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ABSTRACT

The dissertation consists of three chapters that employ applied econometric techniques to analyze employee benefits related questions. In the first chapter I study the impact of the employee stock ownership plan (ESOP) for 122 companies traded on the U.S. stock market with the quantile regression model. In the second chapter I conduct a policy evaluation of Iowa's new ESOP bill. For the last chapter I study the ESOP effect on all American publicly traded companies and make the scenario analysis based on the estimation results.

Chapter I: In this chapter, I investigate the impact of employee stock ownership plan on corporate finance for American firms traded on the stock market. To study the non-uniform ESOP effect on 122 companies from 2007 to 2016, I employ the quantile regression approach. The results firstly support my assumption that the ESOP has the non-uniform positive effect on business performance across different quantile levels. Secondly, the effect of ESOPs is comparable to corporate life cycle theory. For most start-up firms, an ESOP is a powerful tool to save cash flow and this positive effect drops sharply when a firm stepping into the expansion stage. What is more, different industry properties play a significant role when considering an ESOP adoption.

Chapter II: In this chapter, I assess the impact of Iowa's new ESOP policy on companies that already established an ESOP plan. The study uses the data of 871 companies in total from 2004 to 2015, and all firms included in the dataset have already set up a plan before 2004. To conduct the evaluation, I employ a two-step estimation: propensity score matching method resamples the

data and quantile difference-in difference model examines the policy influence across various company size. The findings show that the new bill impacts small business and large scale firms in an opposite direction. Moreover, I decompose the vast differences in plan assets between leveraged and non-leveraged plans and find that the coefficients account for the large variation significantly across all higher quantile levels.

Chapter III: In this chapter, I revisit the ESOP effect on financial performance of all American publicly-traded companies on the stock market. The data set contains 621 firms during a six-year time period. To study the plan effect, I use both estimation-based method and simulation-based estimation. Combining those estimation results, I find that the employee ownership plan has a significant positive effect on firm's financial performance from specific estimation approach, and the leverage property is one of the most valuable function of the ESOP program. Based on the estimation, I make the scenario analysis to provide a detailed guide for firms who are considering the adoption of an ESOP.

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CHAPTER 1

A QUANTILE REGRESSION FOR THE EFFECT OF EMPLOYEE STOCK OWNERSHIP PLANS ON FIRM PERFORMANCE

Introduction

The principle-agent problem between different economic parties received a lot of attention in Stephen's paper (1973). The paper described the theory that shareholders' ownership is separated from the top management due to the management layers, and a disparity of interests occurs. Then this theory is further developed and illustrated in detail by Jensen and Meckling (1976). The authors argued that managers always prefer to undertake responsibilities to achieve their personal goal other than all stockholders at the expenses of owners. From this point of view, equity-based compensation plans began to come into use in most public companies aiming at motivating managers to take actions considering shareholder's benefits. A vast of academic researchers conducted a study on the effects of Employee Stock Ownership Plans (ESOPs) on corporate culture and business performance. However, much less studies uncovered the effect of ESOP on firm performance across different business development phases. Among those limited regional research, most existing empirical studies target at the developing or emerging markets like India and China on this subject, i.e. Koustubh (2016) and Ning & Zhou (2005). However, the literature on ESOP across different levels in developed countries, such as the United States market, is rather scant.

There is a large literature argued that the ESOPs have a positive influence on firm performance since employees are motivated by the equity-based compensation, as Cin and Smith (2002) conducted the research in the South Korea market. What's more, negative impact is also indicated by many academic studies, such as US GAO (1987). The conflicting research findings is not unreasonable because the sample collection and research methodology differ among various exciting studies. Therefore, this paper assumes that the effect of ESOP is not uniform at different levels.

The present research contributes to the existing studies in two ways. Firstly, the research employs a quantile regression model to analyze the relationship between ESOP and corporate financial performance in various development phases of sample firms. It is figured out that the non-uniform effect of ESOP on business performance are comparable to corporates' life-cycle theory. By applying the QR Stata module for panel data specifically, we figure out that for most start-up companies, ESOP could be taken as a powerful way to save cash flow and enhance financial returns. Then, the effect of ESOP fluctuates to some degree during the first half of growing stage attributed to different corporate properties, and the positive effects of ESOP drops sharply when a firm going to the expansion period during the second half of growing phase. When a firm develops into the maturity phase, the equity-based compensation plans effects show little effect although in an increasing trend. Secondly, this research paper captures the correlation between ESOPs and firm performance in different sectors and discusses the industry effect in relationship between ESOP and firm performance. Since an ESOP is a stock-based compensation plan which qualifies employees the right to purchase company's stock at an appointed price during a specified period according to the contract terms, the company strategy for equity-based compensation plan varies from industry to industry due to different industrial characteristics and capital structure. For example, the IT companies in U.S. prefer to issue ESOP to all employees, however, financial related companies generally adopt an ESOP to a limited extent discreetly.

The remaining of this paper proceeds as follows: The second section displays a literature review on the relationship between ESOPs and firm performance. The third section deals with the methodology of regression, data used, and their statistical properties. The fourth section describes the empirical results analysis and related indicates. The last section includes the summary and conclusions of present study.

Literature Review

Starting in the 1950s, stock ownership plans, which links employee interests with company and other shareholders, have become a useful tool for companies to incentive and retain top management. During the 1960s, stock ownership plans continued to be the most used form of long-term equity incentive award at major U.S. corporations. Many researchers agree to the point of view that the executive stock ownership plan scheme indeed raise the firms' productivity. Murphy (2002), Guan *et al.* (2002), Ittner *et al.* (2003), and Kato *et al.* (2005) examined a positive effect from the mutual monitoring, corporate culture, and retain executives' perspective via treating the adoption of stock ownership plans as an exogenous event. Another body of work studies the positive productivity effect of executive stock ownership programs, taking return on equity (ROE), return on assets (ROA), and Tobin's Q as the performance proxy in particular. In 1993, Kumbhakar and Dunbar investigated that the ESOP positively impacts on corporate productivity measures with following finds: when the ESOP rate falls in the range of 1.8 to 2.7, the productive forces are much increased and this also happens when implementation rate of other profit sharing schemes reaches around 3.9 or higher. The largest research was conducted by Hamid Mehran among public companies. His study found that when return on assets are taken as appropriate proxy, 2.7% productivity will be raised by the ESOPs application. This estimate is significantly higher than expected. What's more, Hamid argued in his paper that carrying out an ESOP also helped more than 50% of the corporates to experience a higher stock price performed in the stock exchange market and the price went up approximate to 1.5% on average across companies. Moreover, Hillegeist and Penalva (2004), like Sesil and Lin (2011) focused their works on broader sample firms. After the sample size is enlarged in a longer time period, they also investigated that the executive stock ownership schemes are positively associated with firm productivity. Furthermore, some scholars researched on other local studies outside U.S. and argued a positive influence of executive level stock-based compensation on firm performance (ROA and ROE), such as Lanouar and Elmarzougui (2007) for French market, Ozkan (2009) focus on British companies.

From the 1980s, non-executive employees begin to play more and more important role in corporate development and in particular, the talented stuffs are the core competitiveness for business innovation. The broad equity-based compensation plan including general employees got attention. Guan (2001) analyzed and illustrated the factors of non-executive employee stock ownership scheme. By studying on its exercises, Guan concluded that firms are thinking about increasing the corporate value by giving such ownership rights to more stuffs because many existing studies indicate that non-executive employee stock ownership plans are very effective on attracting and retaining key employees. Chang et al. (2015) provided assertive evidence on this from the perspective of corporate innovation. What's more, in the last decade, it is an obvious trend that every employee began to be taken as the "key" one for the company. From 1990s, companies are moving toward broad-based plans wherein at least 50% employees receive and hold stocks. In Blasi *et al*. (2001), the study described that the broad-based ownership programs appear to increase productivity and the author argued that the dilution theory resulted from broader ownership plans can be balanced in the way of increasing productivity. James C. Sesil later implied that the impact of broad equity-based compensation is positively associated with firm productivity and many firms had already considered broad-plan as a benefit. Sesil *et al.* (2007) supported this argument two years later. There are also studies, Sesil *et al.* (2002), Kim and Ouimet (2009) and Blasi *et al.* (2015), Hochber and Lindsey (2010) show there is a positive link between the broad-based employee stock ownership and firms' performance related to workplace culture, innovation, cooperation and mutual monitoring among co-worker.

In addition, there are also a vast variety of literatures showing a neutral or negative corporate performance and productivity measure from employee stock ownership plans. Some existing works investigate the negative relationship between ESOP and firm performance, including Conte *et al.* (1996), Core *et al*. (1999), Brick *et al*. (2006). Another body of research studies a neutral effect of ESOP on corporation performance. For example, Bulan *et al.* (2010) used the data of 917 American firms in a 10-year time period to argue that there is no strong evidence showing a relation between stock options strategy and business performance. Besides, many researchers also conducted some interesting investigations. Idi Cheffou (2007) studied a contrary effect among different productivity measures. That is the firm's performance is not affected by the

ESOP when it is measured by ROA and ROE, however, productivity is positively related with ESOP when the Tobin's q is applied. What's more, Frye (2004) studied a contrary effect with different time period data. The study found that ROA is positively affected by ESOP in one period, while negatively related in another period. This research is also supported by Aggarwal and Samwichk (2006).

It is clear that the effect of employee stock ownership plans on corporate performance is not uniform and non-monotonic. Moreover, the effect also varies across different company characteristics, business measures, and time period. Therefore, the quantile regression methodology is applied in this study to examine the influence of ESOPs on corporate performance at different levels. Although the neutral and negative effects are uncovered by some researches, this paper sets up a key assumption that the ESOPs are positively related to company performance in the U.S. market.

Model and Data

Empirical model

The main purpose of this research is to study the effect of Employee Stock Ownership Plans on firm's performance at different levels, so we employ the quantile regression model, which is developed and improved by Koenker and Bassett (1978).

Under the assumption that the τth quantile of the depend variable (y_{it}), is linear in independent variable (x_{it}): y_{it}

$= x_{it}'\beta_\tau + \varepsilon_{\tau it}$

The model for conditional QR is defined as: $Q\tau$

$(y_{it} | x_{it}) \equiv \inf \{y: F_{it} (y|x) \geq \tau\}$

and $Q\tau (\varepsilon_{\tau it} | x_{it}) = 0$

where $Q\tau (y_{it} | x_{it})$ refers to the τth conditional quantile of y_{it} on the regressor vector $x_{it}'\beta_\tau$; τ can

take different values in (0,1) depending on the demand for analysis; and $\varepsilon_{\tau it}$ is the error term.

We can obtain the β_τ by using the formula as follows:

$\min \Sigma\, \tau * | \varepsilon_{\tau it} | + \Sigma\, (1-\tau) * | \varepsilon_{\tau it} |$

$= \Sigma\, \tau * | y_{it} - x_{it}'\beta_\tau | + \Sigma\, (1-\tau) * | y_{it} - x_{it}'\beta_\tau |$

where the minimization problem in this model could be solved by employing the linear technique.

In 2011, Koenker and Hallock confirmed the application of bootstrap method for a robust estimation. Therefore, in this paper, we use the bootstrap technology to deal with standard error in QR model.

To compare the empirical findings and based on explanation purpose, Ordinary Least Square (OSL) and Fixed Effect are also included in this study. We define a simple OLS linear regression model as:

$y_i = \beta_0 + \beta_1 x_i + u$

Where y denotes outcome variable, x denotes independent variables, and u represents error terms. We are interested in the coefficient β_1.

To derive this coefficient, we estimate the Ordinary Least Squares Estimates (OLS) by:

$\min \Sigma (u_i)^2 = \min \Sigma (y_i - \beta_0 - \beta_1 x_i)^2$

Leading to

$\square_{\square} = \square\ x_i\ y_i\ /\ \square\ x_i^2$

What's more, to help telling a causal effect from correlation, we employ a fixed effect model into regression. Fixed effect model is described as follow:

$y_{it} = a + x_{it} b + v_i + e_{it}$ (1)

where v_i are the fixed effects and from with it follows that:

$\bar{y}_i = a + \bar{x}_i b + v_i + \bar{e}_i$ (2)

where $\bar{y}_i\ \bar{x}_i\ \bar{e}_i$ are average value of $y_{it}\ x_{it}\ e_{it}$ within individual i.

(2) – (1) leads to

$y_{it} - \bar{y}_i = a + (x_{it} - \bar{x}_i)\ b + (v_i - v_i) + (e_{it} - \bar{e}_i)$

The results in difference are what we include in the fixed effect model.

In particular, the present regression is taking advantage of a new Stata module (QREGPD) to perform quantile regression for panel data. This module is developed by Powell (2016) and it performed very well at fitting the QR model for panel data specifically. The model behind it is embedding the Fixed Effect theorem mentioned above into the quantile regression. Thus, it helps us to illustrate the results in a causal-effect manner.

Data description

Our research selects sample corporations with share traded on The New York Stock Exchange (NYSE). This study includes 122 companies' data from 2007 to 2016. What's more, the ESOP related data and other 401k information are obtained from National Center for Employee Ownership (NCEO), a widely used resource for employee stock ownership plan and equity compensation strategy analysis. The companies selected into the present study are required to have explicit accounting and financial situation data for the entire 10-year time period.

As mentioned in the literature review section, three popular proxies are applied to analyze the relationship between the company performance and the ESOP. They are ROE, ROA, and Tobin q. The return on equity (ROE) is based on the professional accounting measurement and it is very popular till now since ROE is a very important inspect standard for banks when considering a firm's loan extending requirement. Moreover, rating agencies also rely on ROE to assess corporate's debt paying ability. In addition, KJ Stiroh (2005) pointed out that, compared with other market-value-based proxies, accounting indicators can provide more accurate information on firm's financial situation for investors. Also, ROE has been recommended and proved as the appropriate proxy of performance by many studies already. Therefore, regarding to this background, this research also take ROE as the proxy measure of the company's performance.

To make it clear, here is the definition table for important variables included in our estimation:

Table 1: Variable Definitions

Important variables	Definition
Response Variable:	
Return on Equity (ROE)	Net Income after Tax/ Stockholder's equity
Explanatory Variables:	
Employee Stock Ownership Plan (ESOPs)	Natural Logarithm of Annual value of Employee stock ownership plan
Company scale (size)	Natural Logarithm of total assets
Debt-To-Assets ratio (dr)	Total Term Liabilities/Total Assets
Plan Active Ratio (ar)	Active participants/Total participants
Industry (dummy variable)	Business field description

Note: Data for 122 sample companies of NYSE from 2007 to 2016 are obtained from amigobulls and ESOP information obtained from NCEO database.

To improve model fit by linearizing the relationship, we take natural logarithm for ESOP value since the value here refers to the annual plan assets. Firm assets, return assets, and assorted plan assets are generally transferred into log form i.e. Dalber. (2004) explained the transformation of firm assets in detail, Graney *et al* employed the natural log method on retirement plan assets in their book, and in particular, ESOPs plan assets are taken log in empirical by Bernstein (2016) also. So in our regression, we also transfer the ESOP assets value into log form. Besides the main independent variable ESOP, the research also includes several other control variables: debt ratio can measure the leverage and natural logarithm of total assets is a proxy for firm size, active ratio is the description of the plan's efficiency and timeliness, and industry can help us figure out more information in the study.

The summary information of response variable and explanatory variables are presented in Table 2, and the data sources are identical to Table 1.

Table 2： Summary Information

Panel A: Summary statistics of response/explanatory variables

Variables	Obs	Mean	Std. Dev.	Min	Max
roe	1,220	0.2203443	4.273967	-31.36	143.53
esop	1,220	8.328787	1.152631	0	10.7
size	1,220	9.800311	0.932975	7.32	13.91
dr	1,220	28.36489	184.6561	0	3287.19
ar	1,220	0.7487623	0.1565267	0	1
i_manu	1,220	0.3147541	0.4646083	0	1
i_finan	1,220	0.2704918	0.4443961	0	1
i_ser	1,220	0.1557377	0.3627552	0	1

Panel B: Detailed statistics of ROE

ROE				
	Percentiles	Smallest		
1%	-1.05	-31.36		
5%	-0.18	-6.12		
10%	-0.03	-4.33	Obs	1,220
25%	0.05	-3.61	Sum of Wgt.	1,220
50%	0.1		Mean	0.2203443
		Largest	Std. Dev.	4.273967
75%	0.17	2.51		
90%	0.29	3.67	Variance	18.2668
95%	0.48	23.05	Skewness	30.72863
99%	1.3	143.53	Kurtosis	1040.96

Empirical Results

<u>1.4.1 Effect of ESOP on financial performance (ROE)</u>

The empirical findings we get from the regression model are presented in Table 3. The research uses the quantile regression approach and includes the following explanatory variables simultaneously: ESOP, firm size, debt ratio, plan active ratio, and four industry dummy variables. The present research examines the impact of ESOP on 122 sample companies' performance (ROE) and reveals the empirical results at various quantile levels.

