in the column(4) of control enterprises, the regional level and the two-way fixed effect. During the sample period of the advanced manufacturing enterprises entering the industrial internet platform, the return on total assets increased by about 1.8%. It can be seen that the advanced productive services provided by the industrial internet platform can enhance the value of advanced manufacturing enterprises.

Table 2. Benchmark regression results

	(1) *ROA*	(2) *ROA*	(3) *ROA*	(4) *ROA*
IIP	0.0484***	0.0228**	0.0187***	0.0184***
	(0.0127)	(0.0098)	(0.0071)	(0.0071)
lnasset			0.0203	0.0204
			(0.0125)	(0.0129)
PFA			0.0234**	0.0235***
			(0.0092)	(0.0089)
lev			-0.0666***	-0.0665***
			(0.0092)	(0.0092)
ATO			0.0406***	0.0406***
			(0.0105)	(0.0105)
GDP				-0.0452
				(0.0432)
FDI				-0.0057

				(0.0097)
HC				-0.0001
				(0.0016)
internet				0.0187
				(0.0928)
Enterprise fixed effect	Uncontrolled	control	control	control
Time fixed effect	Uncontrolled	control	control	control
constant term	0.1042***	0.1044***	-0.1373	0.4095
	(0.0013)	(0.0001)	(0.1291)	(0.4681)
Observation	134976	134976	134976	134976
Adjusted R^2	0.0003	0.4606	0.5672	0.5672

Note: *, ** and *** are significant at 10%, 5% and 1% respectively. Cluster stability standard error in brackets. The same goes for the table that follows.

4.2 Parallel Trend Test

The premise for accurately assessing the treatment effect by using the DID model is that the experimental and control groups must satisfy the prior parallel trend hypothesis. Specifically in this article, the trend of the change of enterprise value before the experimental group enterprises entered the industrial internet platform is consistent with that of the control group enterprises. Using the event analysis method, the following measurement model is constructed.

$$EV_{it} = \alpha_2 + \sum_{-5}^{4} \beta_n IIP_{it,T+n} + \gamma_2 control_{it}^{jp} + \mu_i + \lambda_t + \varepsilon_{it}^{jp} \quad (2)$$

In Equation (2), $IIP_{it,T+n}$ is the interaction term between the variables of the industrial internet platform and the variables in different periods, and other variables are the same as Equation (1). β_n measures the value difference between different "relative years" login platform enterprises and unstationed platform enterprises, compared to the difference of these two on the base period (this is the period before the processing occurred). The regression results are shown in Table 3. It can be seen that the estimated coefficient fluctuated around 0 during all periods (-5 to-2) before the treatment period and was not significant within the 95% confidence interval, indicating that the prior parallel trend assumption is true.

Table 3. The parallel trend test results

variable	Event analysis
pre5	-0.0261 (0.0199)
pre4	-0.0073 (0.0120)
pre3	-0.0060 (0.0079)
pre2	-0.0040 (0.0055)

Enterprise control variables	control
Regional control variables	control
Enterprise fixed effect	control
Time fixed effect	control
Observation	134976
Adjusted R2	0.6394

4.3 Robustness Test

4.3.1 Replace the Enterprise Value Measurement Index.

The goal of this paper is to examine whether the industrial internet platform helps to promote the value of advanced manufacturing enterprises, and there are other indicators to measure the value of enterprises. In this paper, the profit rate on assets (RTA), which is expressed as the ratio of total profit to total assets, is selected as a surrogate index to measure the enterprise value. The regression results are shown in column (1) of Table 3. The results show that the coefficient of IIP becomes larger and still significantly positive, indicating that hypothesis 1 is robustly true.

4.3.2 Control the Interaction for Fixed Effects.

On the basis of controlling the fixed effect of enterprises, this paper gradually adds the fixed effect of industry-time, region-time interaction, and controls the unobserved factors of the industry and region level change with time, such as the economic fluctuations at the industry level year by year or the impact of the policy implementation at the province level on the enterprise value. The regression results are presented in Table 4, columns (2) and (3). The results showed that the IIP coefficient was still significantly positive after adding the interaction fixed effect, indicating that hypothesis 1 was robustly true.

