Study on the Impact of Enterprise Migration on Total Factor Productivity

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Abstract: *Enterprise migration is an important means to solve business difficulties and explore the development space, which is of great significance for improving total factor productivity and achieving high-quality development. This paper empirically examines the impact of corporate relocation on total factor productivity based on the data of Chinese A-share listed companies from 2006 to 2021. The empirical results show that enterprise migration has a significant positive effect on total factor productivity. After conducting robustness tests, the conclusion still holds. Further analysis reveals that the effect of enterprise migration on total factor productivity is more significant in state-owned enterprises and large-scale enterprises. This study provides empirical evidence for enterprises to promote the improvement of total factor productivity through migration.*

Keywords: *Enterprise migration; Total factor productivity of enterprises; Robustness test; Heterogeneity analysis*

1. Introduction

In order to develop regional economy, increase investment attraction, and improve quality and efficiency, various regions have adopted corresponding development policy measures, such as tax incentives, income incentives, land leasing subsidies, etc., to encourage and attract enterprises to settle down, which is an important driving force for enterprise migration. At the micro level, under the multiple constraints of resources, environment, and cost, enterprises will choose to migrate based on their own situation and external environment to obtain new development space and improve competitiveness. After migration, enterprises can gain resource advantages and development opportunities provided by the migration location, which is beneficial for their production and operation.

The research on enterprise migration mainly focuses on two aspects. Firstly, regarding the motives behind migration, Travis Chow (2021) believes that changes in tax rates related to the location of the enterprise will drive the enterprise to migrate externally[1]; Martina Barbaglia et al. (2023) analyzed that environmental policies are an important driving force for multinational corporations with a sense of corporate social responsibility to migrate[2]; and Zhou Zhengzhu et al. (2015) believe that factors such as labor costs and transaction costs play an important role in the selection of relocation locations for enterprises, but the impact of enterprise costs varies due to different main businesses[3]. The other is the impact of enterprise migration on performance, growth, etc. For example, Kapitsinis (2021) believes that true entrepreneurs can effectively improve business performance by closely integrating enterprise migration and internal change[4]; Engelberg, J. (2018) believes that the information spillover generated by industrial clusters after enterprise migration can significantly reduce the marginal cost of information producers[5]; and Lee, I. H. (2022) believes that intrastate relocation by minimizing transaction costs is beneficial for the survival and sales growth of startups[6]. Few studies have focused on the impact of enterprise migration on the comprehensive indicator of total factor productivity.

Using data from Chinese A-share listed companies from 2006 to 2021, this paper empirically analyzes the impact of firm relocation on total factor productivity and the heterogeneity of this impact across firms. Meanwhile, feasibility suggestions are made for enterprises and the government based on the findings.

2. Theoretical analysis and research hypotheses

Enterprise migration refers to the transfer of enterprises from one location to another, accompanied

by changes in business activities. There are large differences in resources, markets, technologies, and environments in different regions. When the development of an enterprise is restricted by the production factors of the region in which it is located, or when there are fiscal intervention policies in a certain region (e.g., macro-policy regulation, regional policies to benefit enterprises, etc.), managers and decision-makers will choose a suitable target location based on the internal operation of the enterprise in combination with the developmental factors of the different locations, and then make further relocation adjustments. This article believes that enterprise migration mainly affects total factor productivity through the following aspects:

Firstly, when labor costs decrease, enterprises have more manpower and funds invested in production, thereby improving total factor productivity[7]. The neoclassical theory suggests that companies will choose to migrate when they are not in a profitable position, and reducing costs (such as labor costs, production costs, etc.) is the main way to regain profits after migration. The increase in labor costs in the location where the enterprise is located will lead to an increase in the probability of the enterprise launching. Compared to technological upgrades, enterprises are more inclined to migrate to areas with abundant labor and low costs[8]. The reduction in labor costs brought about by migration can effectively improve total factor productivity.

