

ESOP, Double Agency Cost, and Labor Investment Efficiency

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Abstract: Based on the data of Shanghai-Shenzhen A-share listed companies from 2015 to 2022, this paper investigates the impact of employee stock ownership plan implementation on labor investment efficiency. It is found that the implementation of ESOP can significantly improve the efficiency of labor investment, and in this process, the double agency cost plays a part of the intermediary role. In order to solve the potential endogeneity problem caused by self-selection bias, this paper uses the results of propensity score matching to perform regression again, and the conclusion remains unchanged. Further research shows that employee stock ownership plans improve labor investment efficiency mainly by improving labor overinvestment rather than labor underinvestment, and the improvement effect of employee stock ownership plans on labor overinvestment is more significant in private enterprises. On the whole, this paper explores the influencing factors of labor investment efficiency from a new perspective, and provides a reference for enterprises and related departments to improve the efficiency of labor resource allocation.

Keywords: ESOP, labor investment efficiency, double agency cost, enterprise property.

1. Introduction

Labor is a key factor in enterprise production and is crucial for improving productivity. However, the aging of China's population is intensifying, and the negative growth of the working age population is obvious, which affects the labor cost. Therefore, efficient labor investment is crucial. Equity incentives include management and employee stock ownership. The former binds the interests of managers and owners through equity, while the latter becomes the main incentive method. Research has shown that employee stock ownership plans can improve the quality of internal control, thereby enhancing the efficiency of corporate investment. But there is a significant improvement in overinvestment and limited improvement in underinvestment. This article is based on data of A-shares from 2015 to 2022 to study the impact of ESOP on corporate labor investment efficiency. It is found that its implementation significantly improves labor investment efficiency, especially in private enterprises, and partially achieves it by reducing dual agency costs. The contribution of this article is to expand the research on ESOP, explore more factors affecting labor investment efficiency, and enrich the theoretical mechanism of the impact of ESOP on enterprise labor investment efficiency, providing reference for enterprises to implement ESOP.

2. Literature Review

As an important tool to alleviate agency problems, employee stock ownership plans have shown a positive role in improving innovation efficiency and performance of enterprises. In the field of innovation, it links employee interests with the fate of the enterprise, promotes individual efforts and teamwork among employees, and improves innovation efficiency. This effect is more derived from employee shareholding rather than management shareholding[1]. At the performance level, although there is still controversy over the effectiveness of executive equity incentives, employee equity incentives effectively supplement incentive mechanisms and have a particularly significant impact on improving company performance, especially in private enterprises.

The efficiency of labor investment is the key to the development of enterprises, which is influenced by multiple internal and external factors. Internal factors such as improving accounting quality[2], the relationship between CEO and independent directors[3], and employee compensation[4] directly affect labor investment efficiency, especially in specific types of enterprises (such as human capital intensive enterprises) where the effect is more significant. External factors such as environmental uncertainty[5] and social trust levels[6] also play important roles, and while promotion incentives for local officials can stimulate employment growth, they may also distort the structure of human capital and reduce efficiency[7].

Current research mostly focuses on the comprehensive impact of employee stock ownership plans, and the distinction between management and employee stock incentives is not detailed enough, and there is relatively little independent exploration of labor investment efficiency. This article aims to fill this gap by analyzing the specific impact and mechanism of employee stock ownership plans on labor investment efficiency from a dual agency perspective, in order to provide new perspectives and empirical support for research in related fields.

3. Theoretical Analysis and Research Hypotheses

3.1. Theoretical Analysis

This article argues that employee stock ownership plans affect labor investment efficiency by improving internal control quality and mediating through dual agency costs. The effectiveness of internal control is measured from both elements and objectives, both of which are enhanced by employee equity incentives. Internal control deficiencies exacerbate inefficient investment, particularly in terms of labor investment efficiency[8].

Accordingly, this paper proposes the following research hypothesis.