4.3.3 Improve the Clustering Level.

Given that the higher the cluster hierarchy, the weaker the implied assumption, the standard misestimation is more robust. In this paper, we cluster to the industry level, that is, we assume that all the observations in the industry are related to each other, while the observed values of different industries are not correlated. At the same time, considering that the disturbance terms of different individuals in the same industry may also be related, this paper also uses two-way clustering robust standard error, clustering to the industry-time level, that is, that the observed values of the same industry in the same year are correlated with each other, while there is no correlation between the observed values of different industries in different industries or different years. The results are shown in Table 4, columns (4) and (5), respectively. The IIP coefficient is still significantly positive and the value is almost unchanged, indicating that hypothesis 1 is still robust.

4.3.4 Heterogeneity Treatment Effect Test.

Considering the possible bias caused by heterogeneity treatment effects of DID, this paper alleviates it by dual robust estimation method, referring to the dual robust estimator provided by Callaway and Sant'Anna (2021), namely CSDID[16], Calculculation group-period average processing effect, respectively selected never accept, not accept processing samples as a control group, using the inverse probability weighted method (IPW) to calculate the average treatment effect, the results see table 4 column (6), (7), the IIP coefficient is still significantly positive and value almost no change, again hypothesis 1 is robust.

Table 4. Results of the robustness test

	(1) *RTA*	(2) *ROA*	(3) *ROA*	(4) *ROA*	(5) *ROA*	(6)	(7)
IIP	0.0216**	0.0178**	0.0189**	0.0184**	0.0184**		
	(0.0095)	(0.0071)	(0.0069)	(0.0074)	(0.0070)		
CSDID estimation results						0.0185*	0.0184*
						(0.0102)	(0.0102)
Enterprise control variables	control	control	control	control	control	control	control
Regional control variables	control	control	control	control	control	control	control
Enterprise fixed effect	control	control	control	control	control		
Time fixed effect	control	Uncontrolled	Uncontrolled	control	control		
Industry-Time-fixed effect	Uncontrolled	control	control	Uncontrolled	Uncontrolled		
Region- -time-fixed effect	Uncontrolled	Uncontrolled	control	Uncontrolled	Uncontrolled		
Cluster enterprise level	yes	yes	yes	no	no		
Cluster industry level	no	no	no	yes	no		
Industry-time two-way clustering	no	no	no	no	yes		
control group						Never Treated	Not yet Treated
Observation	134976	134976	134976	134976	134976	134976	134976
Adjusted R^2	0.5977	0.5673	0.6403	0.5672	0.5672		

4.3.5 Excluding Major Policy Impacts of the Same Period.

During the same period when the research sample logged into the industrial internet platform, China also implemented some major policies that may have a potential impact on the value of enterprises, which may form a competitive hypothesis for the benchmark regression results of this paper, so the five possible major interference policies in the sample period were sorted out and gradually excluded. First, since 2013, China

began to build pilot free trade zones (referred to as Free Trade Area). Second, in 2009, The State Council issued the "Ten Industry Adjustment and Revitalization Plan" (referred to as the Ten Industry Plan), supporting the development of ten major industries including steel, automobile, shipbuilding, petrochemical, textile, light industry, nonferrous metals, equipment manufacturing, electronic information and logistics. Third, the Decision of The State Council on Accelerating the Cultivation and Development of Strategic Emerging Industries (hereinafter referred to as Strategic Emerging Industries) issued in 2010, focuses on cultivating and developing new information technology, biology, high-end equipment manufacturing, new energy, new materials, new energy vehicles and other industries. Fourth, the Plan for Industrial Transformation and Upgrading (2011-2015) issued by The State Council in 2011 (hereinafter referred to as Industrial Transformation and Upgrading), points out the development orientation of key areas. Fifth, Opinions on Accelerating the Depth of Integration of Informatization and Industrialization issued by the Ministry of Industry and Information Technology (hereinafter referred to as Informatization and Industrialization), Suggests improving traditional industries, as well as promoting the integrated application of information technology in the manufacturing industry.