Table 3: ESOP Effect on ROE across Quantile Levels

Quantile	Coef.		Bootstrap Std.Err.	t
	QREGPD	QR		
0.05	5.004554	0.0182175	0.0160741	1.13
0.1	0.5253372	0.028866	0.007423	3.89
0.15	0.3454404	0.0220897	0.0044598	4.95
0.2	0.653432	0.0182086	0.0032881	5.54
0.25	0.1257683	0.0171401	0.0029709	5.77
0.3	0.1612074	0.0182912	0.0030496	6
0.35	0.7476797	0.0195275	0.0027572	7.08
0.4	0.0707544	0.0217871	0.002764	7.88
0.45	0.0116889	0.0233778	0.0027445	8.52
0.5	0.0121617	0.0224924	0.0037639	5.98
0.55	0.0028793	0.0230341	0.0038366	6
0.6	0.0025306	0.0201497	0.0041973	4.8
0.65	0.001346	0.0213842	0.0038106	5.61
0.7	0.0012476	0.0198848	0.0040161	4.95
0.75	0.0016701	0.0218393	0.0056176	3.89
0.8	0.0019557	0.0240804	0.0063613	3.79
0.85	0.0048609	0.0369543	0.0079873	4.63
0.9	0.0059352	0.054062	0.0131944	4.1
0.95	0.0087698	0.0683328	0.0225152	3.03
OLS	0.0539558		0.0514955	1.05
FE	0.0171404		0.1673529	0.1

Note: The data sources are identical to Table 1 and the significant level is 5 percent.

We focus on the results comparison between OLS and Fixed Effect in the first place. As per the estimation values, we find that when the firm's assets and some other unobserved variables are fixed within FE model, the estimated value is much lower than the one in OLS. What's more, when transferred from OLS regression into FE, the estimation is much more statistically insignificant. (Although the OLS coefficient is insignificant, we take it as rational since OLS is generally inappropriate for panel data and the sample size is not large enough for significance). Combining those two findings, we figure out that some fixed variables in FE model also have the influence on the financial performance. Therefore, in order to obtain the causal-effect results, it's not enough to apply the normal QR method only and we'd better to adopt one newer developed Stata module to address the fundamental problem related to fixed-effect within quantile estimators.

On the normal QR side, the quantile regression model is employed into this study since the key assumption set up previously in this paper is the non-uniform effect of ESOPs (employee stock ownership plan) across different levels. Based on the result of Table 3, the ESOPs are positively associated with performance across all different quantile levels. Interestingly, at the very lower quantile levels from 0.05 to 0.15, the positive correlation is increasing, however, when the quantile level falls in the range of 0.15 to 0.7, the extent of positive relation of ESOP and ROE fluctuates between 0.17 and 0.22. What's more, from the 0.7 quantile level the estimated values of ESOP begin to increase rapidly and reaches approximate to 0.068 at the 0.95 level. The coefficients we obtain are statistically significant except the values at 0.05 quantile level, depicted in Figure 1: confidence band. The empirical results prove our previous assumption that the ESOPs is positively related to the company productivity.

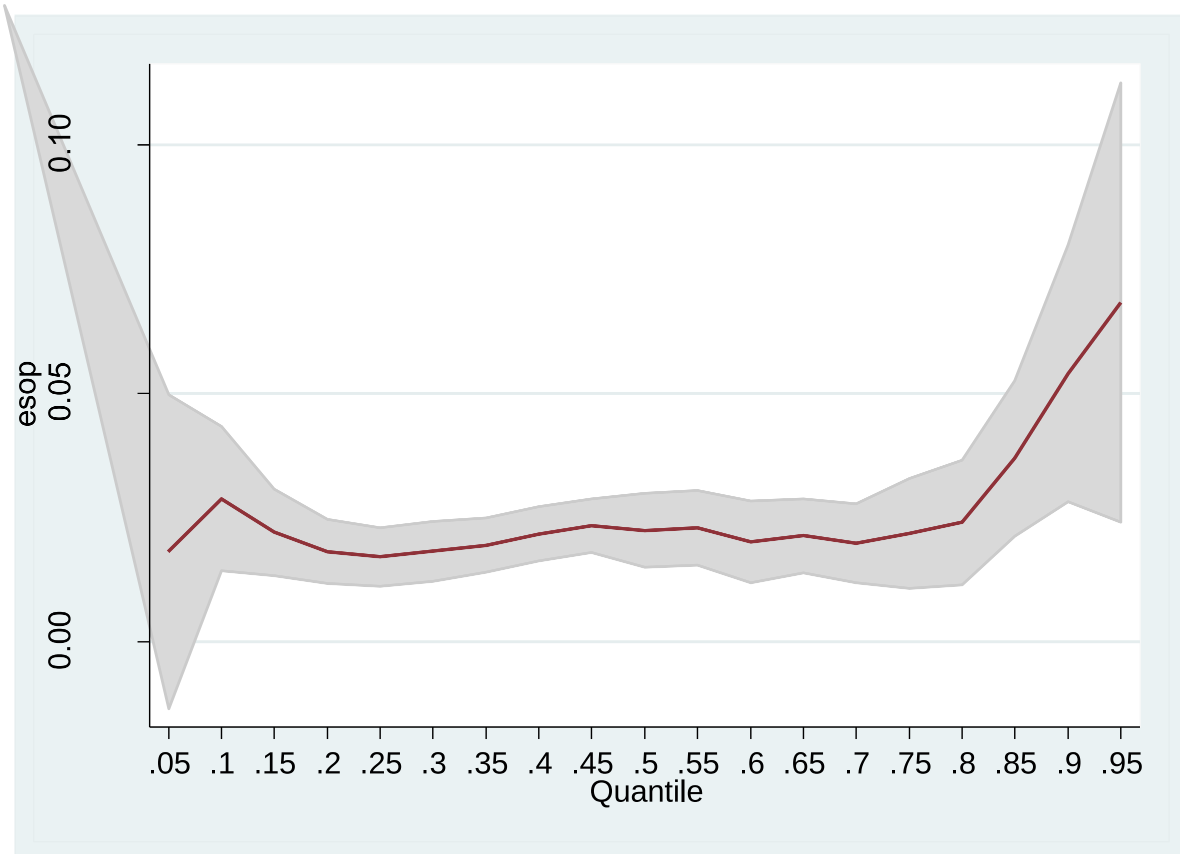


Figure 1: Confidence Band of Estimates.

In order to acquire more implications, we concentrate on the pattern of different ESOPs estimated values at various quantile levels. The ESOPs coefficients trend is depicted in Figure 2 showing that the stock-based compensation has a greater positive association with ROE at higher quantile levels on the whole. When we pay attention to the partitions, it is clear that two large increases occur during the level from 0.5 to 0.1, and 0.8 to 0.95 respectively. Moreover, at 0.1 level and 0.8 level respectively, the trend of estimated values changes direction and the positive correlation increases or decreases by a relatively large amount. What's more, from the level 0.2 to 07 interval, the simultaneous relationship is in a relatively stable section in spite of some small fluctuations.

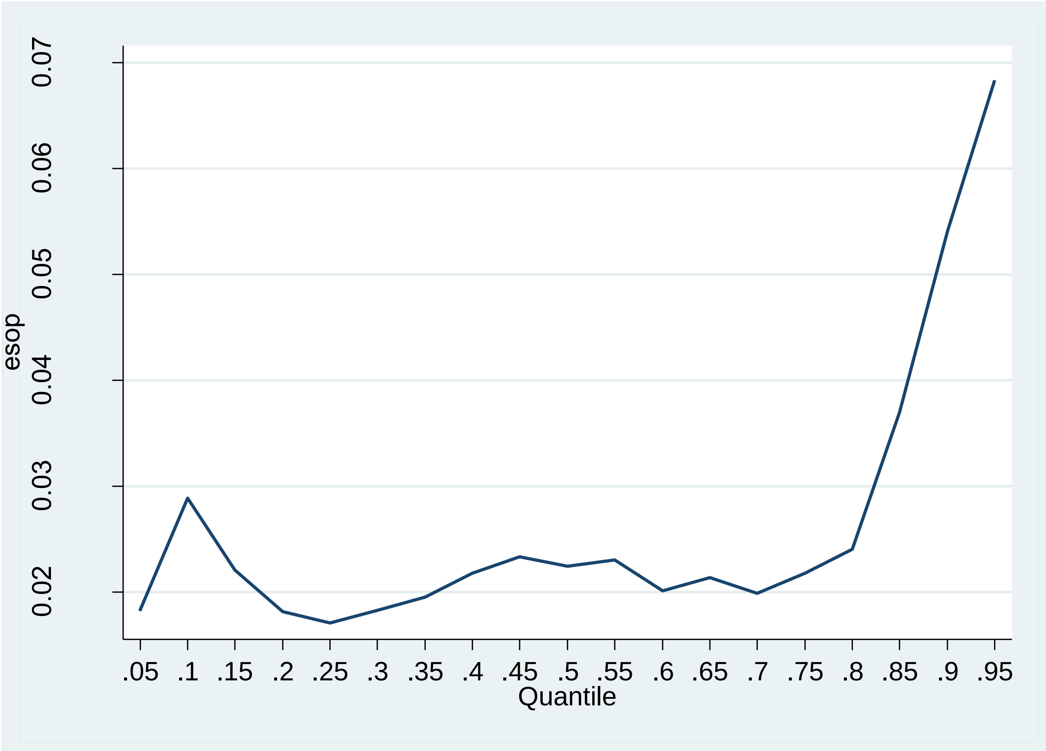


Figure 2: ESOP Effect of Firm Performance (ROE) across Different Quantile Levels.

The findings imply two main considerations on corporate management & performance with equity-based owership scheme. In the first place, we draw the conclusion that the positive correlations are in different degrees according to different quantile levels discussed in the above paragraph. Secondly, according to the Panel B of Table 2, the varying financial performance at different quantile levels is fairly consistent to the business life-cycle theory. Thinking about the four life phases of a firm: start-up stage, growth phases, mature period, and decline moment, a positive ROE is the most pressing issue for the firm at start-up beginning and for companies who are experiencing higher return on equity during their mature phase will be considered with more likely to take various formal compensation strategies aiming at simulating the growth and sustaining the profits. Secondly, as reviewed in the literature section, many existing studies indicate that the adoption of ESOP as a popular management strategy with the purpose of motivating and retaining talented employees to solve the management layers problems. Those align the present study assumption and empirical results of ESOP's positive correlation with financial performance. In addition, the positive relationship between ESOP and ROE is greater at higher levels and reaches the highest at the very high quantile level. At the start-up level, more efforts are devoted to product innovation and market development. Since cash flow is badly needed in this process, most companies prefer to offer some compensations, although not so formal, rather than paying wages directly. In the very beginning phase, the ESOP may help the company performance by saving cash flow motivating company founders and the initial stuffs.

The estimated values of ESOP decline from 0.1 to 0.25 quantile levels indicating that firms taking active steps to adopt stock owership plan in lower ROE quantile levels may not obtain a high increased firm performance as expected. One reasonable explanation is that the adoption of formal corporate compensation strategy may incur a huge debt and cause a relatively lower financial situation at the beginning of the company's growth-phase. What's more, at the growing stage, the fluctuating influence of compensation of firm performance may due to many reasons, such as the balance between high cost on business expansion and hiring over-qualified outsiders for management positions and returns from taking the company forward. In addition, the estimated value of ESOP is positive and increasing largely from 0.75 to 0.95 ROE quantile levels. At this phase, companies have consolidated its brand position and market share. For the sake of avoiding decline, they may decide to enrich the equity-based compensation plans or broader the ESOP participants with enough assets support. Employees in critical departments or positions will be offered more flexible ownership plans in higher compensation level. Thus, the diversified ESOP has a greater positive impact on the firm performance in this business maturity stage.

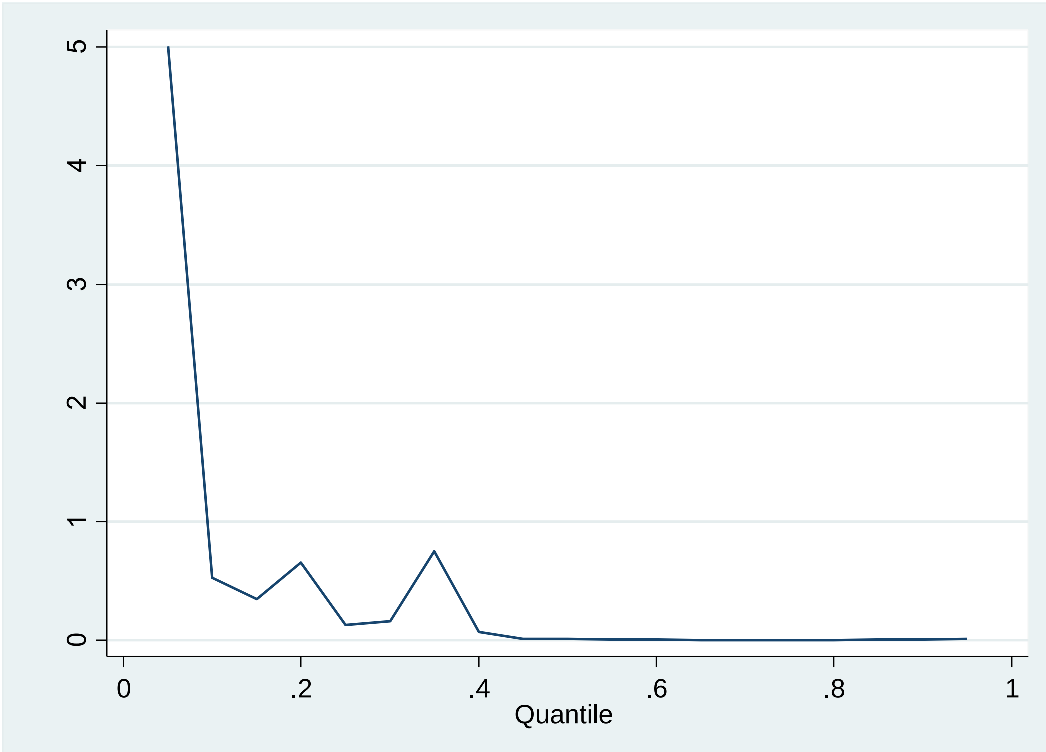


Figure 3: ESOP Effect with QREGPD Module

To achieve the goal of finding out the concrete causal-effect, QREGPD module is necessarily required for this study. Figure 3 presents the pattern of QREGPD module results intuitively. Compare to the normal QR method, QREGPD offers a more precise and significant effect pattern by eliminating the fixed effect within the panel data. At the first place, the results from QREGPD are all positive confirming the positive effect of ESOP on ROE across all quantile levels. Secondly, QREGPD confirms that stock-based option plans can increase the ROE to a high extent when the company is at the start-up stage. What's more, the greatest positive effect appears at the 0.05 level with a 5.00 coefficient. The estimated values fluctuate between the level of 0.1 to 0.35, drops sharply from 0.4 quantile level and increases again until 0.75 level. Similar to the normal QR method, many marketing and strategic reasons can lead to a fluctuating

ESOPs effect for different companies. However, QREGPD estimates perform better at subdividing the firm's situation into first half and second half during the growing stage. When a firm is at the beginning of growing period, various market situations and competitor strategies can result in an unstable effect from ESOPs. However, at the second half of growing, the decreasing pattern of positive results make it clear that investing much resources into ESOPs could help the business return very little. This point matches the firm's life cycle more since the second half of growing phase is taken as the expanding stage specifically according to the business theory. It is believed that the business focus should be put on the new market channel establishment, brand horizon broadening, and funds raising. The business performance is mainly depending on successful external market expansion rather than the internal employees' related strategies. In addition, although the positive trend increases again from 0.75 quantile level, the ESOP effect on firm performance is relatively small compared with the low quantile levels. This finding is completely contrary to the normal QR results. By eliminating the consideration of endogeneity from firm size, the QREGPD results imply that a firm in maturity phase has already stabled its revenue and return. What is considered for such a firm is existing in the current industry or opening up new products to new markets. Therefore, the ESOPs have little effect on the ROE on this stage.

Sector effect analysis as per QR model

Four sector dummy variables are included in our Quantile Regression model to figure out the impact of industry on relationship between ESOP and financial performance. When making employee stock owership plans strategy, industry property is a significant factor to take into consideration since it is related to the business goal and profit pattern closely. That's the reason why the industry is adopted as a dummy variable. We have chosen four representative industries in this research i.e. manufacturing, financial industry, management & services, and technology and information. In the regression, we use "1" to denote companies in manufacturing industry and "0" represents other non-manufacturing industries. Other three sectors follow the same manner.

Taking the sample size and statistically significant problem into account, we employ the normal quantile regression method for the sector effect analysis. The QR model estimates among different sectors dummy are presented in Table 4. This table reveals a significant difference among sector's effect. For all those four industries mentioned above, the estimated values of employee stock ownership plans show a positive relevance. First, this table shows the positive effects of ESOP at all quantile phases in all four sectors. What's more, same pattern as Table 3, the coefficients of ESOPs increase at the very beginning level, then decreases at 0.15 quantile level and keep fluctuating in the range from 0.15 to 0.7 quantile level. In addition, when the firm performance is at the higher quantile levels of ROE, especially from 0.75 to 0.95, the estimated values display a larger and larger positive correlation. Such results are also consistent with our assumption that the relation between ESOPs and financial performance is positive for the four industries in the study.