H1: The implementation of employee stock ownership plan can improve the efficiency of enterprise labor investment.

Under the modern corporate system, ownership and management are separated, and management often seeks personal gain rather than maximizing shareholder interests through information advantages, which is the first type of agency cost. In countries with weak investor protection, major shareholders are prone to plunder the interests of small and medium-sized shareholders, resulting in a second type of agency cost. The pledge of equity exacerbates the risk of major shareholder encroachment and affects labor investment funds. Research has shown that employee stock ownership plans reduce moral hazard and agency costs by binding the interests of employees and shareholders[9]. Employees not only self regulate, but also supervise management, which may reduce dual agency costs and improve labor investment efficiency. Accordingly, this paper proposes the following research hypothesis.

H2: Dual agency cost plays a mediating effect in the influence of employee stock ownership plan on labor investment efficiency.

3.2. Research Design

3.2.1. Sample Selection and Data Source

This article is based on the guidance of the China Securities Regulatory Commission in 2014, and selects data from A-share listed companies with non ST/* ST, non-financial insurance, employees ≥ 30 , and first-time and completed employee stock ownership plans from 2015 to 2022. Unfinished and duplicate samples are excluded, and the data is sourced from the Guotai An CSMAR database. This paper carries on a 1% tailing treatment for continuous variables to avoid the interference of extreme values and a total of 20353 observations were obtained.

3.2.2. Variable Definition

1.Explained Variable

The explained variable is the efficiency of labor investment. Referring to the former studies, this paper measures labor investment with the growth rate of the number of employees, and builds the model (1) to predict the level of enterprise labor investment[2,10]. The residual of the regression result is abnormal labor investment, and its absolute value (Abresid) is used to measure the labor investment efficiency of enterprises. The larger the value is, the more inefficient the labor investment is. Model (1) is shown below:

$$Net_{Hire_{i,t}} = \alpha_0 + \alpha_1 Growth_{i,t} + \alpha_2 Growth_{i,t-1} + \alpha_3 ROA_{i,t} + \alpha_4 \Delta ROA_{i,t} + \alpha_5 ROA_{i,t-1} + \alpha_6 SizeR_{i,t-1} + \alpha_7 Quick_{i,t} + \alpha_8 Quick_{i,t-1} + \alpha_9 \Delta Quick_{i,t} + \alpha_{10} Lev_{i,t-1} + \alpha_{11} Lossbim1_{i,t-1} + \alpha_{12} Lossbin2_{i,t-1} + \alpha_{13} Lossbin3_{i,t-1} + \alpha_{14} Lossbin4_{i,t-1} + \alpha_{15} Lossbin5_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

2.Explanatory Variable

The explanatory variable was the employee stock ownership plan (ESOP). When the listed company implements the employee stock ownership plan in the current year, the variable is 1, otherwise, it is 0[1].

3.Control Variables

With reference to the former studies, we selected control variables and listed them in Table 1 below[2]. The other variables used are also shown in Table 1.

Table 1: Variable Definition

Variable	Symbol	Definition
Inefficient labor investment	Abresid	Model (1) Absolute value of the residual of regression
Employee stock ownership plan	ESOP	If implemented by the listed company in the current year, the value is 1, otherwise it is 0
The first type of agency cost	AC1	Operating income/Average assets
The second type of agency cost	AC2	Net other receivables/total assets at year-end
Revenue growth rate	Growth	(Current Year's operating income - last year's operating income)/last year's operating income
Net interest rate on total assets	ROA	Net profit/total assets at beginning of year
Enterprise market value	SizeR	Percentage ranking of the total market value of individual stocks

Table 1: (continued).

