

A Study on the Impact of Supply Chain Efficiency on Financial Performance of Enterprises: A Case Study of Small and Medium Sized Manufacturing Enterprises

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Received: 7 February 2024; **Accepted:** 28 February 2024; **Published:** 14 March 2024

Abstract:

With the development of globalized economy, the increase of multinational corporations and international trade, the importance of supply chain is becoming increasingly prominent. The globalized economy has made the production and delivery of products and services more complex, requiring more efficient supply chain management to meet customer needs. The market competition is becoming increasingly fierce, and enterprises need to continuously improve production efficiency and reduce costs. Optimizing the supply chain has become an important means to enhance competitiveness. This article takes small and medium-sized manufacturing enterprises from 2000 to 2020 as sample data, and empirically tests the impact of supply chain efficiency on financial performance based on the resource-based view. The research has found that supply chain efficiency has a positive impact on corporate financial performance, also found that enterprise size positively regulates the relationship between supply chain efficiency and financial performance. It not only contributes to the research literature on corporate financial performance, enriches the boundary conditions between supply chain efficiency and financial performance, but also provides important management insights on how enterprises can improve financial performance through resource allocation efficiency, operational efficiency, and production efficiency.

Keywords:

Supply Chain Efficiency, Financial Performance, Enterprise Scale, Resource Based View

1. Introduction

Supply chain management is a process of coordination and optimization, as well as resource integration, ultimately aimed at reducing total costs and improving service levels. To achieve this ultimate goal, efficient operation is an unavoidable issue for supply chain managers. With economic globalization and increasingly fierce market

competition, how to obtain external resources to better serve customers is a difficult problem that many enterprises face. Some companies attempt to integrate, coordinate and share supply chain resources, reduce redundant work processes, quickly meet customer needs, and enhance their competitiveness through supply chain integration. People generally believe that there is a close relationship between supply chain and corporate performance, which can be divided into financial performance and non-financial performance. This article mainly studies financial performance. Since the 1990s, with the intensification of market competition, the lifespan of products has been continuously shortened, and customer demands have become increasingly diversified and personalized, bringing huge impacts to enterprises. In such an environment, many enterprises choose to strengthen cooperation with upstream and downstream enterprises, gradually developing a new type of business model - supply chain management [1]. Supply chain management is a management approach that integrates logistics, capital flow, information flow, and information flow throughout the entire supply chain. The purpose of supply chain management is to reduce costs for enterprises, improve logistics efficiency, strengthen customer loyalty, and gain competitive advantages for their products. At present, researchers both domestically and internationally have used different methods to confirm the significant impact of supply chain on company performance. Zhao Li et al. [2] used a questionnaire survey to study the impact mechanism of supply chain integration on company financial performance, confirming that supplier integration has a positive promoting effect on company performance, and improving company financial performance is achieved through improving customer service performance. Ma Wenchong [3] explored the impact mechanism of supply chain integration on business performance, financial performance, and supply chain performance by introducing factors such as enterprise size, industry characteristics, and national background. Based on this, factors such as enterprise size, industry attributes, and national nature were introduced to further demonstrate that supply chain integration can improve corporate financial performance. Li Yanping [4] explored the mechanism by which supplier integration affects a company's financial performance, and proposed that supply chain integration can improve a company's financial performance by reducing company period expenses and improving fund utilization efficiency.

By establishing a horizontal and vertical integrated development relationship, the supply chain has formed a development community between industries and enterprises, ensuring the continuity of production operations and improving the modernization level of the industrial and supply chains. For micro enterprises, continuous innovation is necessary to reduce production costs, improve efficiency in research and development, production, transportation, sales, and other aspects, to ensure the smoothness and efficiency of the industrial and supply chains. Therefore, how to effectively improve the operational efficiency of the supply chain is of great significance for promoting the modernization of China's entire industrial chain. As a fundamental industry of China's national economy, manufacturing is an important driving force for sustainable economic development. The efficiency of its supply chain cannot be ignored [5]. Currently, domestic and foreign scholars have conducted extensive discussions on how supply chain management affects corporate financial performance, but few scholars have linked it to corporate financial performance. So, how to measure the efficiency of the supply chain, the patterns and characteristics of change, and whether it can improve the financial performance of the company is a question worthy of in-depth research. Therefore, this project intends to take China's equipment manufacturing industry as an example, measure and analyze supply chain

efficiency, explore how supply chain efficiency affects financial performance, and explore the moderating effect of company size. Contribute to research literature on financial performance; Moreover, this study introduces enterprise size as a moderating variable to enrich the boundary conditions between supply chain efficiency and financial performance, providing new ideas for further understanding of enterprise financial performance.