Table 4: ESOP Effect on ROE across Quantile Levels in Different Sectors

Quantile	Coefficient			
	manufacture	service	finance	technology
0.05	0.0197379	0.0169503	0.0277924	0.0120637
0.1	0.0273126	0.0256818	0.0300852	0.0264322
0.15	0.0124792	0.0109298	0.0182605	0.0223701
0.2	0.013141	0.0144959	0.0145886	0.0198303
0.25	0.0140977	0.0163348	0.0171314	0.0193583
0.3	0.0160057	0.0190411	0.0193975	0.0209905
0.35	0.0186571	0.0207773	0.0190836	0.0235148
0.4	0.0202478	0.0230307	0.0196608	0.0265296
0.45	0.0225385	0.0268971	0.0219425	0.0282926
0.5	0.0250656	0.0287288	0.0218887	0.0277258
0.55	0.0258769	0.0278751	0.0206357	0.0290177
0.6	0.0247816	0.0294848	0.0200731	0.0313415
0.65	0.026157	0.0318653	0.0206415	0.032295
0.7	0.0292194	0.0324623	0.0210483	0.0364357
0.75	0.0295312	0.0369248	0.018836	0.0397873
0.8	0.0335472	0.0472164	0.0251911	0.0473245
0.85	0.046796	0.0537155	0.0310758	0.0547054
0.9	0.0678582	0.0750757	0.0506482	0.0871807
0.95	0.1027394	0.1185614	0.0640707	0.117765

Note: The data sources are identical to Table 1 and the significant level is 5 percent.

We draw a conclusion from Table 4 that there is a positive association between shares form compensation plans and the company performance. When detailed analysis conducted among those four sectors, it is clear that the effect of sector in ESOP and firm performance relationship differs to some extent due to their industrial characteristics including different nature of the capital structure, different labor allocation patterns, and terminal product attributes.

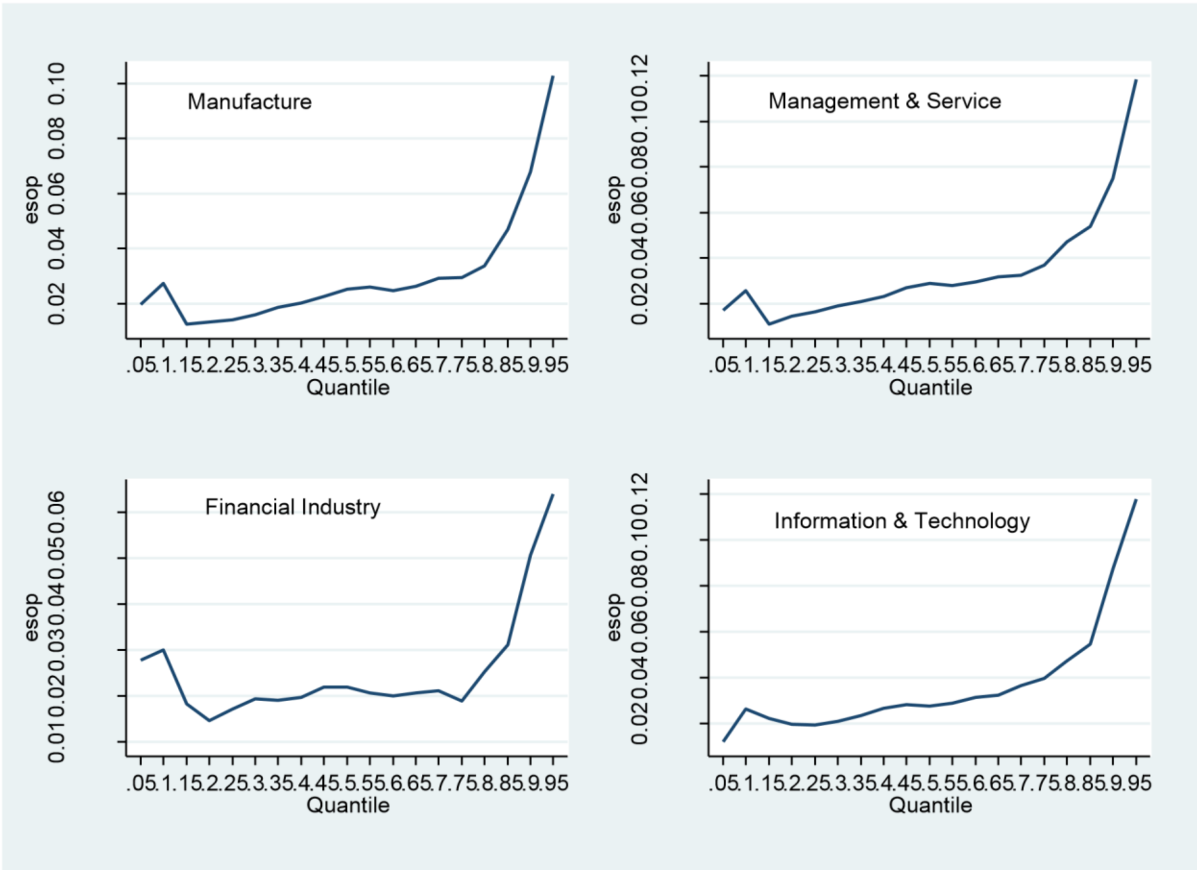


Figure 4: ESOP effect on ROE across Quantile Levels of Different Sectors

From the positive trend depicted in Figure 4, the situation in manufacture sector is similar to the management & service industry and the estimated values of ESOP are also similar to each other at particular quantile levels. At the very lower level i.e. 0.05 to 0.15, the positive relation of ESOP and ROE in service sector is a little bit less than the manufacture industry, which is consistent with its property that the start-up of a manufacture company is more cash needed and the ESOP strategy could play a more important role on the business performance. However, from 0.3 quantile level the estimated values of ESOP in management and service industry shows a greater positive coefficient on ROE than the manufacture one. It indicates that with the company growing and stepping into the maturity business cycle, the positively related employee stock option plan may improve firm performance from the perspective of motivating executives and retaining talented skilled employees. This effect is more pronounced on the in the management and service sector.

When attention is shifted to financial sector, we discover that the estimated value of ESOPs of financial companies are much higher than other threes with lower quantile levels especially at the 0.1 quantile level. This is attributed to the unique capital structure of financial sector. The capital mode is also the main reason that the highest estimated value of ESOP in financial industry is around 0.6 at 0.95 quantile level, only half of the comparisons made to the other three sectors. It is remarkable that broad-based employee stock ownership plans are very welcome by IT and software companies (even technology and information related firms) in the United States. Those corporates tend to offer stock ownership schemes for all employees through various stock plans. In particular at start-up level, employee stock ownership plans increase the firm performance to a larger extent in the IT sector than others: from quantile level 0.05 to 0.1, the estimated value of ESOP goes up from 0.01 to 0.026. This finding is supported by the empirical results and it is evident from Table 4 and Figure 2 that the estimated values of ESOP have less fluctuates during the business life-cycle and it keeps a positive trend as a whole and achieves 0.12 at the very high quantile level. It has been shown that not only the executives, but also general staff can obtain high returns from the stock compensation in a booming stock market. Facebook is one of the typical examples. We have reasons to believe that the promoted employee motivation may be an effective mean to lead to higher productivity to the company in return.

Summary and Conclusions

This study aims at analyzing employee stock ownership plans (ESOP)'s impact on the corporate financial performance (ROE) across different business levels in the United States market. The data of 122 public companies during 2007 to 2016 are applied to the model and regression analysis. The research takes ROE, an accounting measure, as the proxy of firm performance and employs the quantile regression model to explore the ESOPs influence across different levels for the sample companies. Moreover, an attempt is made to study the effect of industry on the relationship between ESOP and firm performance through adding four sector dummy variables in the quantile regression model.

This paper's findings suggest that the ESOPs has positive effects on the firm performance at all quantile levels. In particular, the effect coefficients of ESOPs on ROE increases at the very low quantile level and reaches the highest with 5.00 at the very beginning level 0.05. Then the estimated values fluctuate at the range of 0.15 to 0.7. Rather, during the first half between 0.1 and 0.35 levels, the positive effect fluctuates within limits, but falls rapidly in the second half from level 0.4 to 0.7. What's more, the coefficient trend increases once again at higher quantile levels. The findings imply that the firms prefer to get returns support by taking equity-based compensatory payment at the start-up stage and this is also explained by the business life-cycle theory that firms are quite cash limited at the very early stage of start-up. During the growing phase, there are many reasons including operation decision, market strategy, and other financial situation to explaining a fluctuating positive association between ESOP and financial performance. Definitely, the influence of ESOPs reduces when the firm aims at expanding its business. Moreover, the relatively small positive estimated values of ESOP at much higher ROE levels indicate that the stock-based compensation plans play quite small role for the business returns at the mature phase.

Other conclusions have been observed for all four different sectors included in this regression: manufacture, management & service, technology & information, and financial industry. The study examines the industry effect on the relationship between ESOPs and firm performance within each QR model and figures out a positive association between ESOPs and financial performance. The business life-cycle theory is still supported by the results in different sectors also. But it is necessary to realize that the industry plays a pivotal role in stock-based compensatory payment strategy making and the difference may be attributed to industrial characteristics including different nature of the capital structure, different labor allocation patterns, and terminal product attributes. More precisely, financial companies are more likely to get more returns on equity at the lower quantile levels, but the positively related ESOPs will not be enlarged as much as other sectors at higher quantile levels. The estimated values of ESOPs for Information and Technology achieve the highest at the high quantile levels implies the stock market boom would benefit the IT companies' financial returns most.

The present study findings have several economic implications. Firstly, it presents an examination on the effect of ESOP on firm performance in a particular market since it reveals the non-uniform effect across different quantile levels. Secondly, the research investigates the role of sector on the relationship between ESOPs and financial performance with comparison among different industries. The implications of present research may not be generalized for the whole U.S. market due to the sample size is limited and compensation package is not categorized in detail. What's more, some market-valued performance measurements can be taken into consideration for quantile regression study and the comparison of ESOP effect on other accounting proxies or market value proxies has high reference value for the real market. Moreover, in order to obtain a more productive and instructive result, an analysis of counterfactual distribution of ESOPs effect on firm performance could be a topic in the future.

CHAPTER 2
POLICY EVALUATION OF IOWA ESOP BILL

Introduction

An employee stock ownership plan (ESOP) is a qualified employee benefit plan intended to provide a company's employees with stock ownership. In an ESOP, a company sets up a trust fund, into which it contributes new shares of its own stock or cash to buy existing shares. Starting in the 1950s, ESOPs have been employed as a useful tool for companies to inventive and retain top management and this type of employee benefit plan has also been applied to motivate non-executive employees from the 1980s. The ESOPs plan is acknowledged as one of the core methods to address the principle-agent problem since the shares in an ESOP trust are allocated to individual employee accounts as required. Thus the employees' benefits are linked to the shareholders' interests very closely. Much of the economic literature have investigated a positive influence of the ESOP plan on the corporate performance from the perspective of work motivation and attitudes. However, at the point of view of corporate control, many studies pointed out that the ESOP plan could result in a serious management dilution problem at the meantime, thus the ESOP is negative correlated to the firm performance.

With the maturity of the ESOP's policy and economic development, the financial function of ESOP has attracted more and more attentions since 1990s. On one hand, the plan itself takes many tax benefits, for instance, both stock contribution and cash contribution are tax-deductible, and dividends are tax-deductible as well. On the other hand, it is important to realize that the ESOP can alternatively borrow money to buy shares, with the company making cash

contributions to the plan to repay loan. Moreover, such a leveraged ESOP plan takes another tax advantage as the contributions used to repay a loan in the ESOP are also tax-deductible. That is, the plan takes advantage of borrowing money at a lower after-tax costs. In order to study the effect of the ESOP plan on corporate financial performance, return on asset (ROA), return on equity (ROE), and Tobin q, which are all professional financial terms, are employed as good proxies. A vast of literature finds that the ESOP has a positive effect on business performance, nevertheless, some literature claims a negative casual effect of interest or neutral conclusion.
As of 2015, there were 6669 ESOPs in the United States, holding total assets of nearly $1.3 trillion. To guide and manage more and more ESOPs plans, the federal government constantly improve the ESOP rule and policy. In recent years, the ESOP related tax reform happens quite frequently by comparison of last century. The effect of tax reform on ESOPs becomes a hot topic since 2000s. However, very less literature research the particular ESOP tax reform effect on firm performance. At the state level, to my knowledge, there is no evaluation on the state level ESOP policy.

The most important contribution of the current paper is to provide an evaluation for a state-level ESOP tax policy. Since 1974, there have been 11 federal-level laws relating to the ESOPs plans, including the most recent tax reform effective on December 2017. A large of research papers have conducted the policy evaluation on those legislations. However, States did not get involved in employee ownership legislation proactively. HF2085, Iowa Passed in 2012, is the first local initiative regarding the employee ownership plan. This bill exempts 50% of the net income from taxation if a company is sold to an ESOP that owns at least 30% of the stock aiming at retaining businesses in Iowa communities and helping businesses achieve the competitive benefits that flow from employee ownership. What's more, the bill also provides for an appropriation of $1 million to the state economic development authority to establish a loan program for qualifying ESOPs, and to provide technical assistance, marketing, and education on ESOPs. One economic department officer of Iowa claims that the incentive of this bill is intended to incentivize owners to sell to employees rather than to non-employee buyer. Meanwhile, the price is the loss of local tax revenue. Thus, two important question arise: Is this policy effective on promoting new businesses to set up the stock ownership plan? What's the effect of this policy on existing ESOPs firms across different plan sizes? Furthermore, these two questions are of great interest because Missouri passed the same local policy in 2017 and Kansas has debated for this tax bill several times in the state legislature. Conducting the evaluation on Iowa's bill can provide significant reference value for similar states.

The former question can be answered quite straightforward by looking at the number of new plans since 2012. So the impact of new policy on those existing plan firms is of the main interest of our study. In reality, it is unlikely that all agents would respond to an intervention in precisely the same way. Therefore, in order to explore such heterogeneity in the policy influence across corporates, the Quantile Difference-in-Difference estimation is deployed for the current study. Differences-in-differences model, estimating the treatment effect by comparing the pre- and post- differences in the outcomes, has gained particular prominence on policy evaluation. Since we want to analyze not only the average policy effect, but also the influence on some particular deciles, for instance, how does the policy effect small ESOPs plans companies or what's the relationship between this new bill and very large plans' business? For this reason, we apply the quantile DID model to the current research in order to study the whole distribution of the policy effect. In addition to this, we observe that there exist large differences in mean outcomes and characteristic variables between Iowa and other control states. Regarding the potential bias, we implement a Two-step estimation in the current paper: First we employ the Propensity Score matching method to obtain a resampling control group; second we apply the resampled control group into our Quantile Difference-in-Difference procedure.

We find that through averaged treatment effect on treated, the bill reduced the ESOPs plans assets significantly. What's more, the policy has a negative correlation with firm's plan assets at most percentiles as well. Only at the 0.9 level, a positive relation is showed between the policy and the plans. From the perspective of the retaining the business, it seems the policy is not effective on increasing the plan holding ownership and even do decrease the retaining probability. However, on the financial side, by using the plan assets as a good proxy of financial strategy indicator, the paper shows the evidence that the bill helps the firms saving more cash flow directly and thus make the companies implement various market strategies in the competition.

Moreover, it is worth noting that the results we get are matching the business cycle theory very well. What's more, since 70% of the ESOPs are leveraged, we decompose the large differences in the ESOPs plan assets between the leveraged and unleveraged plans using both Blinder-Oaxaca and Quantile decomposition method to investigate the explanations accounting for such a large variation. We would like to see is the role that the plan's composition or coefficients of those composition plays various at different levels of plan assets? It is showed that the coefficients accounts for the difference significantly across all the quantile levels. Moreover, shifting the characteristics of covariates from unleveraged to leveraged, more investment would be contributed to the ESOP plan assets to support long-term corporate financing strategy. All of these finds shed further light on not only the policy evaluation from the view of business performance but also the corporate finance management.

The format for the paper is as follows. Section 2 reviews the literature and discusses the evaluation motivation. Section 3 describes the data observations. Section 4 outlines the array of techniques included in the study. Section 5 describes the interesting finds and explain the reasons taken into account. Section 6 provides more detailed consideration from the perspective of the leveraged ESOP, linking the ESOP policy to the corporate finance more closely. Conclusion is contained in Section 7.