In order to exclude the possible impacts of the above national policies on the benchmark regression results, the following five virtual variables are set for control. First, if the area where the enterprise is located is established in a free trade area (i. e., Shanghai in 2013), then the FTA dummy variable assigns a value of 1, otherwise, it is 0. Second, among the top ten industrial planning support fields (ICNEA codes 25,36,37,39), the virtual variable TIP take 1, otherwise, it is 0. Third, according to the definition of key areas of strategic emerging industries, the enterprises affected by whether they are screened (ICNEA codes 27,37,39), the SEI dummy variable affected by the policy in that year was 1, otherwise, it is 0. Fourth, based on industrial transformation and upgrading, the ITU variable of the key enterprises (ICNEA codes 25,27,36,37,39) is 1, otherwise, it is 0. Last, among the development goals and main tasks of informatization and industrialization (ICNEA codes 25,36,37,39), if one company is affected by the policy in the current year, II variable will take 1, otherwise take 0.

Table 5 reports the estimated results after excluding the impact of national policies for the same period. Among them, columns (1) - (5) report the estimated results of separately controlling the Free Trade Area, Ten Industry Plan, Strategic Emerging Industries, Industrial Transformation and Upgrading, Informatization and Industrialization, and column (6) reports the results of controlling the above five policy virtual variables simultaneously. It is obviously found that the core explanatory variable IIP in this paper is significantly positive at 1% or 5%, indicating that the above five national policies will not substantially impact the benchmark regression results of this paper, and the benchmark regression results have strong robustness.

Table 5. The estimated results of excluding national policy impacts for the same period

	(1)	(2)	(3)	(4)	(5)	(6)
	ROA	*ROA*	*ROA*	*ROA*	*ROA*	*ROA*
IIP	0.0184***	0.0185***	0.0181**	0.0173**	0.0178**	0.0173**
	(0.0071)	(0.0071)	(0.0071)	(0.0071)	(0.0071)	(0.0071)

Free Trade Area	-0.0142***					-0.0142***
	(0.0028)					(0.0028)
Ten Industry Plan		0.0004				-0.0000
		(0.0027)				(0.0028)
Strategic Emerging Industries			-0.0074***			-0.0019
			(0.0026)			(0.0032)
Industrial Transformation and Upgrading				-0.0093***		-0.0090*
				(0.0020)		(0.0054)
Informatization and Industrialization					-0.0083***	0.0007
					(0.0020)	(0.0050)
Enterprise control variables	control	control	control	control	control	control
Regional control variables	control	control	control	control	control	control
Enterprise fixed effect	control	control	control	control	control	control
Time fixed effect	control	control	control	control	control	control
Observation	134976	134976	134976	134976	134976	134976
Adjusted R^2	0.5672	0.5672	0.5672	0.5672	0.5672	0.5673

4.3.6 Sensitivity Analysis.

As a fact study, in order to control the unobservable confounders affecting, the benchmark regression results, this paper continues to add the control variables for multiple additional regressions, aiming to conduct qualitative analysis as a sensitivity analysis rather than setting multiple equation forms. The ideal result is that if the key variables are not controlled, the estimation coefficient of IIP will be more affected by the combination of multiple control variables, and the positive and negative direction and numerical value of IIP will be unstable in various situations. After controlling the key variables, the IIP coefficient will no longer be sensitive to the subsequent combination of multiple control variables. When we observe the sensitivity of the estimated results to further added variables, i.e. the size of the selection degree of optional variables, we can infer the sensitivity of IIP to other unobservable variables, so as to control the bias of the omission of unobservable confounders.

It is difficult to directly separate unobservable variables. Following the practice of Nunn and Wantchekon (2011)[17], this paper uses the measure of unobservable factors and builds a number of different control variable equations, so as to get different regression results IIP coefficient ratio (ratio). The calculation formula of ratio is $|\beta_C/(\beta_R-\beta_C)|$, β_C is defined as the IIP regression coefficient of control variable equation, β_R is for the IIP regression coefficient of constrained equation, keeping the numbers of observable variables of the control variable equation more than those of the constrained equation. The principle of this method is that if there are factors that can

cause the large bias of the IIP coefficient estimation, the effect of the unobservable part should be much greater than the influence of the factors that have been controlled above. In addition, provided the IIP coefficient of the control variable equation (β_C) is so large, it means that the force of unobservable factors needs to reach a very high level to offset the impact of industrial internet on the improvement of enterprise value. Therefore, the amount of ratio value is inversely proportional to the bias caused by the regression results by the possible missing unobservable factors, that is, the greater the value, the lower the risk of bias.