Secondly, regional policies such as tax incentives and government subsidies provide financial support for enterprises, enabling more factors to be invested in production and effectively improving total factor productivity. Tax incentives, as a widely used regional policy, are a key factor for the government to guide industrial development and also a key factor for enterprise location selection. Relocation is an important strategy for companies to cope with the tax regulations of the zone in which they are located. [9]. The tax benefits obtained from migration can alleviate financing constraints, increase human capital returns, and thus affect total factor productivity. Meanwhile, the subsidies provided by the government (such as entrepreneurship incentives and industry-specific subsidies) can also affect the total factor productivity by promoting the innovation of enterprises, optimizing the allocation of enterprises' factors, and forming the competitive effect[10]. Based on the above analysis, this article proposes the following hypothesis:

H: Enterprise migration can improve total factor productivity.

3. Research Design

3.1 Sample selection and data sources

The enterprise-related data used in this article comes from the CSMAR database. Before identifying the relevant samples, the data was processed as follows: (1) ST&PT samples with abnormal operation and continuous loss with delisting risk were excluded; (2) continuous variables were shrink-tailed, and data with serious missing values of some variables were excluded; (3) the outliers and missing values were supplemented by using the deletion method and interpolation method.

3.2 Variable Description

3.2.1 Explained variables

The explained variable is the total factor productivity (TFP) of the enterprise, which reflects its overall efficiency. Currently, the measurement methods used in academia mainly include parametric, non-parametric, and semiparametric methods. Among the semiparametric methods, LP, OP and ACF methods are more widely used because they take into account the input of production factors of the enterprise, which is in line with the actual production and operation of the enterprise. In this paper, the TFP measured by the LP method is used for main regression, and the OP method is used for robustness test, drawing on the practice of Lu Xiaodong and Lian Yujun[11], and the measurement method is shown in the following equation (1):

$$LnY_{it}=\varphi 0+\varphi 1*LnK_{it}+\varphi 2*LnL_{it}+\varphi 3*LnM_{it}+\varphi 4*LnI_{it}+\varepsilon \qquad (1)$$

In Model (1), Y represents the total output of the enterprise, K is capital input, L is labor input, M is intermediate input (operating costs + management expenses + sales expenses - depreciation and amortization - cash paid to employees), and I is the cash paid by the enterprise to purchase fixed assets, intangible assets, and other long-term assets. The residual term obtained through regression represents the total factor productivity of the enterprise.

3.2.2 Explanatory variables

The main explanatory variable is the dummy variable 'Treated' for enterprise migration. To determine whether a company has migrated, the primary method is to identify changes in the specific office address and latitude/longitude in the database. If the sample has not changed during its existence, the value is 0. If it has changed, the value before the change is 0, and the value in the year of migration and after is 1. To avoid measurement errors, only samples of firms that relocated once were used as the treatment group. Samples of firms that relocated multiple times were excluded.

3.2.3 Control variale

This paper also controls other variables that may affect the total factor productivity of enterprises in the empirical process, such as enterprise size (Size), enterprise age (Age), total asset turnover (AToA), and return on total assets (Roa). The specific definitions of these variables are shown in Table 1.

Table 1: Variable Definition

Variable name	Variable Symbol	Measure index
Enterprise total factor productivity	TFP	Calculation based on the LP method
Enterprise migration	Treated	The variable is assigned a value of 1 if the enterprise has relocated, and 0 otherwise.
Enterprise scale	Size	Take the logarithm of the number of employees
Enterprise age	Age	Statistical year - establishment year +1
Total asset turnover rate	AToA	Operating income / total assets
Return on total assets	Roa	Net profit / total assets
Cash flow	Cash	Net cash flow generated from operating activities / total assets
The largest shareholder's shareholding ratio	Top1	The largest shareholder holds shares / total shares
Nature of Property Rights	Soe	State owned enterprises = 1, non-state-owned enterprises = 0

3.3 Model Setting

As the explanatory variable in this article is the dummy variable indicating whether the enterprise has migrated, there are differences in the migration times among different enterprises. Therefore, we will use the multi-time-point double-difference method (multi-time-point DID) for regression. Model (2) is the main regression model of the paper:

$$TFP = \alpha + \beta Treated + \gamma Control + ProvinceFE + IndustryFE + YearFE + \varepsilon \tag{2}$$

Among them, TFP represents the total factor productivity of enterprises measured by the LP method. Treaded is a dummy variable that measures whether enterprises are migrating. Control is a set of control variables. ProvinceFE is the fixed effect of region, IndustryFE is the fixed effect of industry, and YearFE is the fixed effect of year. ε is a random interference term. The estimated coefficient β measures the degree to which enterprise migration affects the total factor productivity of enterprises.