Quick ratio	Quick	(Cash + short-term investments + receivables)/Current liabilities
Extent of company losses	Lossbin	The interval where ROA is [-0.025,0] is divided into five intervals with 0.005 as the step. If ROA is [-0.005,0], Lossbin1=1; otherwise, it is 0, and so on
Company size	Size	The natural logarithm of the company's total ending assets
Asset-liability ratio	Lev	Total liabilities/total assets
Book-to-market ratio	BM	Total assets/annual total market value of individual stocks
Proportion of fixed assets	Tangible	Net fixed assets/total assets
Labor intensity	Labor_intensity	Number of employees/(natural logarithm of total assets *100)
Cash flow volatility	Sd_cfo	(Cash flow/total assets) three-year volatility, where the three-year volatility is the standard deviation from year t-2 to year t
Nature of property right	SOE	The value is 1 for state-owned enterprises and 0 for other enterprises
Institutional shareholding ratio	Insti	Number of institutional shares/total shares
Operating cash flow	Cashflow	Net operating cash flow/total assets
Board size	Board	The natural logarithm of the number of directors
Management shareholding ratio	Mng_hold	Number of shares/total number of shares
The proportion of the largest shareholder	Top1	Number of shares held by the largest shareholder/total number of shares
Company age	Age	The number of years the company has been listed
Proportion of independent directors	Independent	Number of independent directors/Total number of directors
Management compensation	Pay	The natural logarithm of the total compensation of the top three executives
Dual function	Dual	When the chairman and the CEO of the enterprise are the same, the value is 1; otherwise, it is 0
Industry dummy variable	IND	Control industry fixed effect
Annual dummy variable	YEAR	Control year fixed effect

3.2.3. Model Construction

According to mediation effect test method[11], the model is established in the following three steps:

- 1.The total effect of employee stock ownership plans on the efficiency of labor investment

$$Abresid_{i,t} = \beta_0 + \beta_1 ESOP_{i,t} + \beta_2 Lev_{i,t} + \beta_3 BM_{i,t} + \beta_4 Tangible_{i,t} + \beta_5 Labor_intensity_{i,t} + \beta_6 Sd_cfo_{i,t} + \beta_7 SOE_{i,t} + \beta_8 Insti_{i,t} + \beta_9 Size_{i,t} + YEAR + IND + \varepsilon_{i,t} \quad (2)$$

2.The effect of employee stock ownership plans on dual agency costs

$$AC_{1i,t} = \gamma_0 + \gamma_1 ESOP_{i,t} + \gamma_2 Lev_{i,t} + \gamma_3 BM_{i,t} + \gamma_4 Tangible_{i,t} + \gamma_5 Labor_intensity_{i,t} + \gamma_6 Sd_cfo_{i,t} + \gamma_7 SOE_{i,t} + \gamma_8 Insti_{i,t} + \gamma_9 Size_{i,t} + YEAR + IND + \varepsilon_{i,t} \quad (3a)$$

$$AC_{2i,t} = \gamma_0 + \gamma_1 ESOP_{i,t} + \gamma_2 Lev_{i,t} + \gamma_3 BM_{i,t} + \gamma_4 Tangible_{i,t} + \gamma_5 Labor_intensity_{i,t} + \gamma_6 Sd_cfo_{i,t} + \gamma_7 SOE_{i,t} + \gamma_8 Insti_{i,t} + \gamma_9 Size_{i,t} + YEAR + IND + \varepsilon_{i,t} \quad (3b)$$

3.The mediating effect of dual agency costs

$$Abresid_{i,t} = \lambda_0 + \lambda_1 ESOP_{i,t} + \lambda_2 AC_{1i,t} + \lambda_3 Lev_{i,t} + \lambda_4 BM_{i,t} + \lambda_5 Tangible_{i,t} + \lambda_6 Labor_intensity_{i,t} + \lambda_7 Sd_cfo_{i,t} + \lambda_8 SOE_{i,t} + \lambda_9 Insti_{i,t} + \lambda_{10} Size_{i,t} + YEAR + IND + \varepsilon_{i,t} \quad (4a)$$

$$Abresid_{i,t} = \lambda_0 + \lambda_1 ESOP_{i,t} + \lambda_2 AC_{2i,t} + \lambda_3 Lev_{i,t} + \lambda_4 BM_{i,t} + \lambda_5 Tangible_{i,t} + \lambda_6 Labor_intensity_{i,t} + \lambda_7 Sd_cfo_{i,t} + \lambda_8 SOE_{i,t} + \lambda_9 Insti_{i,t} + \lambda_{10} Size_{i,t} + YEAR + IND + \varepsilon_{i,t} \quad (4b)$$