The sensitivity analysis is as followed. Designate the benchmark equation including individual and region control variables, individual and time fixed effects as constrained equation. Based on the above constrained equation, we first build control variable equations by adding industry-time fixed effect and region-time fixed effect step by step. Then we build another control variable equation controlling for major national policies. Finally, we build additional control variable equations by controlling for industrialization degree and penetration rate of internet of regional level that might be missed step by step. Table 6 reports the calculated ratio values of the five groups of schemes according to the above idea. It can be found that the ratio values of all schemes are much greater than 1 as the reference value. The minimum value is about 15.73, and the maximum value is about 1841, and the mean value is about 421.84. Thus, when the unobservable factors are at least 15.73 times and on average 421.84 times of the control factors, the bias of IIP coefficient in the benchmark equation would be a problem. It is obvious that the benchmark regression results of industrial internet on advanced manufacturing enterprise value can not be affected by such a high unobservable factors.

Table 6. Results of the sensitivity analysis

Constrained equations	Control variable equations	β_R	β_C	ratio
Table (2) Model (4)	Table (4) Model (2)	0.0184	0.0178	29.6667
Table (2) Model (4)	Table (4) Model (3)	0.0184	0.0189	37.8000
Table (2) Model (4)	Table (5) Model (6)	0.0184	0.0173	15.7273
Table (2) Model (4)	The stru variable is added	0.0184	0.0185	185.0000
Table (2) Model (4)	The IAR variable is added	0.0184	0.0184	1841.0000

4.3.7 Placebo Test.

This section further designs a placebo test in a "counterfactual" framework. On the one hand, the experimental group was randomly selected. On the other hand, it was randomly given the time for company to log into the industrial internet platform to build virtual "treated variables" to replace the real treated variables in the benchmark regression model. The above process was randomly repeated for 500 times. The principle is that if the benchmark regression results of this paper are caused by chance, then the virtual "treated variables" should be statistically significant in most cases, otherwise it further supports the robustness of the basic results of this paper. Fig 1 presents the probability density distribution of the estimated coefficients of the virtual "treated variables". It is found that the coefficients are mainly concentrated around 0, and its probability density is normally distributed. That is to say, in the case of the current value of

the core explanatory variables, the estimated significant results are not a statistical incident. In other wors, the industrial internet has a significant impact in promoting the value of advanced manufacturing enterprises.