4. Empirical analysis

4.1 Descriptive Statistics

Combined with Table 2, descriptive statistics were conducted on the main variables. The mean total factor productivity (TFP) of enterprises was 8.328, with a standard deviation of 0.992, indicating significant differences in total factor productivity among enterprises. The average processed enterprise migration is 0.21, indicating that about 1/5 of all enterprises choose to migrate, which is more in line with reality.

Table 2: Descriptive Statistics

Variable symbols	Mean	SD	Min	Max
TFP	8.328	0.992	4.613	13
Treated	0.210	0.407	0	1
Size	7.613	1.135	5.153	10.63
Age	17.40	5.988	1	55
AToA	0.645	0.409	0.111	2.428
Roa	0.047	0.051	-0.157	0.196
Top1	0.350	0.149	0.088	0.750
Cash	0.052	0.065	-0.125	0.236
Soe	0.336	0.472	0	1

4.2 Baseline regression analysis

Table 3 shows the results of the stepwise regression using model 2. Column 1 focuses only on the dummy variable of enterprise relocation, column 2 includes control variables such as Size, and column 3 controls for the fixed effects of industry, region, and year. The coefficient of Treated in the three columns of the results is significantly positive at the 1% level, which indicates that the relocation of enterprises has a significant positive impact on their total factor productivity, and verifies that the hypothesis is valid.

The control variables selected in this paper, such as Size, AToA and Roa, are the key indicators to measure the stable long-term business development of the enterprise. The coefficients of the influence of these variables on the total factor productivity of the enterprise in Table 3 are positive and significant, indicating that the TFP of the enterprises with fast capital turnover, high capital utilization, and good profitability is higher, and the above results are consistent with the conclusions of the study conducted by Zhao Chenyu (2021) et al[12].

Table 3: Baseline Regression Results

	(1)	(2)	(3)
	TFP	TFP	TFP
Treated	0.265***	0.168***	0.061***
	(16.757)	(15.825)	(7.021)
Size		0.419***	0.453***
		(99.016)	(123.205)
Age		0.023***	0.001
		(29.461)	(1.002)
AToA		1.009***	1.032***
		(90.331)	(94.840)
Roa		1.385***	1.635***
		(14.413)	(21.366)
Top1		0.305***	-0.004
		(9.739)	(-0.145)
Cash		-1.627***	-0.794***
		(-21.363)	(-12.987)
Soe		0.143***	0.173***
		(14.790)	(18.063)
control variable	no	yes	yes
Regional fixed effects	no	no	yes
Industry fixed effects	no	no	yes
Year fixed effect	no	no	yes
Adj. R2	0.013	0.570	0.757

Note: *, * *, and * * * represent significance levels of 10%, 5%, and 1%, respectively.

4.3 Robustness test

4.3.1 Replace measurement indicators for total factor productivity of enterprises

To further verify the robustness of the conclusion, the OP method (introducing export behavior decisions of enterprises into the model) is considered to measure the dependent variable. The regression results are shown in column 2 of Table 4, where the regression coefficients of the main explanatory

variables are still significantly positive at the 1% level, suggesting that the previous conclusion that enterprise relocation can enhance total factor productivity is still valid.

Table 4: Robustness Test

	(1)	(2)	(3)
	TFP	TFP_OP	TFP
Treated	0.061***	0.081***	0.061***
	(7.021)	(9.022)	(7.022)
control variable	yes	yes	yes
Provincial fixed effects	yes	yes	yes
Industry fixed effects	yes	yes	yes
Year fixed effect	yes	yes	yes
Adj. R2	0.757	0.643	0.757

4.3.2 Sample processing: PSM method

Considering relocation as a business decision, there may be a self-selection problem, so propensity score matching (PSM) is used to solve the endogeneity problem caused by sample selection bias. The variables of firm size (Size), firm age (Age), total asset turnover (AToA), and return on total assets (Roa) are selected as matching variables to match the samples 1-to-1, and the sample differences between the treatment and control groups become smaller after matching. The regression results are shown in column 3 of Table 4, and the regression coefficients are still significantly positive, indicating that the hypothesis is valid and the conclusion is robust.