4. Empirical Analysis

4.1. Descriptive Statistics

Inefficient labor investment is common, with significant differences (mean 0.2366, SD 0.2214). The implementation rate of employee stock ownership plans is low (mean 4.74%). In A-share companies, the first type of agency cost (average 0.6267) is much higher than the second type (0.0145), and the fluctuation is large, indicating that agency cost issues vary. The distribution of other variables is reasonable and in line with research norms.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Abresid	20353	0.2366	0.2214	0	1.1845
ESOP	20353	0.0474	0.2124	0	1
AC1	20353	0.6267	0.4198	0.0729	2.5539
AC2	20353	0.0145	0.0228	0	0.1477
Size	20353	22.4693	1.2943	20.071	26.4250
Lev	20353	0.4307	0.1962	0.0675	0.8984
BM	20353	0.6228	0.2638	0.1100	1.2111
Tangible	20353	0.2062	0.1554	0.0017	0.6815
Labor_intensity	20353	2.3464	4.2646	0.0601	30.0631
Sd cfo	20353	0.0411	0.0342	0.0027	0.1936
SOE	20353	0.3626	0.4808	0	1
Insti	20353	0.4296	0.2457	0.0031	0.9071

4.2. Regression

1. Analyze the regression coeff. between ESOP & labor investment efficiency

The results showed that employee stock ownership plans were significantly negatively correlated with inefficient labor investment ($\beta = -0.0157$, $p < 0.05$), supporting H1 and improving labor efficiency. Institutional shareholding is also significantly negatively correlated with labor intensity, promoting efficiency, which is consistent with previous research. The scale of enterprises is significantly positively correlated, reflecting the management challenges of scale expansion. The intermediary effect of dual agency costs is significant, providing a basis for subsequent testing.

2. Check the coefficients γ_1 in equation (3) and λ_2 in equation (4) respectively.

Regression analysis shows that both the first and second types of agency costs significantly mediate between employee stock ownership plans and labor investment efficiency: the coefficients for the former are 0.0494 and -0.0145, respectively, while the coefficients for the latter are -0.0017 and 0.1706, both significant at the 1% or 5% level. This indicates that both types of agency costs have a mediating effect on improving labor investment efficiency, assuming H2 is proven.

Table 3: Regression results between ESOP and labor investment efficiency, dual agency cost

VARIABLES	(1) Abresid	(2) AC1	(3) AC2
ESOP	-0.0157** (0.0072)	0.0494*** (0.0127)	-0.0017** (0.0007)
Size	0.0165*** (0.0021)	-0.0176*** (0.0037)	-0.0012*** (0.0002)
Lev	0.0528*** (0.0091)	0.3230*** (0.0161)	0.0230*** (0.0009)
BM	-0.1176*** (0.0080)	-0.0922*** (0.0141)	0.0022*** (0.0008)
Tangible	-0.0494*** (0.0108)	-0.1465*** (0.0191)	-0.0199*** (0.0011)
Labor_intensity	-0.0015*** (0.0005)	0.0185*** (0.0008)	0.0003*** (4.60e-05)
Sd_cfo	0.1871*** (0.0453)	1.7902*** (0.0799)	0.0254*** (0.0045)
SOE	-0.0322*** (0.0037)	-0.0101 (0.0065)	-0.0004 (0.0004)
Insti	-0.0152** (0.0077)	0.0881*** (0.0135)	-0.0027*** (0.0008)
Constant	-0.1306*** (0.0426)	0.6684*** (0.0752)	0.0402*** (0.0043)
Year	Controlled	Controlled	Controlled
Industry	Controlled	Controlled	Controlled
Observations	20,353	20353	20353
R-squared	0.0695	0.1937	0.1254