2. Research Hypotheses

2.1. *Supply chain efficiency and financial performance*

The development process of enterprises is not simply a mechanical accumulation and concentration of each enterprise entity. Node enterprises need to integrate themselves mechanically and achieve unified management with external enterprises. Supply chain management mainly refers to the use of modern technologies such as information networks and systematic management methods, guided by enterprise activity goals, to coordinate various enterprise entities in the supply chain, thereby completing the full process control of circulation products, and ensuring that the main groups of supply chain enterprises obtain sustained and stable high returns.

In the trend of globalization, effective supply chain management has become a strategic tool to ensure competitive advantage and improve organizational performance [6]. According to the resource-based theory, companies generate competitive advantages by developing their specific resources and capabilities [7,8]. From the perspective of the supply chain, inter organizational relationships as strategic resources beyond organizational constraints are also a source of generating competitive advantage [9,10]. From the perspective of dynamic capabilities, enterprises need to adjust their supply chain resources to cope with uncertain environments [11]. Dynamic capability is the ability of enterprises to integrate, construct, and reconfigure internal and external resources to cope with complex and rapidly changing environments [12]. Supply chain management, on the other hand, is the integration and coordination of upstream and downstream enterprise resources, and is therefore regarded as a dynamic capability [13].

Supply chain efficiency refers to the ability of enterprises to utilize resources, technology, and professional knowledge to minimize logistics costs and maximize profits. The goal of an efficient supply chain is to save money and maximize profits by optimizing processes within the supply chain. Supply chain management is of great significance in improving supply efficiency in enterprise operations. In today's fiercely competitive business environment, in order for enterprises to maintain competitiveness, they must continuously optimize supply chain management to improve supply chain efficiency.

The resource-based view holds that a company's core competitiveness is the key to achieving sustained competitive advantage. By rational allocation of resources, enterprises can effectively improve their operational efficiency and production level, thereby enhancing their core competitiveness, which is the key to improving enterprise performance and sustainable development. Integrating supply chain issues into product design and production processes can effectively improve resource utilization efficiency, reduce resource waste, achieve effective utilization of resources, and enhance production efficiency. Establishing a long-term and stable supply chain collaboration relationship can maximize the collaboration ability between equipment

manufacturing enterprises, thereby reducing information asymmetry within and outside the enterprise, and helping to improve the operational efficiency of product procurement, research and development design, manufacturing, sales, and recycling in equipment manufacturing enterprises. By efficiently integrating and allocating internal and external resources of the enterprise, it can effectively reduce operational and procurement transaction costs, improve production efficiency, and ultimately achieve the goal of improving financial performance. Hypothesis 1 is proposed based on this:

Hypothesis 1: Supply chain efficiency has a positive promoting effect on corporate financial performance.

2.2. The regulatory role of enterprise scale

From a resource perspective, the moderating effect of enterprise size on the relationship between supply chain efficiency and financial performance cannot be ignored. According to Reich's study [14], what a company can do is determined by its objective attributes, and different companies will weigh supply chain efficiency and financial performance.

Enterprise size is an important factor affecting the effectiveness of the supply chain [15]. Enterprises of different scales may have varying types and quantities of resources. According to the resource-based view, resources are the source of competitive advantage for enterprises [16]. Generally speaking, larger enterprises with more resources are more likely to acquire the various capabilities required for integration, thereby driving the operation of the entire supply chain. The smaller the company, the fewer resources it has and the poorer its strength. In the process of supply chain management, they are under pressure from large companies to join and become the first or second supplier, which results in poor financial performance of the company [17]. Even though some small enterprises actively promote supply chain effects, there are still issues such as information technology support, mature supply and demand relationships, and insufficient strategic vision compared to large enterprises [18], resulting in a significant gap in their execution efficiency compared to large enterprises.