Literature Review and Evaluation Motivation

Literature Review

Employee stock ownership plan (ESOP) became a qualified retirement plan in 1974 and then the Tax Reduction Act created a tax credit for ESOPs in the following year. Schaumburg (1976) took a closer and objective look at the ESOPs including the discussion about the plan's opportunities, problems, and alternatives. This paper was released as one of the early studies particularly on the employee stock ownership plan. After that, Pierce *et al*. (1991) introduced a conceptual model of the employee ownership's process and effect, followed by Jones and Benner (1995) described the theoretical framework of how does the employee ownership impact on individual motivation and performance in detail. They also made an empirical study of employee ownership schemes and found that firm owners can combine difference ownership mechanisms to maximize their profit. Moreover, many other researchers also supported that the equity-based employee beneficial plans plays a significant role in staff turnover reducing and human resource policies making, such as Bonn (1992) and Kruse *et al*. (2003). What's more, Mary Graham *et al*. (2002) found the positive influence of stock-related rewards on the attraction and retention of employees particularly to the small and medium size firms in the United States. Taken as a core method for employee motivation and individual performance, the ESOPs were investigated deeply from the perspective of enhancing the company performance. Kruse (1992) conducted a research in the United States market providing microeconomic evidence that the profit sharing plan indeed helped to increase individual work effect and thereby promote better firm performance. Freeman (2007) then confirmed Kruse's point of view that this employee benefit plan increased the workplace participation and firm productivity. Through the studies of different countries' empirical cases, large quantities of researchers certified that the ESOPs have a positive effect on company performance, including Ohkusa *et al*. (1997), Frye (2004), Kruse *et al*. (2012), and Lin *et al*. (2014).

With the constant reform and improvement of the tax rule on the ESOP plan, many firms began to realize that the ESOPs can play a significant role in both tax-saving and corporate-financing. At the same time, more and more studies turned their attention to the impact of the plan on a firm's financial performance particularly. A vast of literature argued the positive productivity effect of executive stock ownership programs taking return on equity (ROE), return on assets (ROA), and Tobin's Q as the performance proxy in particular. Kumbhakr and Dunbar (1993) used panel data procedure and showed the evidence that the ESOPs can help the profit increase around 3.9%. Two years later, Hamid Mehran conducted the largest research among public companies and found that the ESOPs can also help more than 50% of the corporates to experience a higher stock price in the stock exchange market. To date, Murphy (2002), Hillegeist and Penalva (2004), Sesil and Lin (2011), and Meng *et al*. (2011) strongly agree to this point of view that the executive stock ownership plan scheme indeed raise the firm's performance.

Although there are some existing works showing a neutral or negative attitude to the equity-based employee plans from the perspective of measuring corporate finance, such as Conte *et al.* (1996), Core *et al*. (1999), Brick *et al*. (2006). Those researchers said that the ESOPs reduced the business performance quite obviously with still employing ROE and ROA as the useful measurements. In addition, Pugh et al. (2001) examined that the ESOPs only provide a short-term boost to firm performance at best. Bulan *et al.* (2010) used the data of 917 American firms in a 10-year time period to argue that there is no strong evidence showing a relation between stock options strategy and business performance.

Freeman concluded that in his 2007 working paper that "Employee ownership is one of the few issues on which the political left and right can agree, and is thereby capable of attracting strong support across the US political spectrum." Given the trend of widening the ESOPs, the evaluation of related policies has attracted constant attention of many economists. In particular, the reform of the tax system is of the most interest because the tax benefits is one of the best-known features of the stock ownership plans. As early as 1976, it is clearly pointed out in Surrey (1976) that the ESOPs are in serious need of careful study from the perspective of tax rule. We can see a vast of evaluation works about each relevant federal tax reform, including Kaplan (1989), Gravelle (1992), Gamble (1998), and Hanna (2009) etc. To the best of my knowledge, a number of scholars are very interested in investigating the effect of the recent 2017 tax reform on the ESOPs.

Evaluation Motivation

It is clear that the function of the employee stock-based plans has been widely identified. Such benefit plans are employed to improve both corporate human resource management and firm productivity. They have been noted as providing the corporate an efficient financial channel as well. Moreover, much of the evaluation literature argued the effect of the tax policy on the ESOPs' firms at the federal level. Recent concerns about the state tax bill implementation are arising and it is realized that the research on a particular state tax policy is necessary and will help promote the plans' adoption and implementation. The HF2085 rule of Iowa is one of the few state-level legislation regarding the ESOP. It aims to promote the more establishments of the employee stock ownership plans to protect the community business profits of Iowa.

It is clear from data that 26 new ESOP trusts have been set up since the policy implementation. Thus, the amount of the ESOP firms of Iowa increased from 201 to 227 totally. Moreover, the data displays that only 7 new stock ownership plans were established during from 2005 to 2011. Such a striking contrast shows that the promotion effect of HF2085 is significant with this more than 10% increment. However, the ultimate goal of this tax rule it aiming at protect the Iowa's business profitability, only considering the number of new plans is far from enough. It is worth noting that to implement this new tax policy, Iowa has to sacrifice a lot of tax revenue. Thus it is very much worth evaluating this policy from the perspective of business performance. Therefore, the investigation of the policy effect on firm's performance is of the most interest of this paper.

Data Description

The current study uses a panel data involving companies from five states as follows: Iowa, Kansas, Missouri, Minnesota, Nebraska and North Dakota. We collect the data of totally 871 corporates from 2004 – 2015, a 12-year time period continuously. All the ESOP related data are obtained from National Center for Employee Ownership (NCEO), a widely used and acknowledged resource for employee stock ownership plan and equity compensation strategy analysis. Since the study focuses on the policy effect on the companies with existing ESOPs, that is all of the firms included here already set up the plan before 2004. The data set is qualified for all the techniques deployed in this paper, including matching, quantile difference-in-difference, decomposition, and counterfactual methods.

Comparing to other studies, the available information is quite limited on the ESOP related topics since most ESOPs firms are private held companies, which means on one hand, the commonly used outcome variables, such as ROE (return on equity), ROA (return on asset), and Tobin q cannot be used for this paper; on the other hand, the amount of control variables is also limited. For these reasons, the study applies the total plan asset as the dependent variable. This variable is of great analytical value for our case: Firstly, it is the most direct variable to depict the firm's employee ownership situation; Secondly, the plan assets contains much information about corporate finance because of it is consisted by both firm liability and equity. Therefore we employ the total plan asset as the outcome and five main explanatory variables in the estimation. The explanatory variables are as follows:

- Employer securities, (es), continuous variable, showing the employer stocks.

- Total plan participants, (tp), numerical variable, showing the total number of plan participants.
- Leveraged plan, (leveraged), dummy variable, indicating the plan type is leveraged or not.
- S-corporation, (sc), dummy variable, indicating the firm type.
- Industry, (indu), categorical variable, representing the different industries.

Large plan, (large), dummy variable, indicating whether the plan participants achieve 100 and above.

Data summary is as follows:

Table 5: Variable Summary

Dependent variable

Variable	Obs	Mean	Std. Dev.	Min	Max
esop	10,449	8.20e+07	4.71e+08	0	1.00e+10

Independent variables

Variable	Obs	Mean	Std. Dev.	Min	Max
es	10,449	2.99e+07	1.94e+08	0	1.06e+10
tp	10,449	3046.81	194178.7	0	1.98e+07
leveraged	10,462	.4299369	.4950905	0	1
sc	10,462	.4826993	.4997245	0	1
indu	10,462	3.719843	1.703415	1	7
large	10,462	.4337603	.4956166	0	1

What's more, the observations can be collected in the manner of treatment group and control group respectively:

Table 6: Group Information

Treatment Group – 201 ESOP firms

Variable	Obs	Mean	Std. Dev.	Min	Max
esop	2,421	3.40e+07	1.88e+08	0	3.29e+09

Control Group – 669 ESOP firms

Variable	Obs	Mean	Std. Dev.	Min	Max
esop	8,028	9.65e+07	5.27e+08	0	1.00e+10

From the data tables above, it is obvious that the mean of ESOP plan assets of the control group is much higher than the treatment state, Iowa, and also the largest ESOP plan corporate is also in the control group. We take this point as one of the potential motivations of the current policy. Iowa is the treatment state, and correspondingly the control group is consisted of Kansas, Missouri, North Dakota, Minnesota, and Nebraska. Besides the demographic and geographic reason, those five states are chosen as comparison due to their income tax rates and business types are very similar to Iowa.

Model Overview

In this section, we introduce all the techniques included in this paper. The two-step procedure, Propensity Score Matching and Quantile Difference-in-Differences, is shown first. Then, both traditional and quantile decomposition are illustrated. Moreover, the distribution regression and counterfactual distribution are contained as a significant factor in the quantile decomposition part. Although the synthetic comparison approach is not a significant role to play in this study, we still discuss briefly below.

Propensity Score Matching

Matching methods have continued to attract attention as a useful toll in the absence of random assignment since 1980s. A number of literature have claimed the effectiveness of matching, especially focusing on the propensity score matching method such as Ho et al., 2007 and Pearl, 2010. Propensity score matching (PSM) is the most commonly used one and has an intuitive appeal arising from the way it mimics random assignment through the construction of a control group post hoc (Bruson *et al.* 2002). In the paper, we apply PSM to preprocessing data to improve causal inferences in observational data.

The propensity score is defined as the conditional probability of treatment given background variables. Suppose there is an outcome Y, several background variables X, and a binary treatment T. The PSM model is as follows:

$$p\ (X) = \Pr\ (T=1|X=x)$$

where T=1 indicates participation in project and the propensity score approach is valid under the key assumption: participation is independent of outcomes conditional on X_i. That is

$$E[y_0 \mid X, d=1] = E[y_0 \mid X, d=0]$$

Thus, instead of attempting to create a match for each participant with exactly the same value of X, we can instead match on the probability of participation.

Quantile Differences-in-Differences

Quantile approach

Quantile Regression, developed by Koenker and Bassett (1978), aims estimating across different percentile levels. Quantile regression is applied on the effects of policy variables in Abadie, Angrist and Imbens (2002). Nowadays, much of the evaluation literature employ the quantile estimator to examine the distributional outcomes rather than simple averages. Under the assumption that the τth quantile of the dependent variable (y_{it}), is linear of independent variable (x_{it}):

$y_{it} = x_{it}' \beta_\tau + \varepsilon_{\tau it}$

The model for conditional QR is defined as:

$Q\tau (y_{it} | x_{it}) \equiv \inf \{y: F_{it} (y | x) \geq \tau\}$

where $Q\tau (y_{it} | x_{it})$ refers to the τth conditional quantile of y_{it} on the regressor vector $x_{it}'\beta_\tau$;

τ can take different values in (0,1) depending on the demand for analysis;

$\varepsilon_{\tau it}$ is the error term and $Q\tau (\varepsilon_{\tau it} | x_{it}) = 0$.

β_τ is the Quantile Treatment Effect (QTE) we are looking for and obtained by:

$\min \Sigma \tau * | \varepsilon_{\tau it} | + \Sigma (1-\tau) * | \varepsilon_{\tau it} | = \Sigma \tau * | y_{it} - x_{it}' \beta_\tau | + \Sigma (1-\tau) * | y_{it} - x_{it}' \beta_\tau |$

where the minimization problem in this model could be solved by employing the linear technique.

What's more, in 2011, Koenker and Hallock confirmed the application of the bootstrap method for a robust estimation. Therefore in this paper, we use the bootstrap technology to deal with standard error problem in the QR model.

Differences-in-Differences Estimation

DiD estimator is also known as the natural experiment method. It is introduced by John Snow as early as the 1850s. The essence of this approach is comparing a before-after estimate for treatment group with a before-after estimate for control group and regarding the difference as the average treatment on the treated (ATT). Blundell and MaCurdy (1999) applied the DiD estimator in the labor market case and illustrate its application in detail. Since then, the Differences-in-Differences model has become a more widely-used approach, particularly for the policy evaluation. In order to countenance the causal effect, there are two assumptions required for the panel data: the treatment is independent to outcome at baseline; treatment and comparison groups have parallel trends in outcome. The basic principle of DiD model is:

$DiD = \bar{Y}_{\text{treatment post}} – \bar{Y}_{\text{treatment pre}} – (\bar{Y}_{\text{comparison post}} – \bar{Y}_{\text{comparison pre}})$

And the DiD estimation is defined as:

$Y = \beta 0 + \beta 1*[T] + \beta 2*[D] + \beta 3*[T*D] + \beta 4*[X] + \varepsilon$

where Y denotes the outcome variables,

T refers to the time variable,

D denotes the treatment/intervention dummy variable,

X represents the covariates

ε is the error term.

the DiD regression is usually implemented as an interaction term between time and intervention dummy variables in a regression model. Accordingly:

$\beta 0$ contains the baseline average,

$\beta 1$ measures the time trend in control group;

$\beta 2$ tells the difference between two groups pre-intervention;

$\beta 3$, the subject of interest, shows the difference in changes over time; and

$\beta 4$ are the coefficients from other independent variables.

Quantile Differences-in-Difference Model

Abadie, Angrist and Imbens also argues that quantiles or distribution functions of difference may also be of interest if panel data is available. By computing the quantiles of treated and the control outcomes, we obtain the quantile treatment effect on the treated as follows:

$QTE(\tau) = F^{-1}_{Yit}(\tau) - F^{-1}_{Yot}(\tau)$ -- Quantile treatment effect

$QTET(\tau) = F^{-1}_{Yit|Dt=1}(\tau) - F^{-1}_{Yot|Dt=1}(\tau)$ -- Quantile treatment effect on treated

In this paper, we are more interested in the Quantile treatment effect on treated because we aim evaluating the policy effect on firms that are in different scales. Particular for the small and very large corporates respectively. Moreover, to proceed the two-step estimation with Propensity Score Matching first and followed by the quantile treatment effect on treated, we hold two specific assumptions, Distributional Difference in Differences Assumption and Copula Stability Assumption, refer to Callaway and Li (2017).

Blinder-Oaxaca Decomposition

Blinder (1973) illustrated this counterfactual decomposition technique and Oaxaca (1973) used it to study mean outcome differences between groups. According to this method, the difference can be explained by two parts: explained differential (composition component) and unexplained differential (structure component). Still under the linear model $Y = X'\beta + \varepsilon$, to decompose the difference between two groups, we have:

$$\begin{aligned}\Delta o &= E(Y_B) - E(Y_A)\\ &= X_B\beta_B - X_A\beta_A\\ &= (X_B - X_A)\beta_A + X_B(\beta_B - \beta_A)\end{aligned}$$

where Δo is the observed mean difference between two groups; the first part of the last line is the impact in composition component; and the second part is not explained by coefficients of those characteristics.

Quantile Decomposition

Firstly the estimation of counterfactuals should be clarified. To make it clear, we just use a simplified notation as follows:

$$
\begin{aligned}
\Delta o &= Y_B - Y_A \\
&= (Y_B - Y^C) + (Y^C - Y_A) \\
&= (XB\beta B - Xa\beta A) + (XB\beta A - XA\beta B) \\
&= (X_B - X_A)\,\beta_A + X_B\,(\beta_B - \beta_A)
\end{aligned}
$$

Where Y^C is the counterfactual outcome of group B, $Y^C = X_B\beta_A$.

Secondly, to construct the counterfactual distribution, let's define the distribution regression as the first step. The conditional distribution of the outcome Y given the set of covariates X can be expressed as:

$$F_{Y|X}(y \mid x) = E\,[1\{Y \le y\} \mid X = x]$$

where the outcome satisfies, $1\{Y \le y\}$, $y \in T \subset R$, T is countable subset of R.

Thus we can model the conditional distribution of Y given X by using a binary regression as follows:

$$F_{Y|X}(y \mid x) = P\,(Y \le y \mid X = x) = F_y\,(B(x)'\beta(y)),$$

where Fy is a link function and B(X) is a dictionary of transformations of X including a 1 as the first entry.

More important, given the conditional distribution we can obtain the conditional quantiles:

$F^{\leftarrow}_{Y|X}(\tau \mid x), \tau \in [0, 1]$,

where ← means the left-inverse of the map $y \rightarrow F_{Y|X}(y \mid x)$ on T.

Once the condition distribution is obtained, we can construct the unconditional distribution as:

$$F(y) = \int F_{Y|X}(y \mid x)\, dM(x),\ y \in T,$$

where $M = F_X$, the marginal distribution for the covariates.

Therefore, F (y) is called the "counterfactual" if *M* is not *M(x)*.

Let F_{Xk} denote the distribution of characteristics for group a when k = a, and for group b when k = b. Let $F_{Yj|Xj}$ denote the conditional distributions of outcome given characteristics for group j ∈ {a , b}. Thus the counterfactual distribution of outcome for group k facing group j characteristics is:

$$F(j|k)(y) = \int F_{Yj|Xj}(y|x)\, dF_{Xk}(x),\ y \in T$$

It is worth noting that the estimation of the counterfactual distributions can be done using the plug-in principle.

Now we can show the quantile decomposition more detailed in the manner of distribution regression:

$$F_{(b|b)} - F_{(a|a)} = \{F_{(b|b)} - F_{(b|a)}\} + \{F_{(b|a)} - F_{(a|a)}\}$$

where $F_{(b|a)}$ is the counterfactual distribution of the distribution of group a; the first part is the composition effect and the second part is the coefficient effect.