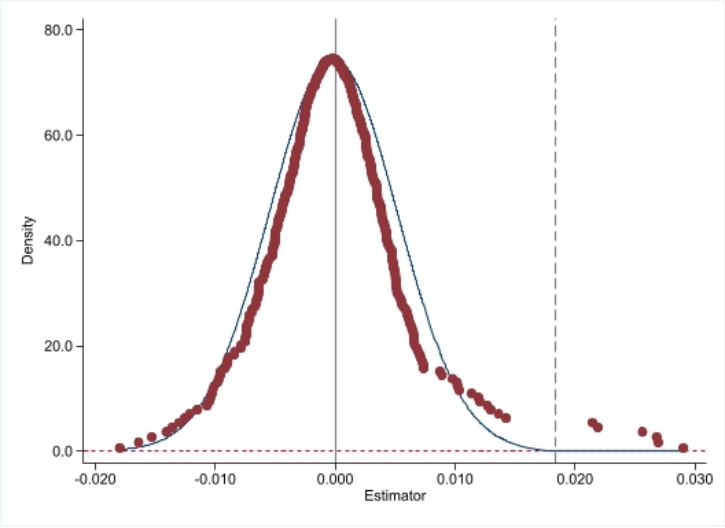

Fig. 1. The placebo test results

4.4 Mechanism Testing

The above parts of this paper examines the effect of industrial internet platform on the value of advanced manufacturing enterprises, and the theoretical analysis also suggests that industrial internet platform may promote the improvement of enterprise value by triggering the trade cost reduction effect and the driving effect of enterprise growth. Actually, controlling for the variables that happen after the independent variables is one kind of "bad control" (Angtist and Pischke , 2009) [18].Such a conclusion is hold even in a simple randomly experimental research. In the observational study, the mediation variables often are not completely strictly exogenous. Moreover, when the mediation variables are correlated with the independent variables or the random error term, there are one or more omitted factors which simultaneously affect the mediation variables and the dependent variable, therefore, the regression estimation coefficient results will produce strong bias caused by the missing variables. Dell (2011) proposed that the improvement method of the mediation effect analysis should focus on proposing the mediation variables reflecting the influence channel of the treat effect, and use the identification method to verify the causal relationship of the core independent variable on the mediation variable provided the effect of the mediator on the dependent variable is obvious[19].

This paper introduces enterprise trade cost and enterprise growth level as mediation variables that can reflect the effect of industrial internet on enterprise value. Under the condition that the two mediation variables are obvious to increase enterprise value, the same method of benchmark regression is used to identify the causal relationship of

industrial internet on the two mediation variables. In this paper, the logarithm of sales expenses is used to measure trade cost, and the growth level of enterprises is expressed as the logarithm of total assets of enterprises after deflating. The mechanism test model is as follows.

$$M_{it} = \alpha_3 + \beta_3 IIP_{it} + \gamma_3 control_{it}^{jp} + \mu_i + \lambda_t + \varepsilon_{it}^{jp} \quad (3)$$

In the above equation, Mit is the dependent variables in the mechanism test, representing mediation variable of the enterprise trade cost (cost) or enterprise growth level (lnasset), and the other measures are the same as Equation (1). The results of the mechanism test verify that the industrial internet platform can promote the improvement of enterprise value by reducing trade costs and driving the growth of enterprise. Column (1) of Table 7 shows that the IIP coefficient of the main independent variable is significantly negative, indicating that the industrial internet directly reduces the trade cost of advanced manufacturing enterprises, and thus contributes to the improvement of value. In fact the industrial internet can help advanced manufacturing enterprises reduce their trade cost through value chain linkage, labor pool and knowledge spillover. Column (2) of Table 7 shows that the IIP coefficient of the main independent variable is significantly positive at 1% significance level, indicating that the industrial internet produces the objective pulling effect, by expanding market network and boundary of advanced manufacturing enterprises, so as to improve its growth ability, scale level as well as scale return.

4.5 Expansion Analysis

4.5.1 Strengthening Effect of Platform Agglomeration Degree.

According to the above analysis, the industrial internet has an effect on improving the value of advanced manufacturing enterprises by reducing trade costs and driving the growth of enterprises. In addition, this effect is also affected by the agglomeration degree of industries on the platform. For one thing, the enterprises on the industrial internet platform together constitute a virtual industrial ecology with centralized division of labor and divergent structure. The stronger the ecological environment, the more the enterprises gather, and the more obvious of the effect of enhancing the enterprise value. Therefore, in the above ecological environment, the transmission of the industrial internet to the value of enterprises is more obvious, that is, the externalities formed by the industrial virtual agglomeration would realize the value sharing ecology of the platform, and significantly enhance the spillover effect of the industrial internet.

The technology threshold is of advanced manufacturing quite higher. In order to ensure cross-border integration and updating timely, agglomeration of enterprises in industrial internet platform. So as to promote grasping of industry development trend as well as innovation ability, and further the availability of high quality data, user information and trading frequency. On the one hand, the higher the industrial virtual agglomeration degree, the more likely enterprises which login onto platform can increase value through shared labor pool and effective use of knowledge spillover thus significantly reducing trade cost or enhancing level of specialization with higher degree, and

enlarging the positive influences of the basic story. On the other hand, the industrial virtual agglomeration environment enables more enterprises from different industries to share the spillover effect of value ecology system formed by industrial internet platform and increases the enterprise value. In shot, the increase of number of enterprises agglomerating on platform can not only promote the interaction and matching between the upstream and downstream firms in one supply chain, but also strengthen the space concentration of relevant professional service providers. Therefore, the higher degree of industrial virtual agglomeration brings about higher effect on the value of advanced manufacturing enterprises by industrial internet (Bernard, 2019)[20].