As the scale of enterprises increases, they can benefit from economies of scale. This means that through large-scale procurement, automated production lines, and more efficient use of resources, companies can reduce costs and improve efficiency. Large enterprises usually have more R&D and innovation resources, and can invest more funds and manpower in technological innovation, thereby improving manufacturing levels and product quality. By increasing market share, more resources and better conditions can be obtained, such as more favorable supplier cooperation and sales channels, thereby improving the operational efficiency and manufacturing level of the enterprise. Large scale enterprises can better integrate various resources, including human resources, logistics resources, supply chain resources, etc., thereby improving overall production and operational efficiency. Large enterprises usually have stronger brand influence, which helps to increase product market recognition and sales, thereby enhancing the core competitiveness of the enterprise.

As a company grows in size, it usually has more internal resources, including human resources, funds, equipment, etc. Enterprises can improve production efficiency by better allocating these resources. External resources such as suppliers, partners, and market channels can be better utilized. By collaborating with more

suppliers, enterprises can obtain better procurement conditions and higher supply stability, thereby improving production efficiency; Large enterprises usually have more R&D and innovation resources, which can invest more funds and manpower in technological innovation, thereby improving production efficiency. This promotes the relationship between supply chain efficiency and financial performance. Therefore, this article proposes hypothesis 2:

Hypothesis 2: Enterprise size positively regulates the relationship between supply chain efficiency and financial performance.

The model diagram of this article is shown in Figure 1.

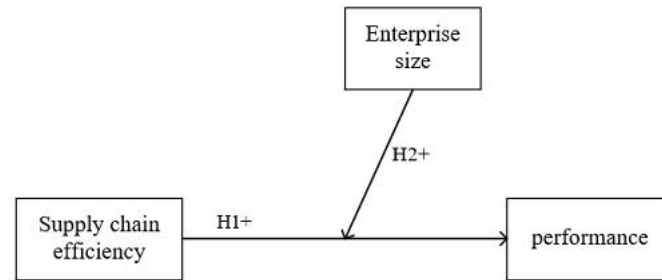


Figure 1. Model diagram.

3. Research Design

3.1. Sample selection

This article selects small and medium-sized manufacturing enterprises from 2000 to 2020 as the research object. During this period, the supply chain has undergone various developments and changes, including globalization, technological innovation, sustainable development, risk management, and strengthened cooperative relationships. These changes have made supply chain management more complex and critical, and have had a profound impact on the competitiveness and sustainable development of enterprises. According to the 2023 national economy and industry code, the manufacturing industry is defined as (C13-C43). The data in this article mainly comes from CSMAR database, Wind database, and CNRDS database. Drawing on the practices of existing research, the initial sample is screened according to the following criteria: excluding samples of financial industry, ST, * ST, or PT listed companies; Exclude listed companies with missing data in the database; Perform a 1% truncation on all continuous variables to eliminate the influence of extreme values of the main variable, resulting in 23325 observed values.

3.2. Variable selection

a. Dependent variable

Financial performance: Regarding the measurement of financial performance, domestic and foreign research is relatively mature, mainly including Tobin's Q value, return on total assets (ROA), return on equity (ROE), etc. [22]. This article mainly uses Return on Equity (ROE) to measure financial performance. To ensure the robustness of the research results, Total Return on Assets (ROA) is used for robustness testing.

b. Explanatory variables

Supply chain efficiency: Supply chain efficiency= $\ln(365/\text{inventory turnover rate})$, following the approach of Zhang Qianxiao [19], Feng (2015), and Zhang Shushan [20], inventory turnover days are used to measure supply chain efficiency. Inventory turnover days effectively overcome the measurement error of low supply chain efficiency caused by enterprises retaining safe inventory, reflecting the frequency of dialogue and trade between upstream and downstream enterprises in the supply chain, Reflects the flexibility and responsiveness of the supply chain.