Thus the quantile decomposition is showed:

$$Q_{(b|b)} - Q_{(a|a)} = \{Q_{(b|b)} - Q_{(b|a)}\} + \{Q_{(b|a)} - Q_{(a|a)}\}.$$

The techniques relative to quantile decomposition and counterfactual distribution are proofed in detail in much literature, including Melly (2006), Chernozhukov and Fernandez (2017).

Event Study Method and Synthetic Group Approach

Event Study methodology is a statistical method to assess the impact of an event. It is traditionally used to find the abnormal return related to a company and its stock with financial market data. In this study, this approach is employed to test there are no differential trends between treatment and control groups before the treatment period. We create a time dummy variable for each time period before the treatment and use these dummies to replace the treatment variable in the Differences-in-Differences model.

Synthetic group is usually called the synthetic control method evaluating the effect of an intervention by constructing a weighted combination of groups used as controls. Thus the treatment group is compared to the re-constructed comparison group. The essence of synthetic is that “new” control group is combined by all original control groups with different weights, that is, $Y^N_{1t} = \Sigma_{wj} Y_{jt}$ for $t > T_0$. Compare to Differences-in-Differences model, one main advantage of synthetic method is to provide a better match for the treatment group before the intervention. As early as 2003, Abadie and Gardeazabal suggested this idea. The understanding and process for this approach is much intuitive and illustrated the in detail via a classic comparative case study by Abadie *et al*. (2010). Currently, the synthetic group approach is being employed into more and more research fields, including economics, health policy, political science, and criminology. One of the leading examples is Gobillon and Magnac (2016), which constructs the synthetic control group to evaluate the regional policy.

Results Analysis

Traditional approach

Difference-in-Difference regression

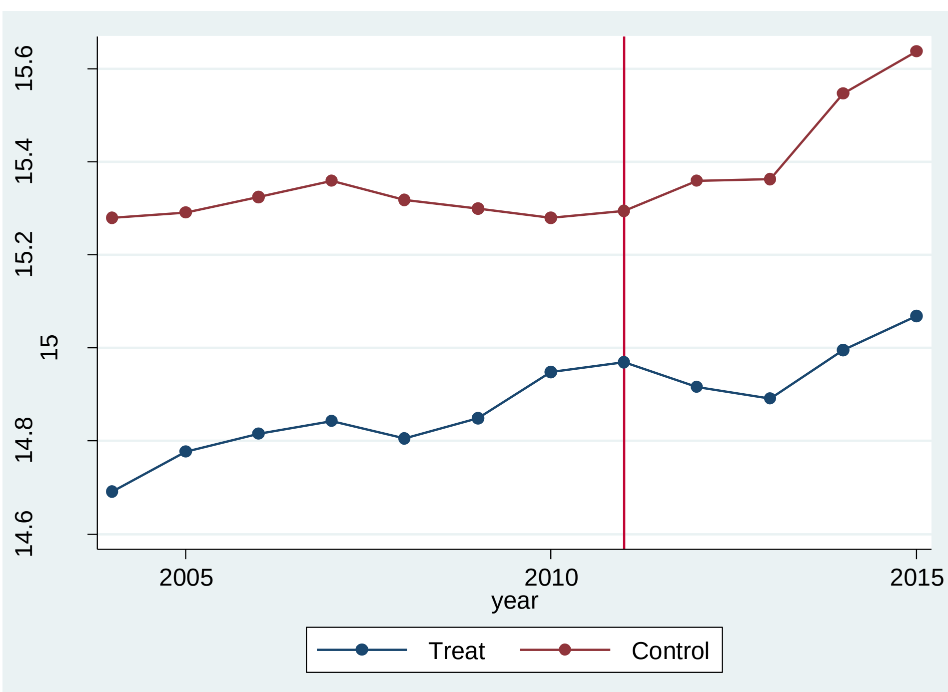
By using the traditional Differences-in-Differences estimation, we find that the intervention has a positive effect on the total asset plans. As shown on the table below, from the estimation, we can see that the ESOP total assets increased around 9 percent after the policy implementation. That means the plan assets of the ESOP trust fund are enhanced by more invested stocks or cash. It seems that the policy encouraged the employers invest more assets into the plan. In order to countenance this result, a common trend is required for the control and treatment group. However, from the trend diagram below, it is clear that trends from control and treatment are not so paralleled well. That make sense, since as mentioned, the selection of the control group considers the perspectives including geographic, demographic, life style, industrial development, and tax policies. But the ESOP issue is not so much straightforward because it is also comprised with state-level business orientation, employer motivation, corporate finance strategy, and so on. Therefore, more data-driven method should be contemplating for this study.

Table 7: Difference-in-Difference Method Estimation

log_esop	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dd	.0923757	.0306064	3.02	0.003	.0323801	.1523713
treat	-1.824843	.8432172	-2.16	0.030	-3.477745	-.1719415
post	.1968478	.0140859	13.97	0.000	.1692362	.2244593
es	1.97e-10	5.84e-11	3.37	0.001	8.23e-11	3.11e-10
tp	-9.50e-09	3.01e-08	-0.32	0.752	-6.84e-08	4.94e-08
leveraged	.6548594	.5961249	1.10	0.272	-.5136841	1.823403
large	.0682598	.3050788	0.22	0.823	-.5297656	.6662852
sc	-1.101447	1.07015	-1.03	0.303	-3.199191	.9962964
_cons	15.78626	.5516113	28.62	0.000	14.70498	16.86755
sigma_u	2.2552123					
sigma_e	.57066176					
rho	.93982323	(fraction of variance due to u_i)				

F test that all u_i=0: F(872, 8825) = 91.63 Prob > F = 0.0000

Figure 5: Parallel Trend



Event Study

Before the data-driven approach is employed, we conduct an event study first is to examine the pre-trend effect. The test results are showed as follows:

Table 8: Event Study _ pre Trend Effect Test

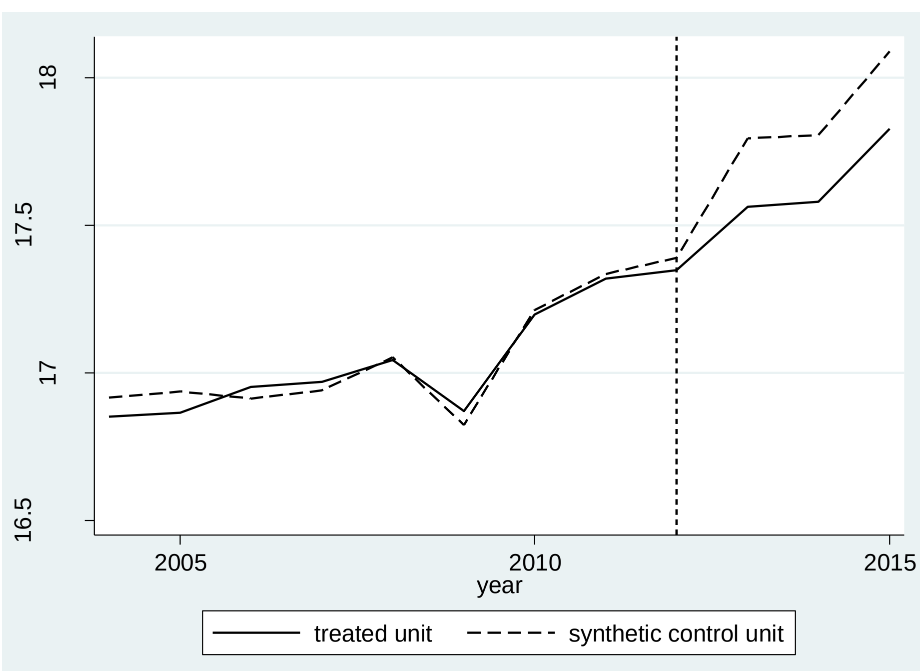
Year	coefficients	std.err	t	P > |t|
2004	-0.1522381	0.0541852	-2.81	0.005
2005	-0.0902435	0.0541706	-1.67	0.096
2006	-0.446139	0.382428	-1.17	0.243
2007	-0.092222	0.0540505	-1.71	0.088
2008	-0.0760896	0.0539793	-1.41	0.159
2009	-0.0328217	0.0538318	-0.61	0.542
2010	0.0805868	0.0530351	1.52	0.129
2011	0.1097351	0.052686	2.08	0.037
2012	0.0882091	0.0502306	1.76	0.079
2013	0.0982034	0.0497886	1.97	0.049
2014	0.0279478	0.0496435	0.56	0.573
2015	-0.0240095	0.0500679	-0.48	0.632

The table shows that it is clear the only coefficients in the year 2004 and 2011 are statistically significant, which is reasonable. On one hand, there are eight years from 2004 to 2012 (event occurrence), it is possible that some other events, policies, or business issues had influence even before the available data period on the firm's ESOP strategy and the plan assets allocation. On the other hand, in the official published "Iowa 2011 Economic Development Report", the incentives and significances of the ESOP policy reform are indicated expressly. Many firms take this report as a clear signal of the new policy's implementation. Thus, due to such an expectation, the test result shows a policy effect in 2011, a year right before the treatment period. Therefore, with all the other coefficients are not statistically significant and the two reasonable explanations, we find that there is no pre-trend effect in this study.

Synthetic Group method

It is worth taking a moment to use a data-driven approach for this study. When one of recently developed techniques: synthetic group is used, it seems like a negative influence exists on the total plan assets in Iowa's case from the picture below. Nevertheless, although the synthetic group method is much data-driven, it is not very convincing in our case since we can hardly get a good synthetic group from the available data, especially in the time rage of 2004 to 2009. What's more, selection bias is another problem arising from the current limited data. On one hand, we should have included some key observable variables in the equation such as employer stock contribution and bank loan. On the other hand, the employer's attitude to the plan is unobservable but influential on the participation of plan related policies. Therefore, to make a more precise and credible estimation under available data, we apply a two-step estimation as follows: firstly, using matching methods to eliminate the bias due to observables; then employing conditional difference-in-difference procedure to address the bias due to unobsevables.

Figure 6: Synthetic Group Method



Matching and Quantile Difference-in-Difference

Matching resampling

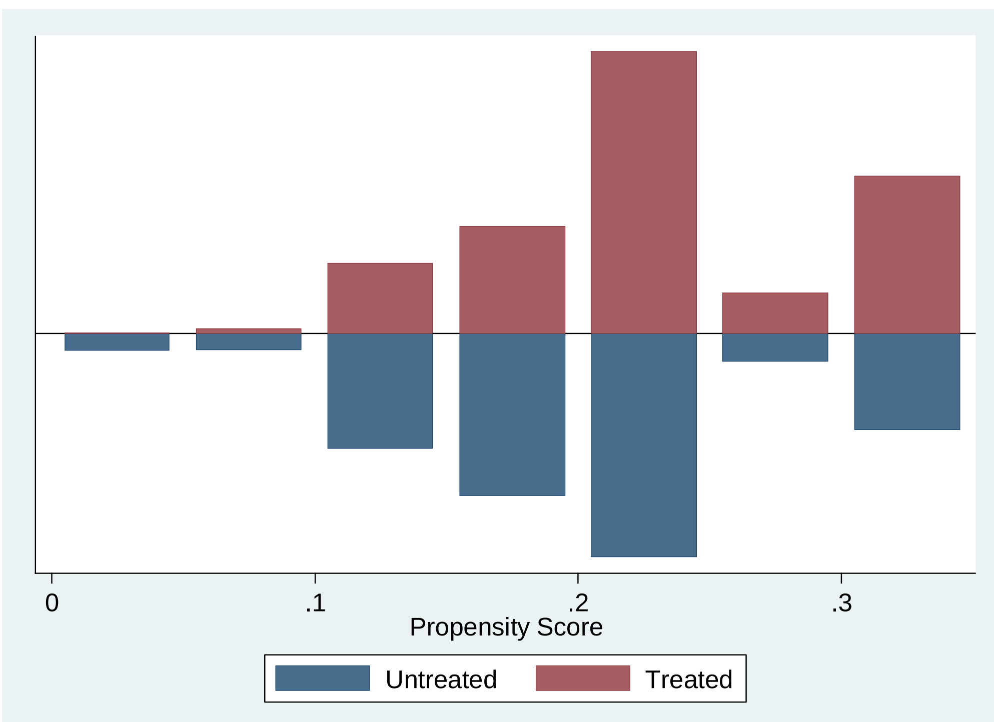
The core method of this study is a two-step estimation. In the first stage, the propensity score matching approach is applied and we resample the data set through matching the treatment group with one nearest neighbor from the comparison group. By checking the support condition, there are only three observations are off support and 2064 treated observation are valid in sample.

Table 9: Support Condition

Treatment assignment	support: Off suppo	support: On suppor	Total
Untreated	0	7,630	7,630
Treated	3	2,064	2,067
Total	3	9,694	9,697

Certainly, the Figure 2.3: Propensity Score Comparison between Treated and Untreated Group, below shows this very good support more intuitively:

Figure 7: Propensity Score Support



Although we employ the propensity score matching method to resample our data for better comparison result, it is worth noting that the ATT obtained from the matching approach is negative, which is consistent with the synthetic group technique we briefly mentioned in section 5.1. The basic for those two methods is constructing a more precise comparison group for Iowa. So here we argue that due to the limited data assess relative to the ESOP research, the original data is not recommended for estimation directly.

Table 10: Propensity Score Matching

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
log_esop	Unmatched	14.8879844	15.3639352	-.475950774	.053663106	-8.87
	ATT	14.8896566	15.026956	-.137299394	.06248362	-2.20

Quantile Difference-in-Difference Estimation

By resampling the original data set, now we construct a new study data, including the original treatment group, Iowa, with 2064 observations, and a resampled control group containing 2064 matching information. We obtain the following results through the Quantile DiD model from the new data set:

(The detailed estimation results of each level are listed in the appendix)

Table 11: Average treatment on treated & Quantile coefficients

		QDiD Coefficients				
log_esop percentiles	Observed Coef.	Bootstrap Std. Err.	z	P > |z|	Normal-based [95% Conf.	Interval]
ATT	-.25072	.0986965	-2.54	0.011	-.4441615	-.0572785
0.1	-0.5456171	0.2684758	-2.03	0.042	-1.07182	-0.0194142
0.2	-0.2248265	0.1967763	-1.14	0.253	-0.6105009	0.160848
0.3	-0.3971556	0.1324	-3.00	0.003	-0.6566548	-0.1376563
0.4	-0.2206915	0.0931071	-2.37	0.018	-0.4031781	-0.038205
0.5	-0.0638561	0.051099	-1.25	0.211	-0.1640083	0.0362961
0.6	-0.0843801	0.0800467	-1.05	0.292	-0.2412687	0.0725085
0.7	-0.0302844	0.0588996	-0.51	0.607	-0.1457255	0.0851568
0.8	-0.0964766	0.0595931	-1.62	0.105	-0.213277	0.0203237
0.9	0.1062764	0.0819478	1.30	0.195	-0.0543384	0.2668911

From the results outlined above, we gain several interesting findings. First, the coefficient of the ATT tell us that the policy intervention of Iowa affects the existing ESOP firms negatively on the plan assets. Second, with the total asset size increasing, such a negative influence reduces constantly until to the 90 percentile. Thirdly, the implementation do has a causal effect on the low tail particularly. What's more, the policy affects the very low percentile and very high percentile in an opposite direction. More specifically, only at the 0.9 quantile level, there is a positive correlation between the Iowa policy and the ESOP assets. To illustrate those findings, several reasons can be taken into account:

Recall that one of the most important advantages of ESOP is tax-deductible. Many firms set up the ESOP plan aiming to save cash flow from the tax benefits. This point is particularly vital for the small businesses. When a firm has less plan assets, the ESOP is mainly contributed by employers' own stock and company's operating cash, thus compared to leveraged plans of large plan firms, it is more sensitive to cash contribution and cash flow obtained from the ESOP trust procedure. Therefore, when the policy is implemented, it helps the small plan firms save before-tax cash directly without applying the ESOP program, small firms could benefit not only from obtaining more cash flow fast and directly but also saving time and ESOP trust operating costs. Therefore we see at the 0.1 level, the negative effect is greatest, it shows that the very small plan firms are most likely to reduce the contribution to ESOP plan and invest their cash flow to business operation directly.

Contrary to the relative small plans, the Policy reflects a positive correlation on the other polar case: very large scale ESOP plans. In general, firms with very large plan scale always take advantage of an ESOP plan to make loans from banks, which is also what we called leveraged plans. In other words, ESOPs are more taken as a vital component to a corporate's financing strategy. To keep the ESOP trust credible and attractive to banks, those companies always maintain the ESOPs asset to a certain extent since the implementation of the financing objective is much more important than other aspects, such as short-term cash returns and plan evaluation risks. Therefore, after the treatment, the large firms could take advantage of this policy to contribute more net income into the ESOP plan seeking to make loans from banks and acquire further long term benefits. We can say the policy motivates those firms invest more into the ESOPs plans. What's more, compare to the small firms, tax burden are usually much heavier for large companies. Thus taking advantage of ESOP to make contributed stocks tax-deductible is also considerable.