In order to analyze the above effect, an interaction model is constructed according to Christofzik and Kessing (2018)[21]. Specifically, we introduce the interaction term multiplied by the main independent variable and the industrial virtual agglomeration degree on industrial internet platform, so as to test whether the above hypothesis is hold. Accordingly, a difference-in-difference-in-difference model is constructed as follows.

$$\mathrm{EV_{it}} = \alpha_4 + \beta_4 \times \mathrm{IIP_{it}} \times \mathrm{VA_{j,2008}} + \gamma_4 \mathrm{control_{it}^{jp}} + \mu_i + \sigma_{jt} + \varepsilon_{it}^{jp} \quad (4)$$

In Equation (4), $\mathrm{VA_{j,2008}}$ is the virtual agglomeration degree in platforms of each industry (j) at the beginning of 2008, reflecting the ratio of the number of enterprises already stationed in the industrial internet platforms in the industry j at the beginning of 2008 to the total number of enterprises in the industry j. Thus, reverse causality could be avoid. μ_i, σ_{jt} are the fixed effect of enterprise and industry-year respectively, and other measures are the same as Equation (1). Column (3) of Table 7 reports the estimated results in the model (4). The regression result shows that the estimated coefficient of the interaction term $IIP_{it} \times VA_{j,2008}$is positive at the significance level of 5%, indicating that the higher the virtual agglomeration degree of advanced manufacturing industries in the industrial internet platform, the greater the increasing effect of enterprise value.

Table 7. Results of mechanism test and reinforcement effect test by virtual agglomeration

	(1)	(2)	(3)
	cost	*lnasset*	*ROA*
IIP	-0.0632*	0.1213***	
	(0.0326)	(0.0237)	
IIP_VA			185.3677**
			(78.8902)
Enterprise control variables	control	control	control
Regional control variables	control	control	control
Enterprise fixed effect	control	control	control
Time fixed effect	control	control	Uncontrolled
Industry-Time fixed effect	Uncontrolled	Uncontrolled	control
Observation	133151	134976	134976
Adjusted R^2	0.8383	0.9593	0.5673

4.5.2 Regional Heterogeneity Analysis.

The scope of China's enterprises in the industrial internet platform has formed a coordinated situation between the Easten and Westen regions due to rapid development and wide popularization of the internet. But similar to the development process of the consumer internet, the industrial internet is still gradually emerging from the Eastern region to the Central and Western regions. According to the classification criteria of the China National Bureau of Statistics, the samples were divided into two groups of the Eastern regions and Non-Eastern regions for regional heterogeneity analysis. The estimated results are shown in column (1) of Table 8. On the one hand, promotion effect of the value of advanced manufacturing enterprises by industrial internet is mainly shown in the Eastern region, while such effect in Non-Eastern regions has not yet emerged. As to the reasons, we suppose some points. Because the economic development level and information acquisition speed of the Non-Eastern region are slightly lower than that of the Eastern region, and the servitization transformation process of the manufacturing industry of the Non-Eastern region is also relatively slower than that of the Eastern region. So the Non-Eastern region's enterprise value has no a timely and effective response to the cost reduction brought by the industrial internet. On the other hand, P-value in column (1) of Table 8 shows that there is no statistically significant difference between the two regions in the respect of average treatment effect. As a matter of fact, the professional services provided by the industrial internet break the limit of time and space and cover the entire industrial chain, resulting in the overall enhancement of the value of advanced manufacturing enterprises across different regions.