c. Adjusting variables

Enterprise size: Enterprise size is generally measured by indicators such as the number of employees, operating income, and total assets. The article selects the natural logarithm of the annual total assets of the enterprise to reflect the enterprise size [21].

d. Control variables

The financial performance of enterprises is influenced by multiple variables. In order to more accurately reflect the relationship between the main variables, drawing on previous research results, asset liability ratio, total asset turnover efficiency, revenue growth rate, number of directors, integration of two positions, and Tobin Q value are selected as control variables [22]. The specific variable definitions are shown in Table 1:

Table 1. Variable Definition.

	variable	define
Dependent variable	Financial Performance (ROE)	Using return on equity (ROE) to measure financial performance, $\text{ROE} = \text{net profit} / \text{average balance of shareholder equity}$
Explanatory variables	Supply Chain Efficiency (SCE)	$\text{SCE} = \ln(365 / \text{Inventory Turnover})$
Adjusting variables	Enterprise size	Reflecting enterprise size through the natural logarithm of annual total assets
control variable	Asset liability ratio (Lev)	$\text{Lev} = \text{using year-end total liabilities} / \text{year-end total assets}$
	Total Asset Turnover (ATO)	$\text{ATO} = \text{operating income} / \text{average total assets}$
	Growth rate of operating revenue	$\text{Growth} = (\text{current year's revenue} / \text{previous year's revenue}) - 1$
	Number of directors (Board)	Represented by taking the natural logarithm of the number of board members
	Dual	The Chairman and General Manager are the same person with a value of 1, otherwise it is 0
	Tobin Q value	$\text{Tobin} = (\text{circulating stock market value} + \text{number of non circulating shares} \times \text{net assets per share} + \text{book value of liabilities}) / \text{total assets}$
Instrumental variable	Management shareholding ratio (Mshare)	$\text{Mshare} = \text{Management shareholding data} / \text{Total share capital}$

4. Empirical Result Analysis

4.1. Descriptive statistics and correlation analysis

Table 2 presents the descriptive statistical analysis results of the relevant variables, where the mean of financial performance is 0.062, the standard deviation is 0.128, the

minimum value is -1.356, and the maximum value is 0.446; The average value of supply chain efficiency is 4.707, the maximum value is 12.46, the minimum value is -7.027, and the standard deviation is 0.792, indicating significant differences in supply chain efficiency among the sample enterprises. Table 3 shows the results of the relevant analysis.

Table 2. Descriptive Statistical Analysis Results.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
ROE	16,517	0.0619	0.128	-1.356	0.446
SCE	16,553	4.707	0.792	-7.027	12.46
Size	16,553	21.13	0.596	19.17	22.11
adjust	16,517	1.312	2.690	-29.09	9.800
Lev	16,553	0.359	0.188	0.0274	0.991
ATO	16,550	0.662	0.377	0.0444	3.262
Growth	14,847	0.163	0.372	-0.747	4.806
Board	16,491	2.124	0.198	1.609	2.833
Dual	14,694	0.327	0.469	0	1
TobinQ	16,281	2.120	1.357	0.815	17.68

Table 3. Correlation Analysis Results

	ROE	SCE	Size	adjust	Lev	ATO	Growth	Board	Dual	TobinQ
ROE	1									
SCE	-0.098**	1								
Size	0.050**	-0.0006	1							
adjust	-0.089**	0.986**	0.161**	1						
Lev	-0.306**	-0.067**	0.208**	-0.032**	1					
ATO	0.217**	-0.549**	0.0358***	-0.536**	0.188**	1				
Growth	0.288**	-0.123**	0.056**	-0.112**	0.034**	0.176**	1			
Board	0.007	-0.023**	0.113**	-0.011	0.134**	0.087**	0.013	1		
Dual	0.053**	0.053**	-0.049**	0.045**	-0.134**	-0.071**	0.019**	-0.150**	1	
TobinQ	0.057**	0.031**	-0.213**	-0.001	-0.080**	-0.036**	0.011	-0.114**	0.001	1