In addition, the results could also be explained by the business cycle theorem as well. When a firm is at the growing stage with small assets, the first goal is to expand market share by investing in market competition. Very often maintaining cash flow and saving cost are the two most important tools. So for the growing firms, ESOPs are employed as an employee motivation mechanism. Firms at this stage would like to respond to any policy helpful to saving cash and costs. In contrast, when a firm is stepping into the mature phase, with steady earnings and sustained profit, it is facing the problem of how to expand the rigid market or explore new areas. At this stage, the ESOP is considered a significant approach for corporate financing strategy to support further development of the company. What’s more, although talents are vital no matter at which stage, top management pays more attention to the assets scale of employee beneficial plans when they are evaluate a mature firm. That's another reason to maintain the ESOP assets for large firms.

Regarding the original goal of this policy: retaining the business within the Iowa community, on average, the policy do reduce the plan assets holding, that is the employee ownership decreased due to this bill. In this case, the company owner might have a higher probability to sell the firm to others, this is not what the policy aims to do. However, when looking at the quantiles results, the ESOP plan assets of very large firms increase by more than 10%. It is known that remaining the very large firms are more significant than those small business under some circumstances. Therefore, we could not say the last word to the policy’s effect considering the original goal. But we could offer the evidence that although the policy benefits the firms’ business development, it has a negative effect on the business remaining.

Extension Research

Considering the results analysis in Section 5, it is significant to realize that the ESOP type is mainly taken account of both the ESOP function and response to policy intervention. Nowadays, the leveraged ESOP plans are receiving more and more attention since it plays a significant role in corporate financing and business competition. However, so far, a number of literature pay attention to the advantages of the leveraged plan only and a number of employers still stick to unleveraged structure. For my knowledge, there is no clear research on the comparison between leveraged and unleveraged firms in detail. More specifically, in our case, there are 102 leveraged plans among the total 201 ESOPs in Iowa. That is, half leveraged compared to the other half unleveraged ownership plans. Studying on the plan type of ESOPs is meaningful for not only the policy-making but also the further research related to the ESOP's practicality. For this purpose, we employ the decomposition method and counterfactual approach to investigate some internal relation between the leveraged and unleveraged plans. In addition, we focus on the observations after the intervention for two reasons: Firstly, there is no plan type change before and after the policy implementation; secondly, to make our study applicable, it is more practical to make the study given the current policy circumstances.

Intuitively, there is a huge difference on the plan assets between unleveraged and leveraged. Several interesting question raised: What are the most important explanations accounting for these differences? Are those explanations homogeneous or different across various percentile levels? What information the difference convey to us? Then followed by the quantile decomposition via counterfactual distribution method. The results are shown as following figures.

Table 12: Blinder-Oaxaca Decomposition

```
Blinder-Oaxaca decomposition                   Number of obs     =        812
                                                 Model           =     linear
Group 1: unleveraged = 0                         N of obs 1      =        416
Group 2: unleveraged = 1                         N of obs 2      =        396
```

esop	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
overall						
group_1	3.07e+07	4607513	6.67	0.000	2.17e+07	3.98e+07
group_2	7.01e+07	1.75e+07	4.00	0.000	3.58e+07	1.04e+08
difference	-3.93e+07	1.81e+07	-2.17	0.030	-7.48e+07	-3846324
endowments	-1.09e+07	1.99e+07	-0.55	0.583	-4.98e+07	2.80e+07
coefficients	-3.15e+07	1.21e+07	-2.60	0.009	-5.53e+07	-7782663
interaction	3085783	1.37e+07	0.23	0.821	-2.37e+07	2.99e+07
endowments						
es	-1137980	3483156	-0.33	0.744	-7964840	5688880
tp	-3.38e+07	1.83e+07	-1.84	0.065	-6.97e+07	2128654
sc	2.62e+07	7900843	3.31	0.001	1.07e+07	4.17e+07
large	-2177355	1728048	-1.26	0.208	-5564268	1209557
coefficients						
es	8153881	3061672	2.66	0.008	2153115	1.42e+07
tp	-4.83e+07	1.02e+07	-4.72	0.000	-6.83e+07	-2.82e+07
sc	-2.02e+07	5419377	-3.72	0.000	-3.08e+07	-9555920
large	1.24e+07	6470623	1.92	0.055	-285351.4	2.51e+07
_cons	1.64e+07	1.07e+07	1.52	0.128	-4699577	3.74e+07
interaction						
es	1.09e+07	4479358	2.44	0.015	2132420	1.97e+07
tp	2.09e+07	1.14e+07	1.84	0.066	-1391173	4.33e+07
sc	-3.07e+07	8129464	-3.77	0.000	-4.66e+07	-1.47e+07
large	1907206	1593593	1.20	0.231	-1216180	5030591

From the figure above, we can claim that unleveraged plans hold greater plan assets than leveraged ones. It is quite intuitive because the assets of unleveraged ones only come from the employers' own contribution. However, the leveraged plans can take advantage of bank loans to invest into the ESOP trust. The more remarkable finding is the coefficients components, or so called structure components are the most important explanations accounting for this large difference. To answer the second question, then the quantile decomposition method is employed.

Table 13: Quantile Decomposition by Counterfactual Distribution

Differences between the observable distributions (based on the conditional model)

Quantile	Quantile effect	Pointwise Std. Err.	Pointwise [95% Conf.	Interval]	Functional [95% Conf.	Interval]
.1	-86437	56384.2	-196948	24074	-271197	98323.3
.2	-184236	95909.9	-372216	3743.9	-498515	130043
.3	-205873	151694	-503188	91441.8	-702946	291200
.4	-706004	258003	-1.2e+06	-200328	-1.6e+06	139422
.5	-1.3e+06	388410	-2.1e+06	-569123	-2.6e+06	-57647.4
.6	-2.4e+06	1.6e+06	-5.5e+06	665718	-7.6e+06	2.8e+06
.7	-6.0e+06	2.1e+06	-1.0e+07	-1.9e+06	-1.3e+07	908668
.8	-1.0e+07	2.6e+06	-1.5e+07	-5.3e+06	-1.9e+07	-1.9e+06
.9	-2.1e+07	2.9e+07	-7.8e+07	3.5e+07	-1.2e+08	7.3e+07

Table 14: Composition components explanation

Effects of characteristics

Quantile	Quantile effect	Pointwise Std. Err.	Pointwise [95% Conf.	Interval]	Functional [95% Conf.	Interval]
.1	53870	38818.4	-22212.7	129953	-85856.2	193596
.2	-47845	159414	-360290	264600	-621651	525961
.3	-60936	143058	-341324	219452	-575869	453997
.4	-396414	523418	-1.4e+06	629467	-2.3e+06	1.5e+06
.5	-2.6e+06	725404	-4.0e+06	-1.1e+06	-5.2e+06	40789.7
.6	-2.7e+06	1.0e+06	-4.7e+06	-626783	-6.4e+06	1.1e+06
.7	-4.8e+06	1.5e+06	-7.8e+06	-1.8e+06	-1.0e+07	740187
.8	-1.5e+07	7.6e+06	-3.0e+07	56065.1	-4.2e+07	1.3e+07
.9	-2.0e+08	8.8e+07	-3.8e+08	-3.0e+07	-5.2e+08	1.1e+08

Table 15: Structure components explanation

Effects of coefficients

Quantile	Quantile effect	Pointwise Std. Err.	Pointwise [95% Conf.	Interval]	Functional [95% Conf.	Interval]
.1	-140307	50173.5	-238645	-41968.8	-342818	62204.1
.2	-136391	140606	-411974	139192	-703907	431125
.3	-144937	114455	-369264	79390.4	-606902	317028
.4	-309590	404734	-1.1e+06	483674	-1.9e+06	1.3e+06
.5	1.2e+06	490010	279495	2.2e+06	-737890	3.2e+06
.6	214319	977021	-1.7e+06	2.1e+06	-3.7e+06	4.2e+06
.7	-1.2e+06	1.2e+06	-3.5e+06	1.2e+06	-6.0e+06	3.7e+06
.8	4.5e+06	6.0e+06	-7.3e+06	1.6e+07	-2.0e+07	2.9e+07
.9	1.8e+08	9.1e+07	3.6e+06	3.6e+08	-1.9e+08	5.5e+08

With the firm's ESOP plan assets increasing and business expanding, the differences on the plan assets becomes larger constantly. It shows that the usage of leveraged plan is much significant in the high percentiles contrast to the low quantile levels. At the relative low quantile levels, the difference is small due to the ESOP plan is mainly employed to attract talent staffs. The function of corporate financing is not obvious within small ESOP plans. In contrast, for the large size plans corporates, employer's self-contribution is substituted by the external funding channel. Analysis becomes complex when it comes to the quantile differences of the characteristics and coefficients explanations respectively. The characteristics effect contributes increasing constantly with the plan assets, however, the effect of coefficients change in opposite directions at different levels. At the lower levels, from 10% percentile to 40% percentile, coefficients play a significant role in the difference. In the range of 0.5 to 0.8 quantile, the composition components take account for the variation more. Overall, at the lower quantiles, the characteristics component plays an important role to explain the huge difference between leveraged and unleveraged assets However, at the higher levels, it is the coefficients component should be taken into account regarding the variation. This complex results will inspire us to think more about the relation between leveraged ESOP and the plan usage.

Conclusion

The aim of this paper is to provide an effect evaluation of a state-level ESOP policy on the firm's performance. Due to the particularity of the ESOP relative data, we conduct a two-step estimation. Firstly we use the propensity score matching to build a new control group for the treatment eliminating the bias from the observable characteristics. Then the quantile difference-in-difference estimation followed investigating the policy effect across levels and eliminating the bias from the unobservable characteristics. We find that the intervention affects the small firms negatively and the negative impact reduces with the plan size. In addition, at the 0.9 quantile, there is a positive relation between the policy and total plan assets. Those interesting finds are explained most by the cash flow purpose, the ESOP related corporate finance, and the business cycle theorem. On the financial side, the policy encourages different firms to take various financial strategy to market competition. On the business remaining side, the policy effect is hard to conclude in a word. In addition, we decompose the assets difference between leveraged and unleveraged plans particularly for companies in Iowa under the intervention. We find that at the lower levels, the composition component plays a significant role to take account the variation. However at the higher quantiles, the coefficients component is the main explanation for the difference.

These findings provide a lot of motivations in terms of that we may would like to think about the policy impact from the perspective of corporate financing and risk management as well. Moreover, since the leveraged plan is the development trend for all employee benefit plans, it is worth further researching, such as the influence of the transformation from unleveraged one both in the short-term and in the long run. Also the paper employed several approach to examine the policy effect, providing a comparison and suggestion on how to deal with the particular ESOP study with current limited data.

CHAPTER 3

SCENARIO ANALYSIS ON ESOP PUBLICLY TRADED COMPANIES: EVIDENCE FROM SIMULATION-BASED ESTIMATION

Introduction

The principle-agent problem began to receive much attention in 1970s. Various equity-based compensation plans have been introduced to economic parties to motivate top management to consider all employees or shareholders' benefits. Employee stock ownership plan (ESOP) is known as one of the most effective tools to address such a principle-agent problem as it links the interests of owners, managers, and employees' tightly, although some people question the usage of the stock ownership of employee as they believe it is the main reason of management dilution problem. In 1984, the Deficit Reduction Act expanded the tax benefits significantly for ESOP plans. It makes an employee ownership plan more attractive and a growing literature on the plan began to be published. At the beginning of the 1980s, most ESOP studies focused on employee motivation and retention only, and the vast majority of them show a significant favorable influence of employee stock ownership plan on corporate governance from enterprise culture and employee turnover. Pugh *et al.* (1999) and McHugh *et al*. (2005) are representatives.

The establishment of an ESOP plan becomes popular in 1990s because all plan contributions are entitled to a tax deduction, including the firm’s loan and repayment in the plan. It makes corporates available to raise funds through the plan. Thus the employee stock ownership plan has developed further and many researchers have investigated its financial function. As more and more firms have tried to borrow money and keep strong cash flow through an ESOP, the proportion of leveraged ESOPs rising rapidly. Thus, ESOPs have been considered a multi-function program not only on employee management but also on corporate finance. Many scholars tend to believe that an ESOP has a positive relation to firm’s productivity and business performance in view of multi-effects. A vast amount of literature investigates the plan has a positive effect on corporate performance, such as Teri (2017).

Moreover, many states have begun to set up their own tax bills to facilitate ESOP growth since 2010 as the state government aims to retain the business profits within its community by this equity-based plan. Therefore it is reasonable that we expect to see a booming of ESOPs over the last decades in the United States. Table 1 shows the development of the employee stock ownership plans since the 1970s.

Two sets of data deserve our attention: First, the total plan number was only 6717 in 2014. Second, although ESOP plans increased a lot in the 1990s, there is an apparent downward trend in recent years. The trend is shown more clearly in Figure 1. It is worth noting that despite various incentive policies, ESOP companies are still a minority in the whole U.S. market, and the overall number is even falling in the last ten years. We have to wonder: What is the exact effect of ESOPs on business performance? Is the financial leverage function of the plan closely related to corporate productivity? Should existing ESOP continue or abandon the project in the future? Should non ESOP firms set up a plan when provided more benefits? To answer those problems, the study revisits the ESOP effect by applying both estimation-based method and simulation- based estimation to a dynamic panel data model. Monte Carlo Study is employed to examine the various estimators. What is more, a scenario analysis is conducted based on our estimates to provide detailed decision making options for both existing ESOPs and non-ESOPs companies. This study focuses on existing publicly traded ESOP companies considering the data availability.

The essential contribution of the current paper is to investigate the ESOP effect in the dynamic panel model. To my knowledge, this paper is the first one to apply dynamic panel data to the stock ownership program. Moreover, the current study uses the indirect inference method for the first time on the ESOP related estimation. Furthermore, the ESOP project has never been any detailed analysis of this project under various circumstances. The scenario analysis in our study is of great practical for corporates to decide on an ESOP given future trends.

By estimating on public held ESOPs, we find that the ESOP has a significant positive influence on the firm's return on assets and correlated with return on equity positively. What's more, a leveraged plan can improve business performance appreciably from the investor's and shareholder's point of view. Regarding the four scenarios analyzed in the paper, on the one hand, we suggest no equipment of an ESOP plan for an intense trade war with increased tariff, particularly for the manufacturing industry. Considering a pandemic like Covid-19, the ESOP plan is strongly recommended for all firms, and a leveraged ESOP will be more effective in raising funds and protecting employees. On the other hand, if tighter regulations are imposed on equity-based plans or more ESOP-like plans are available, other options are better to consider since the cost of establishment and annual valuation is considerable.

The format for the paper is as follows: Section 2 reviews the plan background and related literature. Section 3 describes the data and methodologies are outlined in Section 4. Section 5 conducts a Monte Carlo Study. Section 6 explains main results and findings. Section 7 provides a detailed scenario analysis given various future trends. The conclusion is in Section 8.

Background and Literature review

ESOP background

An employee stock ownership plan is a qualified employee benefit plan providing employees' corporate stock ownership. It is essentially a qualified retirement benefit plan. The mechanism of an ESOP is a trust fund: a company sets up a trust. It contributes stock shares and cash into the ESOP trust to buy existing shares, and shares in the trust are allocated to individual employees. When employees leave the company, they receive their stock, which the company must buyback. The company can borrow money to buy new or existing shares, which is called the financial leverage of ESOP. ESOPs are well known for significant tax advantages. The most important tax benefit is the company's contributions to the trust are tax-deductible. That is, not only the stocks and cash contributions are tax-deductible, but also the borrowed money, which it uses to buy shares; both principle and interests are deductible. Firms can take advantage of this tax benefit to borrow money at a lower after-tax cost. What is more, employees are tax free to contribute to the ESOP and reasonable dividends are tax-deductible.

Regarding the plan's tax advantages, some recent bill reforms make business owners take a fresh look at employee stock ownership as a retirement benefit. At the federal level, one opportunity is from 2018; there is a change from a bracketed tax system to a flat corporate tax. This implicates a lower tax rate beginning in 2018, which would increase available cash for corporations and likely increase the value of its stock shares. A challenge might be the change of the reduction tax limitation: the deduction is limited to 30% of EBIT from 2022, rather than a deduction of 30% of EBITDA before. That means the deductible expenses will be lower. Thus a higher taxable income might result under this change. At the state level, Iowa passed its fit specific ESOP related bill in 2010. The bill exempts 50% taxation on net income for ESOP firms and provides one million fund support to the new plan setup. This local tax policy incentivizes company owners to sell the business to employees and remain the business within the Iowa community.

The ESOP statistics are summarized in Table 2. The latest statistics show more than 6600 existing ESOP companies, covering close to 14 million participants in the United States. Those firms control 1.3 trillion dollars in assets approximately. Of these, publicly held companies account for eight percent, and private firms ESOP funds account for ninety-two percent. However, the total participants of publicly traded companies are six times as many as privately held companies. Moreover, the total plan assets of public firms are 87% approximately. It is reasonable that the employee ownership plans of public companies are worthy of study. Besides, almost half of plans are leveraged, which means the financial function of an ESOP is being exploited actively. ESOPs are set across various industries, with a plurality in manufacturing, professional and technical services, finance and insurance, construction, and wholesale trade companies. The mentioned industries above account for 77% of plans in total.