4.5.3 Industry Heterogeneity Analysis.

This paper classifies advanced manufacturing industry into capital-intensive industry and technology-intensive industry according to China's Industrial Classification for National Activities. Capital intensive advanced manufacturing is inclusive of industries of category code for 25,34,35,40, and technology intensive advanced manufacturing is inclusive of industries of category code for 26-27,36-39. The results of column (2) in Table 8 show that the industrial internet has a significant improvement effect on the value of capital-intensive advanced manufacturing enterprises, but has no significant impact on the value of technology-intensive advanced manufacturing enterprises. The related P-value further indicates that industries with a difference in factor intensity do have significant differences in the respect of average treatment effect. The time span of this paper is 2008-2013, and the development of industrial internet in China was still in the early stage, and its service function was not perfect at that time. On the one hand, capital-intensive advanced manufacturing is characterized with large amount and volume of producing equipment, raw materials and finished products. Then, the industrial internet platform can relatively easily provide convenient trading, logistics, warehousing services for it and reduce trade cost to increase enterprise value. On the other hand, the value chain of technology-intensive advanced manufacturing is so circuitous and complex that the main source of enterprise value enhancement depends on the increasing of the level of specialization, such as application of advanced technology, innovation of product and service, improvement of financing efficiency, etc. Obviously, it was

quite difficult to provide qualified services to meet these demands in the early age of development of industrial internet.

4.5.4 Export-level Heterogeneity Analysis.

Considering the different directions of individual market research, the effect size of its industrial internet influence may be different. According to the export intensity i. e., the export delivery value (export), the average export delivery value of all samples in the same year is taken as the measurement limit, and the samples are divided into two groups of high export value and low export value for heterogeneous effect test. The specific results are shown in column (3) of Table 8. In the two groups of enterprises, the value promotion effect of industrial internet has been shown, and the effect of high export value enterprises is more obvious, it can be seen that high export enterprises have more conditions and motivation to achieve their own value enhancement with the help of industrial internet platform. On the one hand, for the domestic professional market advantage and the comprehensive utilization of international market pioneering more help to promote advanced manufacturing enterprise value, on the other hand, although the low export value type enterprise is not closely linked with the international market, the enterprise value still from the association of the internet driving effect. The results show that in the construction of the new pattern of digital economy and industrial informatization, giving full play to the value spillover role of industrial internet is not only conducive to improving the value of individual enterprises, but also conducive to accelerate the international and domestic economic cycle and realize a more positive economic development trend.

4.6 Heterogeneity Analysis of Industrialization Degree

According to the practical observation, the business environment with higher degree of industrialization will provide better development conditions for manufacturing enterprises. Therefore, it is inferred that in the regions with higher industrialization degree, the industrial internet plays a more obvious role in promoting the value enhancement of advanced manufacturing enterprises. To this end, this paper introduces the degree of industrialization (stru) variable to measure the proportion of the secondary industry in the GDP in each region in the same year, and taking the average industrialization degree of the same year as the boundary, the whole sample is divided into high industrialization degree enterprise group and low industrialization degree enterprise group for heterogeneity test. Table 8, in column (4), reports the test results based on differences in different degrees of industrialization, showing that the coefficient of enterprise value is significantly positive only in the highly industrialized enterprise group. For high degree of industrialization, manufacturing enterprises especially to share the knowledge and technology in the process of industrial development spillover effect, and improve cost control ability and market boundary development ability, for low degree of industrialization of enterprise, enterprise development is more dependent on capital and technology, dependence on virtual agglomeration external degree is not high, so the internet to its value promotion effect is not obvious.

Table 8. Results of the heterogeneity test

	(1) Location heterogeneity	(2) Industry heterogeneity	(3) Exports heterogeneity	(4) Industrial heterogeneity
IIP_east	0.0189**			
	(0.0075)			
IIP_noneast	0.0180			
	(0.0207)			
IIP_cap		0.0353***		
		(0.0111)		
IIP_tech		0.0025		
		(0.0086)		
IIP_highexp			0.0425**	
			(0.0184)	
IIP_lowexp			0.0114**	
			(0.0056)	
IIP_highst				0.0364***
				(0.0101)
IIP_lowst				-0.0093
				(0.0061)
Enterprise control variables	control	control	control	control
Regional control variables	control	control	control	control
Enterprise fixed effect	control	control	control	control
Time fixed effect	control	control	control	control
P-values of differences between groups	0.9674	0.0197	0.0872	0.0001
Observation	134976	134976	134976	134976
Adjusted R^2	0.6399	0.6430	0.6398	0.6499