4.2. Benchmark regression analysis

4.2.1. Testing the Impact of Supply Chain Efficiency and Financial Performance

By using OLS regression method to empirically test research hypothesis H1, which examines the specific impact of supply chain efficiency (SCE) on financial performance (ROE), we can verify whether hypothesis H1 is valid. The regression results in Table 4 indicate that, after gradually incorporating control variables such as board size and dual roles, the impact of supply chain efficiency on corporate financial performance remains positive. In column (1) of Table 4, the coefficient of influence of supply chain efficiency (SCE) on financial performance (ROE) is 0.011, which passes the significance test at the 1% level, indicating that with the effective operation of the supply chain, the company's financial performance will also improve. This means that companies with high supply chain efficiency can enhance their core competitiveness by improving their operational efficiency and production level. At the same time, it can effectively integrate and allocate internal and external resources of the company, thereby reducing operational and procurement transaction costs, improving production efficiency, and ultimately enhancing the company's financial performance.

4.2.2. Testing the moderating effect of enterprise size

Based on regression analysis, we test hypothesis H2, which is the moderating effect of enterprise size on the relationship between supply chain efficiency and financial performance. The regression results of column (2) in Table 4 indicate that enterprise size has a significant negative moderating effect on the relationship between supply chain efficiency and financial performance, with a coefficient of 0.004 for the interaction term (Size * SCE), which passes the significance test at the 10% level. This indicates that the larger the enterprise size, the more it promotes the relationship between supply chain efficiency and financial performance. This means that large enterprises usually have more R&D and innovation resources, and can invest more funds and manpower in technological innovation to improve operational efficiency and manufacturing level, and enhance production efficiency. This indicates that the larger the enterprise size, the more it can promote the relationship between supply chain efficiency and financial performance. Therefore, the research hypothesis H2 is supported by empirical results.

Table 4. Benchmark Regression Results.

VARIABLES	(1) ROE	(2) ROE
SCE	0.011*** (7.56)	-0.068* (-1.66)
Size		0.013 (1.41)
Size*SCE		0.004* (1.93)
Lev	-0.232*** (-41.65)	-0.248*** (-44.38)
ATO	0.093*** (28.14)	0.093*** (28.63)
Growth	0.091*** (32.82)	0.088*** (32.22)
Board	0.033*** (6.00)	0.025*** (4.70)
Dual	0.003 (1.14)	0.003 (1.16)
TobinQ	0.004*** (6.13)	0.007*** (9.63)

Constant	-0.067***	-0.328*
	(-4.72)	(-1.68)
Observations	12,528	12,528
R-squared	0.226	0.243

t-statistics in parentheses

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

4.3. Robustness testing

Firstly, replacing variable measurements can be used to test the robustness of empirical results by replacing independent or dependent variables. This article replaces the dependent variable with the independent variable and other control variables remaining unchanged, and measures supply chain efficiency using return on total assets (ROA) [23]. The results show significant differences. Table 5 results column (1) shows that the coefficient of 0.006 after replacing the financial performance measurement method of the dependent variable is significant at the 1% level. The result of column (2) shows that the interaction term coefficient is significant at the 1% level with a value of 0.021.

Secondly, even with a fixed year effect, the results show still significant. The model is still robust, and the results are robust.

Thirdly, endogeneity testing; The Hausman test shows endogeneity, so this article uses instrumental variable method to exclude its endogeneity. In order to avoid the potential impact of sample selection bias and omitted variable bias on the results, and to avoid the possible mutual influence between supply chain efficiency and corporate financial performance, this study uses the instrumental variable method of least squares (IV-2SLS) to alleviate endogeneity issues [24]. In the relationship between supply chain efficiency and financial performance, we use management shareholding ratio (Mshare) as an instrumental variable. The results of the least squares test show significant consistency with the hypothesis test, indicating robustness. Therefore, endogeneity can be largely excluded.

Table 5. Results of the robustness test for replacing the dependent variable measurement.