Besides the summary information, a comparison between total plans and newly created plans is showed in Table 3. Although newly created ESOPs have continuously increased from 2014, the number of total plans has decreased obviously. As Figure 2 shows, about 260 new ESOPs are established every year, however, the descent of existing ESOPs is accelerating at the same time.

Literature Review

Employee stock ownership plan was officially granted as a qualified retirement plan in 1974, and corresponding tax preferences were expanded in the following year. The notion of organizational conflict was introduced and studied by many researchers, including Kirby (1985), Tjosvold (1988), and Wilson (1989). ESOPs began to be taken as one of the effective tools to solve a so-called principle-agent problem. Dunn and Daily (1991) describes the process of an ESOP and examines the ESOP effect on solving conflicts between managers and shareholders' interests. Kruse *et al.* (2004) and Henry *et al.* (2007) provide empirical evidence to support the plan effect against free-rider problem and principle-agent problem. Despite some literature question, the effectiveness of an ESOP, as Faleye *et al.* (2005) argued that there is no clear evidence to show a maximized value for shareholders obtained from ESOPs. The majority of research investigates that an ESOP affects corporate culture and management positively.

A study on leveraged ESOPs began to flood in the late 1980s. Significant contributions include Rosen (1989), Shackelford (1991), Field (1997), etc. After that, there is a growing literature on ESOP's effect on business performance, particularly firm productivity and financial performance. Using return on assets (ROA) and return on equity (ROE) as a proxy, a significant number of researchers find a positive effect of ESOP on corporate performance. For example, Park and Song (1996) prove the ESOP can improve financial performance in the long-term. Freeman conducted a thirty-year research on the effect of ESOP adoption. The author outlines the plan development progress and summarizes existing related functions. By identifying what we have learned about ESOP in 30 years, the author affirms the stock ownership plan's positive effect as a retirement benefit and believes this program deserves a promotion. What is more, Conte *et al.* (2019) illustrate the investor effect of ESOP, which confirms that large public companies prefer the stock ownership plan for defensive purpose and ESOP is a good signal for investors to buy the firm's stock. On the contrary, some existing works show a neutral or negative attitude toward this equity-based benefit plan. Borstadt and Zwirlein did not support a positive effect of ESOPS on a firm's performance in their research paper with an observation of 85 public held companies during 14 years.

Besides the study on productivity, profitability, or corporate culture and staff attitude, Kruse and Sesil examined the correlation between ESOP plans and firms' survival situation. They found those ESOP companies have a greater survival rate, which could be explained by increased employment stability. They analyzed the ESOP impact on employment security and pointed out that the ESOP could remain employees, especially when economic difficulties occur. In addition to research on the United States, ESOP programs have become hot topics all over the world as well. Tjakrawala (el) focused on the effect of stock ownership plan and financial leverage on return on assets and equity. It discussed the financial leverage affects both ROA and ROE significantly, but the ESOP plan does not. The results are limited since the data period is relatively short. Moreover, in 2004, a study of 220 companies are studied in French markets by Stephane Trebucq. The author argues that although the ESOP companies have more stable profitability, their business is riskier at the same time.

Study Motivation

It is well known that the ESOP companies can take advantage of tax benefits and obtain tax subsidies through a leveraged plan. However, the existing program firms are not the majority relative to the whole market. Furthermore, with new policies incentives for establishing ESOPs, the number of newly created plans stays around 260 each year, much less than the number of termination. Although growing research finds the positive effect of an ESOP on corporate performance, including employee motivation, corporate culture, firm’s productivity, and financial performance, the downtrend of ESOP’s development is explicit. All of these make us interest in the exact effect of ESOP on business performance, particularly from a financial perspective. What is more, adopting an employee stock ownership plan requires a complicated consideration due to its establishment cost and complex administration. However, to the best of my knowledge, there is no study to give firms specific program analyses and advise accordingly.

Therefore, the paper has a two-fold purpose: to investigate the effect of ESOP on financial performance by using the latest dynamic panel data; and offer a decision-making guide for companies who taking the ESOP into consideration.

Data Description

This paper estimates 621 publicly traded companies in the United States stock market across a six-year time period from 2013 to 2018. Thus a dynamic panel data is employed in this paper. In this Data set, we can take advantage of the latest available statistics concentrating on both ESOP program factors obtained from professional ESOP organization and corporate financial ratios collected from the balance sheet, income statement, and annual stock report of each public held firm. To the best of my knowledge, the number of public companies included in the current study is the largest one about the employee stock ownership topic. The data set statistics summary is shown in Table 4.

Dependent variables are ROA and ROE:

The study takes ROA (return on asset) and ROE (return on equity) as a dependent variable, respectively. ROA is the ratio to show how well a company is generating profits from total assets. At the same time, ROE measures how efficient a firm's management is at generating earnings from shareholder's equity. What is more, it is worth noting that ROA can help us find how a firm's ability to earn profits from financing leverage because the measurement of return on assets includes all assets, including those raising from liabilities and those contributed by investors. ROE is usually of more interest to shareholders since this ratio is only net income relative to equity. Both ROA and ROE have been favored to be used as a proxy for business performance. Not only are those two significant financial ratios for the corporate analysis in finance, but also they are heavily relied upon by rating agencies when accounting for borrowing approval through an ESOP program. Two ratios in our data set are obtained from each corporates' balance sheet, income statement, and Macrotrends net.

To consider various scenarios, independent variables are as follows:

- tpa (total plan assets): a continuous variable. Total plan asset is an indicator of the scale of the employee stock ownership plan and it can reflect the plan purpose since the plan is usually associated with the 401K in many large public companies.
- leveraged (Leveraged ESOP): a dummy variable showing the financial feature of the plan. 1 indicates the company uses the ESOP fund to borrow money, showing a financial function of the plan.
- large (a large-ESOP plan): a dummy variable indicating total plan participants. 1 indicates the firm is employing a large scale ESOP program, also called a broad-ESOP in much literature which represents there are more than 100 active employees participating in the plan.
- k (401k): a dummy variable reflecting company retirement options. 1 indicates the sponsor also provides 401k or KOPS as well as another optional retirement plans. Since one of the fundamental function of employee stock ownership plan is at employee motivation and retention, a retirement beneficial indicator is required in the estimation.
- tax (state of local tax benefits): a state location dummy variable, 1 indicates that the ESOP sponsoring company locates in the states where have been implementing an

individual state-level incentive tax bill or providing other plan related subsidies to existing ESOP companies.

- s-corp (S type corporation): a dummy variable showing different corporation type in tax system. 1 indicates the S type firm and 0 represents a C type corporation. Considering C-corporation and S-corporation differ a great deal in tax collecting, this variable can provide some insight when making the strategic comparison between S and C corporations. Since the scenario analysis aims to provide a very detailed guide for firms, this variable is significant in the estimation.

In conclusion, this data set's main source includes National Center for Employee Ownership (NCEO), a professional ESOP resource website; Macrotrends, providing detailed financial ratios and analysis for public held companies in the United States; Yahoo Financie, focusing on the stock market.

A vast literature has also suggested that the key financial ratios, such as ROA and ROE, are autogressive, including Socol and Danuletiu (2013), Akpan *et al.* (2020), etc. They depend on the value of their last time in a way that is not explained by the regressor. What is more, most existing studies take the AR (1) process for ROA and ROE. Since we conduct a scenario analysis for future prediction in this paper, it is also necessary to consider the correlation of current and previous time. Therefore we employ dynamic panel data in the current study.

Methodology

Dynamic Panel Data Model

By taking advantage of containing both cross-section observations and time-series data, panel data is widely used to estimate both various microeconomic and macroeconomic models. Stanca employs the panel data model as a fundamental tool for introductory microeconomic students in his paper of 2010. Regarding the use in macroeconomic fields, Blundell and Bond (2007) introduce how to use the panel data model to estimate the classic Cobb-Douglas production functions. A simple panel data model is written as:

$$y_{it} = \theta_0 + X'_{it}\theta + \varepsilon_{it} \tag{1}$$

for individual i = 1,…,N at time t = 1,…,T

where y_{it} refers to dependent variable;$\varepsilon_{it} = \mu_i + \nu_{it}$

X_{it} denotes to a set of explanatory variables;

$\varepsilon_{it} = \mu_i + \nu_{it}$;

where μ_i refers to individual effects;

ν_{it} is time varying random components;

$\boldsymbol{\theta}$ are the coefficients we want to estimate.

When we take a lagged dependent variable as a regressor in the panel data model, we capture an autoregressive nature in the process. In other words, the Dynamic Panel data model allows the dependent variable to depend on its previous value. Thus the model is dynamic. The dynamic panel data model has attracted more attention since the 1990s. In 2002, Bond made a review of primary econometric methods for dynamic panel models, particularly on microeconomic models. Bucheli *et al.* (2011) conducted a detailed comparison between static panel data to the dynamic one, and conclude that the dynamic panel model can unravel new relationships between experimental variables and highlight new paths in behaviors. Moreover, the dynamic panel data model is widely used for causal effect estimation. Sequeira examined the relationship between tourism development and economic growth by the dynamic approach and confirmed a positive effect of tourism on economic development. The formal dynamic panel data model is as follows:

$$y_{it} = \theta_0 + \alpha y_{i,t-1} + X'_{it}\theta + \varepsilon_{it} \tag{2}$$

for individual $i = 1,\ldots,N$ at time $t = 1,\ldots,T$

where y_{it} refers to dependent variable;

X_{it} denotes to a set of explanatory variables;

$\varepsilon_{it} = \mu_i + \nu_{it}$

where μ_i refers to individual effects,

ν_{it} are observation-level regressor errors;

α is the degree to which change effects the system and $| \alpha | < 1$;

$\boldsymbol{\theta}$ are the coefficients we want to estimate.

<u>First-Difference System Generalized method of moments</u>

Because the lagged dependent variables thus appear as the explanatory variables in the model, strict exogeneity of the regressor no longer holds. The Least-squares dummy variables (LSDV) are no longer consistent for a dynamic panel data model with individual effects. The bias of the LSDV estimator is known as Nickell's bias (1981) and illustrates by Anderson and Hsiao (1982).

At the same time, Anderson and Hsiao introduced the instrumental variable approach to solve the bias. Three years later, based on the consideration of estimation bias and instrumental variables, Arenallo and Bond (1991) indicate that the GMM approach can estimate dynamic panel data models, particularly on the data set with a relatively short time period for a relatively large number of observations.

The generalized method of moment estimation is taken as one of the most practical methods for panel data. It estimates the parameters to make the model moments as close as possible to the data or model moments. Vast microeconomic studies have employed the GMM estimation for dealing with panel data models. For example, Ahn *et al.* applies the GMM to estimate a linear panel data model with time-varying individual effects. Halkos (2003) employs GMM to estimate random coefficient panel data models for solving environmental causal effect problems.

Suppose we have N observations $\{y_i\}_{i=1\dots N}$, where N is the sample size. Let θ denote a $k\times1$ parameter vector and θ_0 the true parameter value. A moment condition is a statement involving the data and parameter:

Let $m_i(\theta) = m(y_i, \theta)$ be a $q\times1$ vector of functions of the data and parameters.

For the true parameter value θ_0, it satisfies $E[m_i(\theta_0)] = 0$, where E denotes the expectation.

Let $\hat{A}$ denote a $q\times q$ positive semi-definite weighting matrix, then we have

$$E[m_i(\theta)'\hat{A}\, m_i(\theta)] = 0 \tag{3}$$

We define the sample average of $m(\theta)$ as

$$\hat{m}(\theta) = \frac{1}{N}\sum_{i=1}^{N} m_i(\theta) \tag{4}$$

Thus the GMM estimator can be written as:

$$\hat{\theta} = \underset{\theta}{\operatorname{argmin}}\ \hat{m}(\theta)'\hat{A}\hat{m}(\theta) \tag{5}$$

That is the GMM estimator $\hat{\theta}$ minimizes the quadratic form $\hat{m}(\theta)'\hat{A}\,\hat{m}(\theta)$.

The difference and system generalized method-of-moment estimator are well known to apply to dynamic panel data; a model shows a linear functional relationship with the dependent variable is dynamic, depending on its past realizations. It is a better design for small T and, Large N panels, few time periods, and many individuals. The first-difference system GMM estimator combines the moment conditions in first-difference and level equations. Han and Philips proved the system GMM as a reasonable estimation for an AR (1) time series model in their paper of 2005. They further discussed this method's asymptotic properties and concluded that estimator has little bias even in tiny samples with an application to panel unit root testing. In the regression model equation (1), we see ε_{it} has two orthogonal components: the fixed effect μ_i, and the idiosyncratic shocks ν_{it}, that is:

$$E[\mu_i] = E[\nu_{it}] = E[\mu_i\,\nu_{it}] = 0 \tag{6}$$

Taking the first-difference to remove unobserved company-specific effect, we get:

$$y_{it} - y_{it-1} = \alpha\Delta y_{i,t-1} + (\Delta X'_{it})\theta + \Delta\varepsilon_{it} \tag{7}$$

Under the assumptions:

1. E [ε_{it} ε_{is}] = 0, where for i= 1,…, N and t‡s, means that the transient errors are seriously uncorrelated
2. E [y_{i1} ε_{is}] = 0 for t ≥ 2, which means y_{it-1} is not correlated with $\Delta\varepsilon_{it}$

The values of y_{it} lagged two periods is taken as instrumental variable.

The moment conditions hold for the first-difference equation is as follows:

$$E\,[\Delta\varepsilon_{it}\, y_{it-r}] = 0 \text{ and } E\,[\Delta\varepsilon_{it}\, X_{it-r}] = 0 \tag{8}$$

where r = 2, …, t-1, and t = 3,…,T.

When instruments are weakly correlated with the regressor, instrumental variable methods have a strong bias. Considering the financial ratio might be a strong autoregressive component, the lagged difference is suggested to be used as the instrumental variable for estimating equations in level. This method is so-called first-difference system GMM method. The validity of the system GMM approach requires one more mild condition on initial values as:

$$E\,[\varepsilon_{it}\ {}_{\Delta}y_{it-1}] = 0 \text{ and } E\,[\varepsilon_{it}\ {}_{\Delta}X_{it-1}] = 0 \tag{9}$$

where i = 1,…,N and t = 3,…, T

Applying moments (8) and (9) to estimation procedures (3)-(5), we obtain the first-difference system GMM estimators. It is worth noting that first-difference GMM uses moment conditions from the estimated first differences of the error term, while system GMM uses moment conditions from the first-difference and residuals levels.

Regarding how to estimate the variance-covariance matrix corresponding to the parameter estimates, there is no general answer at present which procedure, one-step or two-step estimation, outperforms. Bond and Windmeijer provide inference for both one-step and two-step GMM estimators with finite samples in linear panel data models. Erickson and Whited (2002) suggest that the two-step GMM estimation performs better than a one-step procedure regarding equation errors. Hwang and Sun (2015) recently compare the one-step GMM to two-step GMM estimation and find that the two-step GMM estimator and test perform as least and the one-step estimator and test in a large sample. However, it may harm than good sometimes if we blindly use the two-step procedure. There is no study providing a clear-cut benefit and cost comparison between one-step and two-step estimation so far to the best of my knowledge. Therefore we employ both two methods in the current study. This paper estimates the following GMM approaches: first-difference GMM, one-step system GMM, and two-step GMM on our dynamic panel model, respectively.

Indirect Inference

Bun and Windmeijer discussed the bias of the system GMM method for dealing the dynamic panel data model. They argued that a weak instrument problem might exist in level equations no matter one-step or two-step procedure is implemented. To deal with the dynamic panel data model, the simulation-based estimation is recommended by many scholars. Another consideration of the application of indirect inference comes from the specificity of ESOP data. Since the available data of ESOPs is very limited, in case of unobserved variables, the study employs indirect inference method.

The indirect inference method is firstly introduced and applied to time-series models by Gouriéroux *et al.* (1993). Since 2000, this method is widely applied to panel data as well. Gouriéroux *et al.* (2006) indicate that indirect inference provides a clear improvement over existing models in a simple dynamic panel data model. The core of the indirect inference approach is to take advantage of an auxiliary model.

Given the dynamic panel data set

$$y_{it} = G\,(y_{it-1}, X_{it}, \mu_{it}, \theta) \qquad (10)$$

where i = 1,…, N t = 1,…,T

The auxiliary model does not need to be an accurate description of the data generating process. To meet the twin criteria of statistical and computational efficiency, we could let the auxiliary model to be a linear probability function. The auxiliary model is defined by a conditional probability density function, f $(y_{it} \mid y_{it-1}, X_{it}, \beta)$, which depends on a k-dimensional parameter vector. We denote $\hat{\beta}$ to be the parameters of the auxiliary model, then we can estimate $\hat{\beta}$ as:

$$\hat{\beta} = \arg\max_{\beta} \sum_{t=1}^{T} log\ f\,(y_{it \mid yit-1}, X_{it}, \beta)$$

That is, we estimate the parameters of the auxiliary model by using the observed data and maximize its log of likelihood function, f.