5 Conclusions and Countermeasures

5.1 Study Conclusions

In this paper under the background of the development of consumer internet to industrial internet transformation, to login industrial internet platform as a policy variable, build staggered double difference model, select in 2008-2013 small and medium-sized advanced manufacturing enterprise panel data, the integrated use of a variety of identification strategy to inspect industrial internet effect on the enterprise value effect and mechanism of action. The study found that after enterprises logged on the industrial internet platform, the return on assets increased significantly, and the conclusion was still established after a series of robustness tests. According to the action channel analysis, industrial internet. On the one hand, it can promote the promotion of enterprise value by reducing the trade cost of enterprises and driving the growth level of enterprises, and play the cost correction function in production, logistics, procurement and

other perspectives to play the cost correction function to achieve the improvement of enterprise value. On the other hand, firstly logging in to the industrial internet platform can realize the deepening of the division of labor of enterprises, accelerate the positive cycle of division of labor. Secondly, it can expand the market network, broaden the scale boundary. The combination of the two can achieve a variety of positive effects, such as promoting enterprise financing, improving the level of human capital, increasing the added value of products, improving and optimizing the management process, and enhancing the overall professional level, then finally to achieve the effect of increasing enterprise remuneration, and to realize the driving effect of the industrial internet on the growth capacity of advanced manufacturing enterprises. Further expansion analysis shows that the virtual agglomeration degree of the industry has a strengthening effect on the action strength, and the platform agglomeration can be positively adjusted across the spatial distance. According to the heterogeneity analysis, the role of industrial internet has a stronger effect on the geographical location in the eastern region and capital-intensive enterprises. Meanwhile, the level of export delivery value of enterprises and the level of regional industrialization are also proportional to the effect of enterprise value enhancement.

5.2 Countermeasures and Suggestions

5.2.1 Platform Level: Explore, Innovate, Optimize and Improve Quality.

Industrial internet relies on artificial intelligence technology as a new economic form of business for the innovative application of internet and big data. Industrial internet should make efforts to link the important nodes of the industrial chain system and actively empower the real economy around the connotation of high-quality development. Based on different platform types, actively optimize and improve quality. First, the B2B trading platform expands the extension chain of service business, expands the knowledge and resource sharing advantages generated by the platform agglomeration, and effectively reduces the trade cost of enterprises. Second, the industrial interconnection platform should strengthen the interactive integration of advanced science and technology and efficient industrial technology, provide intelligent production and manufacturing development solutions for the advanced manufacturing industry, and promote the promotion of its enterprise value. Third, the intelligent customization platform expands the service delivery form of intelligent computing and resource storage, improves the accuracy of digital twin technology under the efficiency level, and accelerates the improvement of economic benefits and scale growth of enterprises.

5.2.2 Enterprise Level: Take Advantage of the Platform Dynamically.

While improving the quality of industrial internet platform, it should take into account the value enhancement effect, especially the impact on high-tech level enterprises. Enterprises should actively deploy digital and platform-based development strategies at the decision-making level, realize business integration and innovation driven by new infrastructure, and improve the production efficiency and innovation level of enterprises. Based on the results of heterogeneity analysis, first, the eastern

region of China has a stronger ability to drive the innovation and development of enterprises, and should give full play to the ability advantages to promote enterprises in the central and western regions to enhance their enterprise value. Second, technology-intensive enterprises should pay more attention to the degree of structured embedding of industrial internet and improve production efficiency and professional level. Third, enterprises with different export levels and degrees of industrialization rely on the industrial internet to actively carry out media aggregation and industrial ecological transformation to drive the value growth of inefficient enterprises.

5.2.3 Government level: To Help Deepen Development and Expand Capacity.

For the government, strengthening organizational guarantee and strengthening policy support is an effective support for the innovation and development of industrial internet. Due to the development of the internet industry to form the new market situation, technology, the government also need the adjustment of the new rules and new standards, and may face corresponding resistance, for the applications that meet the development trend, utility economy, high feasibility, the government should actively coordinate relevant departments, eliminate application barriers, continue to release relevant policies to guide and encourage industrial internet economic development, so as to realize the platform expansion, with the accumulation of quality, realize the development of industrial Internet platform with good quality. Further more, according to the research results obtained from the heterogeneity analysis in this paper, the government can adjust and control the macro strategy, and promote the advanced manufacturing industry to achieve regional and industrial balanced development by relying on the industrial internet.

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