	(1)	(2)
VARIABLES	ROA	ROA
SCE	0.006***	0.007
	(7.43)	(-0.73)
Size		0.001*
		(1.68)
Size*SCE		0.021***
		(203.37)
Lev	-0.159***	-0.055***
	(-53.93)	(-37.28)
ATO	0.049***	0.005***
	(26.75)	(6.25)
Growth	0.047***	0.007***
	(32.61)	(10.05)
Board	0.018***	0.004***
	(6.21)	(2.67)
Dual	0.003**	0.001
	(2.39)	(1.34)
TobinQ	0.003***	0.002***
	(8.92)	(11.41)

Constant	-0.015*	0.004
	(-1.92)	(0.40)
Observations	11,023	10,998
R-squared	0.298	0.854

t-statistics in parentheses

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

5. Conclusion and Inspiration

5.1. Research conclusion

This article studies the impact of supply chain efficiency on financial performance of enterprises and the moderating effect of boundary conditions on enterprise size from the perspectives of operational efficiency, production efficiency, and resource allocation. Firstly, a conceptual model was constructed based on existing research perspectives and theoretical analysis, and then empirical analysis was conducted using survey data from Chinese manufacturing enterprises from 2000 to 2020. This article is based on the resource-based theory, starting from the perspectives of enterprise resource allocation, operational efficiency, and production efficiency, to explore the promoting effect of supply chain efficiency on corporate financial performance. The research results indicate that in the process of improving supply chain efficiency, enterprises can enhance their financial performance by improving resource allocation capabilities, as well as improving operational and production efficiency. The study also found that enterprise size has a positive moderating effect on the relationship between supply chain efficiency and financial performance. The larger the enterprise size, the stronger its resource allocation ability, operational efficiency, and production efficiency. Therefore, the greater the supply chain efficiency of large enterprises, the better their financial performance.

5.2. Research contribution

This study has made several important contributions. On the one hand, by empirically testing the impact of supply chain efficiency on financial performance, this study contributes to the literature on financial performance research. In terms of financial performance of enterprises, previous research mainly focused on the impact of supply chain integration, supply chain integration, and other factors on financial performance [2,3], ignoring the impact of supply chain efficiency on financial performance. To fill this research gap, our theoretical analysis and empirical testing indicate that supply chain efficiency has a positive impact on corporate financial performance. Enriched the research on antecedent variables of financial performance and contributed to relevant literature on financial performance.

On the other hand, this study introduced enterprise size as a moderating variable and found that enterprise size has different characteristics in enterprise management, enriching the boundary conditions between supply chain efficiency and financial performance, and providing new ideas for further understanding of enterprise financial performance.

5.3. Management inspiration

This study has certain implications for the financial performance of small and medium-sized enterprises and related government management practices. Firstly, the

efficiency of the supply chain has a positive impact on a company's financial performance. Small and medium-sized manufacturing enterprises need to fully utilize the promoting role of supply chain efficiency in improving their financial performance. By improving their resource allocation ability, operational efficiency, and production efficiency, they can enhance their financial performance. To manage resources while maintaining the innovation capability of the enterprise.

Secondly, enterprises also need to consider the size of the enterprise more, fully utilizing the high resource allocation ability, high operational efficiency, and high production efficiency brought by the annual enterprise size. Under the premise of reasonable allocation of existing resources, moderately expanding the enterprise size can effectively enhance the scale effect of the enterprise, thereby improving the supply chain efficiency of the entire manufacturing enterprise.

5.4. Research limitations and prospects

Like all studies, our research also has certain limitations, which provides important opportunities for future research. Firstly, this article focuses on the financial performance of small and medium-sized manufacturing enterprises, and future data from other industries can be used to further validate this viewpoint.

Secondly, as the supply chain efficiency data in this article is only available up to 2020, there is a lack of data from recent years. Future research can use more recent and longer span sample data to investigate whether the conclusions are meaningful.

Finally, this study only considered the moderating role of firm size in this process, while ignoring the mediating role of supply chain efficiency on firm financial performance and other boundary conditions. In the future, more moderating and mediating variables can be introduced to deepen the research.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

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