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4: The mediating effect of double agency cost

VARIABLES	(1) Abresid	VARIABLES	(1) Abresid
ESOP	-0.0150** (0.0072)	ESOP	-0.0154** (0.0072)
AC1	-0.0145*** (0.0040)	AC2	0.1706** (0.0702)
Size	0.0162*** (0.0021)	Size	0.0167*** (0.0021)
Lev	0.0575*** (0.0092)	Lev	0.0489*** (0.0093)
BM	-0.1189*** (0.0080)	BM	-0.1180*** (0.0080)
Tangible	-0.0516*** (0.0109)	Tangible	-0.0461*** (0.0109)
Labor_intensity	-0.0012*** (0.0005)	Labor_intensity	-0.0015*** (0.0005)
Sd_cfo	0.2130*** (0.0458)	Sd_cfo	0.1827*** (0.0453)
SOE	-0.0323*** (0.00370)	SOE	-0.0321*** (0.0037)
Insti	-0.0139* (0.0077)	Insti	-0.0147* (0.0077)
Constant	-0.1204*** (0.0427)	Constant	-0.1370*** (0.0427)
Year	Controlled	Year	Controlled
Industry	Controlled	Industry	Controlled
Observations	20,353	Observations	20,353
R-squared	0.0701	R-squared	0.0697

3. Check the coefficient λ_1 in equation (4)

As shown in Table 5, in (4a) and (4b) adding the two types of agency costs, the coefficients between ESOP and inefficient labor investment are -0.0150 and -0.0154 respectively, both of which are significant at the 5% level, indicating that the direct effect is significant.

4. Compare the signs of $\gamma_1\lambda_2$ and λ_1

When two types of agency costs act as intermediaries, the symbols of $\gamma_1\lambda_2$ and λ_1 are the same, indicating that both dual agency costs play a partial intermediary role.

4.3. Robustness Test

4.3.1. Endogeneity test

ESOPs' implementation by firms is affected by multiple factors, causing sample bias. This study employs PSM for 1:2 matching, achieving good results. It confirms that ESOPs, despite constraints, are still significantly negatively correlated with labor investment efficiency, opposing the hypothesis of improvement.

4.3.2. Increase in the number of control variables

In this part, Cashflow, Board, Mng_hold, Top1, Age, Independent, and Pay are added as control variables. Equation (2) was used again for regression. The results show that after adding a series of control variables, the regression coefficient between labor investment efficiency and employee stock ownership is still significantly negative at the significance level of 5%, and the robustness has been verified to a certain extent.

Table 5: Regression results after PSM&Regression results after the increase of control variables

VARIABLES	(1) Abresid	(1) Abresid
ESOP	-0.0170** (0.0072)	-0.0216** (0.0091)
Size	0.0193*** (0.0023)	0.0157*** (0.0057)
Lev	0.0383*** (0.0096)	0.0469* (0.0274)
BM	-0.1161*** (0.0084)	-0.1222*** (0.0223)
Tangible	-0.0321*** (0.0115)	-0.0999*** (0.0351)
Labor_intensity	-0.0013*** (0.0005)	-0.0018 (0.0013)
Sd_cfo	0.1908*** (0.0463)	0.0841 (0.1311)
SOE	-0.0193*** (0.0042)	-0.0276* (0.0161)
Insti	0.0246** (0.0114)	-0.0255 (0.0204)
Cashflow	-0.1493*** (0.0252)	
Board	-0.0417*** (0.0104)	
Mng_hold	0.0394*** (0.0137)	
Top1	-0.0657*** (0.0138)	
Age	-0.0008*** (0.0003)	
Independ	-0.0519 (0.0354)	
Pay	0.0005 (0.0028)	
Abs_Invest	0.2607*** (0.0321)	
Constant	-0.0991* (0.0569)	-0.0984 (0.1181)

Table 5: (continued).