5. Further analysis

5.1 Heterogeneity of enterprise ownership

State-owned enterprises refer to state-owned and state-controlled enterprises. Compared to other types of enterprises, state-owned enterprises have a natural link with the government and are more likely to enjoy political and resource advantages. Therefore, this paper refers to the ownership variables in the Wind database and records local state-owned, central state-owned, and collective enterprises as state-owned enterprises, while other enterprises such as private enterprises are recorded as non-state-owned enterprises.

Dividing the samples by enterprise ownership, the regression results are shown in columns 1 and 2 of Table 5. The impact of enterprise migration on total factor productivity is positively significant in both types of sample regression results, but the TFP improvement effect is better after the migration of state-owned enterprises, and there is a significant difference between groups. It may be due to the fact that most of the relocation decisions of state-owned enterprises are to respond to the call of the state and support the development of national strategies, and after relocation, they can get relevant policy support faster, eliminate the short-term costs and internal and external changes due to relocation, and stabilize their operations in a timely manner, so that the impact of enterprise relocation on total factor productivity is more significant in state-owned enterprises.

Table 5: Heterogeneity Analysis

	(1)	(2)	(3)	(4)
	State-owned Enterprises	Non-State Enterprises	Large Enterprises	Small Enterprises
Treated	0.106***	0.038***	0.095***	0.051***
	(7.173)	(3.432)	(8.387)	(3.826)
Control variable	yes	yes	yes	yes
Provincial fixed effects	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes
Year fixed effect	yes	yes	yes	yes
Adj. R2	0.5726	0.5367	0.607	0.477
Coefficient difference P-value	0.0024		0.0407	

Note: The P-value of the coefficient difference is calculated based on the estimated results of the seemingly unrelated test.

5.2 Heterogeneity of enterprise size

In this paper, the sample is divided into two groups based on the median enterprise size: large enterprises and small enterprises. The regression analysis is conducted separately, and the results are shown in columns 3 and 4 of Table 5. Both types of enterprises have significantly improved their total factor productivity after migration, but the improvement effect of large enterprises is significantly higher than that of small enterprises. This may be due to the fact that enterprise migration requires a large amount of capital, while the capital chain of large enterprises is more stable. At the same time, large enterprises have advantages in labor costs and policy support, so the improvement effect of the total factor productivity of large enterprises after migration is more significant.

6. Conclusion and enlightenment

This paper uses the microdata of enterprises as the research sample, employs a multi-time point double difference model combined with fixed effects to study the impact of enterprise migration on total factor productivity, and conducts robustness tests on the relevant conclusions. It also analyzes the heterogeneity of these effects. The results of the study show that: first, enterprise migration has a significant positive impact on its total factor productivity, and after replacing the measures of the explanatory variables and conducting sample processing, this conclusion still holds; second, the impact of migration on total factor productivity varies with different enterprise characteristics, with state-owned enterprises and large enterprises having a more significant effect on total factor productivity improvement after migration. Based on the above research conclusions, this paper makes the following relevant recommendations:

On the one hand, for enterprises, when their original production and operation are restricted, which is not conducive to their long-term development, or when they need to seek new development space, managers and decision-makers of enterprises may consider migration. Enterprises, as the main body of migration, should pay attention to whether the destination has labor cost advantages and policy support when making migration decisions. At the same time, it is necessary to consider their own characteristics. After migration, the purchase of office space and equipment, environmental adaptation, and the restoration of production and supply chains all require a large amount of manpower and material resources, so enterprises that are well financed and have steady development will have better results in the relocation process.

On the other hand, the state and government should play an effective role in enhancing the total factor productivity of enterprises. In order to achieve the goal of regional economic development, it is necessary to pay attention to the relevant support policies for enterprises and to increase tax incentives and subsidies so as to effectively alleviate the financial pressure on enterprises after relocation and enable them to resume production as soon as possible. At the same time, it is important to monitor whether enterprises are able to allocate financial resources effectively so as to stimulate them to improve their total factor productivity.

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