Year	Controlled	Controlled
Industry	Controlled	Controlled
Observations	19,667	2,629
R-squared	0.0770	0.078

4.4. Further Analysis

The actual labor investment of enterprises often deviates from the optimal level, which can be divided into excessive and insufficient. This article uses Mresid and Lresid to explore the impact of employee stock ownership plans on both, and conducts heterogeneity analysis by distinguishing between state-owned enterprises and private enterprises. The results show that employee stock ownership significantly reduces excessive labor investment in private enterprises, but has no significant impact on state-owned enterprises, possibly due to the high level of government intervention and difficulty in adjustment. For insufficient labor investment, employee stock ownership plans have no significant effect, indicating that they mainly improve efficiency by improving overinvestment.

Table 6: Heterogeneity Analysis

VARIABLES	Full sample		State-owned enterprises		Private-owned enterprises	
	Mresid	Lresid	Mresid	Lresid	Mresid	Lresid
ESOP	-0.0249* (0.0141)	0.0108 (0.0077)	-0.0275 (0.0412)	-0.0073 (0.0272)	-0.0260* (0.0155)	0.0105 (0.0083)
Size	-0.0013 (0.0040)	- (0.0023)	-0.0021 (0.0064)	- (0.0035)	-0.0026 (0.0053)	- (0.0032)
Lev	0.0961*** (0.0172)	-0.0143 (0.0102)	0.0947*** (0.0270)	0.0198 (0.0158)	0.0953*** (0.0224)	- (0.0136)
BM	-0.0157 (0.0160)	0.2150*** (0.0088)	-0.0290 (0.0255)	0.1924*** (0.0132)	-0.0082 (0.0207)	0.2332*** (0.0119)
Tangible	- 0.1015*** (0.0208)	0.0110 (0.0120)	- 0.0910*** (0.0275)	0.0112 (0.0157)	- 0.1086*** (0.0311)	0.0101 (0.0185)
Labor_intensity	0.0007 (0.0009)	0.0030*** (0.0005)	-0.0005 (0.0012)	0.0019*** (0.0006)	0.0028* (0.0016)	0.0051*** (0.0008)
Sd_cfo	0.4173*** (0.0851)	-0.0285 (0.0507)	0.2658** (0.1327)	-0.0405 (0.0791)	0.5125*** (0.1098)	-0.0176 (0.0659)
SOE	- 0.0481*** (0.0071)	0.0175*** (0.0041)				
Insti	-0.0196 (0.0143)	0.0140 (0.0086)	-0.0078 (0.0315)	0.0223 (0.0183)	-0.0216 (0.0165)	0.0127 (0.0101)
Year&Industry	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Observations	9378	10984	3234	4149	6144	6835
R-squared	0.0594	0.1113	0.0358	0.1183	0.0645	0.1075

5. Conclusion and Enlightenment

This article is based on data from A-share listed companies from 2015 to 2022, and studies the impact of employee stock ownership plans (ESOP) on labor investment efficiency. It is found that ESOP significantly improves efficiency, especially in private enterprises, mainly by correcting overinvestment. ESOP reduces agency costs, promotes rationalization of management and major shareholder behavior, and optimizes labor resource allocation. After implementation, the company needs to regularly evaluate the effectiveness and prevent opportunism; Regulatory authorities should improve supervision to ensure that ESOP supports high-quality development of enterprises. At the same time, we call for policies to promote labor mobility and optimize the allocation environment to address the issue of redundant employment that may arise in state-owned enterprises due to social responsibility. However, the study did not consider the impact of regional differences, industry heterogeneity, and enterprise lifecycle on the ESOP effect, which points the way for future research to explore the ESOP effect under regional differences, industry heterogeneity, and enterprise lifecycle.

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