After that, we use a random number generator to draw a sequence of random errors $\{\tilde{u}_{it}^{m}\}_{t=1}^{T}$, then pick a parameter vector θ to iterate on equation (10), using the observed exogenous variables and the simulated random errors to generate a simulated sequence of endogenous variables $\{\tilde{y}_{it}^{m}(\theta)\}_{t=1}^{T}$

Maximizing the average of the log of the likelihood across the M simulations to obtain

$$\tilde{\beta}(\theta) = \arg\max \sum_{m=1}^{M} \sum_{t=1}^{T} log f\,(\tilde{y}_{it}^{m}(\theta) \mid \tilde{y}_{it-1}^{m}(\theta), X_{it}, \beta)$$

The central idea of indirect inference estimation is to choose θ so that $\tilde{\beta}(\theta)$ and $\hat{\beta}$ are as close as possible.

Monte Carlo Study

The paper conducts a Monte Carlo Simulation Study to assess the performance of the above discussed estimators in terms of bias and efficiency. Recall our panel data model for this study:

$$y_{it} = \theta_0 + X'_{it}\theta + \varepsilon_{it} \tag{1}$$

for individual i = 1,…,N at time t = 1,…,T

where y_{it} refers to dependent variable;$\varepsilon_{it} = \mu_i + \nu_{it}$

X_{it} denotes to a set of explanatory variables;

$\varepsilon_{it} = \mu_i + \nu_{it}$;

where μ_i refers to individual effects;

ν_{it} is time varying random components;

θ are the coefficients we want to estimate.

Two simulations are carried out using different sample size. All results obtained from 1000 replications and the values of parameters fixed in the various Monte Carlo experiments are:

$$\alpha = 0.5,\ \theta = 1,\ \sigma_v^2 = 1$$

The simulation results are summarized in Table 5 and Table 6, including the estimators' means, the empirical standard deviation, and the root-mean-square error (RMSE) in the experiments. Table 5 shows the simulation results as T =5, N = 100. To make the comparison clearer, we use the following figure 3 to show the bias and RMSE for those estimators. We find that in the simulation with 100 individuals, the indirect inference method performs best with relatively small bias and outstanding efficiency. However, large sample bias and very low precision are found in the first-difference GMM approach. What is more, the one-step GMM model performs better among all three estimation-based methodologies. Although the root-mean-square errors are close between the one-step and two-step GMM procedures, the precision of one-step is higher than the two-step estimation.

As we increase the sample data set to N = 400, we get the simulation results showed in Table 6. We can see as the sample individual increased to 1000, the overall comparison result resembles. However, both GMM estimators and indirect inference estimators are improved considerably. This improvement can be seen in Figure 4-1 and Figure 4-2 more directly. Due to the large sample properties of the generalized method of moments, GMM estimators significantly improve both bias and efficiency. Moreover, the indirect inference estimator still has the smallest bias with the highest precision. Therefore, the estimators of indirect inference and one-step system GMM are of the main interest of analysis in our study.

Results and Findings

Table 7 provides the estimation results from three first-difference system GMM approaches. Four main findings emerge there. Firstly, the ESOP plan assets are positively correlated with a firm's return on assets. Although no significant causal relations indicated, an increased contribution to the ESOP program has a positive relation with a higher ROA ratio. Secondly, the first-difference and two-step GMM show a significant positive effect of plan assets on the company's ROE as the coefficients are 1.49e-10 and 5.41e-09, respectively. Combining with the one-step estimation, we can say the plan assets are at least positively linked to a firm's earning ability from equity. Thirdly, a leveraged plan is negatively correlated to ROA but positively to ROE. On the one hand, since ROA considers debt, given the equity constant, when a company takes debt through the ESOP, the denominator of ROA increases, and thus, the ROA ratio decreases. On the other hand, the positive coefficient of approximately 0.2 shows the more leverage a firm takes; the higher the ROE ratio is relative to ROA for the company. Fourthly, it is worth noting that it is common to consider a large or broad plan that will be much helpful on corporate culture and employee motivation, enhancing the firm's productivity. This is supported by the positive correlation between a broad-ESOP and two ratios. The one-step GMM indicates a significant positive effect of a large plan on the firm's ROA at 0.0171. Besides, a positive relationship also exists between state-level tax benefits and financial ratio, between various retirement options and business performance. It is common that a tax benefit will save more cash flow, thus increasing the net income, resulting in a higher ROA and ROE ratio. It is also reasonable that more options of retirement benefit plans can improve staff welfare directly. Corporate type is complicated to distinguish and discussed due to the details of accounting and tax bill. However, we see some evidence that ESOP S corporations have a relatively higher ROA but lower ROE compared to C corporations.

Table 8 reports the results from the indirect inference method. The following key conclusions emerge from this table. First, the ESOP plan has a positive effect on a firm's return on assets. The coefficient is 5.91e-10 and significant at the 1% confidence level. As there is 1 million more investment into the ESOP trust, a publicly held firm's ROA will increase around 0.006. It shows a positive effect of stock ownership plan on a firm's ability to generate profits from total assets. Second, a positive correlation between stock ownership plan and ROE is indicated from our results. Therefore from the estimation of Indirect Inference methodology, both ROA and ROE positively relate to the plan. Third, an ESOP trust fund's financial function affects return on assets negatively but return on equity positively. From the estimates of -0.004 and 0.2117, we see the positive effect of a leveraged plan on ROE is much higher than the negative influence on ROA. A higher ROE ratio is more attractive for investors in the financial market. That explains why more and more companies prefer to value the ESOP program on its leverage effect on corporate finance. Moreover, the plan's function of employee motivation has a more powerful significant influence on ROE than ROA, which is reflected from the positive effect of a large plan and other retirement options in the estimation. When employees are included in the plan, they become the firm's shareholders as well. It is an evidence for employees to participate in the plan since the corporate has a greater ability to generate profits through equity. This point is more critical for those public held companies than private firms since they are traded in the stock market. However, it is contrary to our common assumption that local tax benefit would increase the business performance regarding the state-level tax benefits. One reasonable explanation might be most tax bill sponsoring states require more contributions into ESOP; thus the total assets and equity increase primarily as a denominator, then the ratio decreases accordingly. Moreover, the corporate type does have an essential effect on business performance as the absolute value of coefficients is 0.024 and 0.164. Therefore the corporate type convention should be taken into consideration under various circumstances.

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Scenario Analysis

Given the estimation results, we conduct a scenario analysis according to the flow of trends in the near future. Thus all corporates, including ESOP sponsoring firms and non-ESOP companies, could predict where the firm is headed and guide their strategic decision making.

Scenario Factor 1: International Trade and Tariff

Since 1970, the U.S. tariff has stayed below 10%, and in 2016, the rate is only 5%. Notably, in 2018, the U.S. tariff on Chinese exports is 3.1%. However, the rate increased sharply to 19.3% according to an enforceable agreement on a Phase One trade deal between the United States and China in February 2020. In the future, the United States will continue to negotiate with the Chinese administration on tariff issues. It’s hard to predicate whether a “Phase two agreement” will be reached and how the new agreement will affect the international business world. The meanwhile, the negotiation about tariffs between the USA and Japan, Indian, and Europe is in process. We cannot predict the outcome of the trade war accurately, however, the volatility of international trade would affect the business significantly in the next ten years. The international trade war has a greater influence on ESOP companies than other companies, particularly those located in economically distressed areas. Because employees are both staff and firm owners, the economic cost of the tariff would impact both their job stability and retirement benefit assets.

Suppose the United States gets a strong position in trade treaties. An ESOP sponsor company engaging in international business can take advantage of the treaties and retain more profits through the plan related tax benefits. Our estimation results suggest that existing ESOP companies contributing more to the ESOP trust fund, resulting in higher profits from assets and equity. What is more, taking advantage of a leveraged plan can save cash flow and attract more investors to become more competitive in international trade. For those non-ESOP firms, an ESOP establishment could be considered as it is positively related to both ROA and ROE. However, no particular initiatives are recommended under a better trade treaty.

Suppose the exports of the Unites States will be levied on huge tariff in the next decades; In that case, those ESOP companies will be under intense pressure as we discussed, especially manufacturing companies are facing serious challenges. Although companies can apply for an exception to certain “Section 301” tariffs if specific criteria are met, other corresponding business strategy is urgently needed, rather than a retirement benefit. Regarding non-ESOP firms, we think it best not to rush into setting up the plan under trade pressure.

Scenario Factor 2: Unexpected Emergencies

We used to focus on business uncertainties, such as some triggers for market volatility when doing analysis. However, a pandemic like Covid-19 in this particular year draws our attention to consider unexpected emergency. In this August 2020, NCEO performed a survey on 160 ESOP companies to investigate how those companies handled the Covid-19 crisis. We compare the turnover rate of ESOP companies to the national data; we get the results showed in Table 9. From this survey, we can see that ESOP companies' turnover rate is much lower than the national statistics. Although the sampling size is relatively small, this result still shows evidence that the ESOP plan has a tremendous positive effect on employee attraction and retention during this period of crisis.

We believe that an equity ownership plan supports the business more under such a passive circumstance. The plan can offer employees not motivation but a sense of security when facing the pressure of unemployment. Moreover, the decreased ROA in our estimation indicates a greater ability to raise external fund through a leveraged plan. This finding is vital to most firms under emergency. An increased ROE resulted from a leveraged plan reflects a significant positive effect on the firm's financial performance. Therefore, we suggest existing non-leveraged ESOP companies take advantage of the plan to minimize corporate taxes and maximize cash preservation. In terms of non-ESOP companies, setting up an ESOP is strongly recommended if the cost is affordable. In addition to the benefits discussed above, the plan also creates liquidity for shareholders who wish to retire or reduce their ownership stake under unexpected events.

Scenario Factor 3: Tax Regulation and State-Level Bill

In 2022, there will be an ESOP deduction limitation: the deduction is limited to 30% of EBIT, rather than a deduction of 30% of EBITDA before. This bill itself does not change the ESOP related tax advantages much, but it is a clear signal that the government has planned to regulate the tax benefits rather than offering more "discount" as before. There is no signal that the federal-level tax benefits will be adjusted in addition to increasing regulation, but state-level local tax bills have increased constantly since 2012. Our estimation shows that the state-level tax policy affects the business performance slightly compared to other factors. It is still the federal tax bill that plays the dominant role in pushing the ESOP forward. Given federal-level tax remain unchanged, on the one hand, increasing regulation with no additional state-level tax subsidy will provide no incentive for firms to change, including either ESOP or non-ESOP companies. On the other hand, increasing regulation with state-level tax subsidy might encourage more new created plans, but no convincing evidence from the current study. Specific analysis is necessary for each firm given their own condition.

Scenario Factor 4: ESOP-like Options

Data from the General Social Survey (GSS) shows over 4000 qualified retirement options called "ESOP-like" plans by 2018. They have many things in common with traditional ESOPs, including equity-based bonuses, profit sharing, cash contribution invested into employee stock, and at least five active participants in the plan. Table 10 and Figure 5 show a clear trend of the development of those retirement plans. From the table we see the ESOP-like plans are increasing steadily since 2010. Another survey conducted by GSS in 2014 indicates that at least 32 million employees in the United States own employer stock through 401k plans, ESOPs, and other stock option plans. It is worth noticing that many employees prefer to participate in more than one plan. Many 401k participants also acquire stock or options from other equity-based compositions, such as ESOP or stock option plans. This phenomenon is consistent with our estimation in Section 6. Various options in a company can significantly improve both ROA and ROE from the perspective of employee motivation and, in turn, increase the firm's productivity. As more options represent more choice of employee incentive system, this point is not an essential consideration for non-ESOP firms to sponsor an exact ESOP plan.

ESOP is distinct from other similar options, mostly because of its "leverage." That makes the ESOP program outstanding in the ability to raise external funds. In our estimation analysis, the leverage function has a significant effect on the firm's ROE at 0.22 and only reduces return on asset about 0.004. Thus the ESOP is great valued by its financing function. As long as no leverage feature is equipped with other ESOP-like plans, a leveraged plan is still strongly recommended to those firms who need access to external financing.

Conclusion

The purpose of this paper is twofold: to revisit the ESOP effect and investigate the impact of various plan functions on firm's business performance; to provide a detailed strategic guide on the use of this plan based on the scenario analysis. To conduct scenario analysis, we estimate the effect of ESOP on corporate business performance as the first step. Since a dynamic panel data model is employed in this paper, three first-difference system generalized moments of methods are implemented. Moreover, the current study implements the indirect inference approach as well due to the data features.

We find that the employee stock ownership plan has a positive effect on business performance. According to the indirect inference estimation, particularly the total plan assets improve a firm's ROE significantly. From the estimation results from all methods employed in the current study, ESOP plan assets are positively correlated with a firm's ROA and ROE. Moreover, two valuable features of this plan, financial leverage, and Employee motivation, are also validated in our estimation results: a leveraged plan can improve a firm's ROE by 0.2, which will make the business more attractive to potential shareholders; a broad ESOP program has a significant positive impact on both ROA and ROE, mainly increase ROE relatively more than the return on assets. As expected, employees various retirement options can affect a firm's productivity as it increases employee incentives directly. However, we obtain an inverse estimator on the local tax bill's effect from system GMM method and indirect inference approach.

Scenario analysis is conducted according to predicted future trends. The paper suggests establishing a leveraged ESOP under pandemic such as Covid-19 because it helps reduce shareholders' stake for employees and raise external fund for the firm. Inversely, an ESOP plan is not suitable given intense trade war with high tariffs, especially in manufacturing. The high cost of exporting will double hurt employees' interests because staff in an ESOP sponsoring company are taken as both employees and corporate shareholders. Regarding the other two trends soon: strengthening tax regulation and more ESOP like retirement plans, we can conclude that as long as the federal-level tax benefits remain unchanged and no other similar options are allowed to financing, the state-level tax bill reform and more retirement plans emerging are not the fundamental considerations for target companies.

Some future work might be productive. First, we find that the simulation-based estimation provides fruitful results for the current study. As the ESOP-related data become more comprehensive and the corresponding conditional functions become more accurate, the use of simulated maximum likelihood estimation will be implemented us a more efficient estimation. Second, it is proved that the influence of leveraged ESOPs on the company's performance is constantly increasing, the financial risk function should be added into the model for further exploration.

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APPENDIX A:

CHAPTER 2: QTET ACROSS DIFFERENT LEVELS

Table A1: 0.1 Percentile Results

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Bootstrap results                               Number of obs     =      4,128
                                                Replications      =         10
                                                Wald chi2(9)      =          .
                                                Prob > chi2       =          .
```

log_esop	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
1.jime	.4048154	.272527	1.49	0.137	-.1293277	.9389586
1.exp	.5534322	.0997419	5.55	0.000	.3579416	.7489228
jime#exp						
1 1	-.5456171	.2684758	-2.03	0.042	-1.07182	-.0194142
sc	-.087857	.0967404	-0.91	0.364	-.2774647	.1017507
large	1.946528	.1125531	17.29	0.000	1.725928	2.167128
es	2.60e-08	4.44e-09	5.86	0.000	1.73e-08	3.47e-08
tp	.0000309	.0000571	0.54	0.589	-.0000811	.0001429
indu						
2	-.7916017	1.018503	-0.78	0.437	-2.787832	1.204628
3	.2512638	.2081931	1.21	0.227	-.1567871	.6593148
4	-.4971855	.2178132	-2.28	0.022	-.9240915	-.0702794
5	-.523084	.2284717	-2.29	0.022	-.9708804	-.0752876
7	-.2236666	.2404102	-0.93	0.352	-.6948619	.2475287
_cons	11.99967	.2023936	59.29	0.000	11.60298	12.39635

Table A2: 0.2 Percentile Results

log_esop	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
1.jime	.2371381	.179761	1.32	0.187	-.1151871	.5894632
1.exp	.0533302	.0833442	0.64	0.522	-.1100214	.2166817
jime#exp						
1 1	-.2248265	.1967763	-1.14	0.253	-.6105009	.160848
sc	.2647206	.1227368	2.16	0.031	.0241608	.5052803
large	1.798639	.1318367	13.64	0.000	1.540244	2.057034
es	2.75e-08	2.37e-09	11.60	0.000	2.29e-08	3.22e-08
tp	.000061	.000079	0.77	0.440	-.0000939	.0002158
indu						
2	-1.249373	.1804375	-6.92	0.000	-1.603024	-.8957222
3	.0404063	.1827307	0.22	0.825	-.3177393	.398552
4	-.3208202	.1196247	-2.68	0.007	-.5552804	-.08636
5	-.403498	.1881613	-2.14	0.032	-.7722874	-.0347087
7	-.4341489	.3031471	-1.43	0.152	-1.028306	.1600085
_cons	12.95728	.1644872	78.77	0.000	12.6349	13.27967

Table A3: 0.3 percentile Results

log_esop	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
1.jime	.2796844	.0961595	2.91	0.004	.0912153	.4681535
1.exp	.1220234	.0608463	2.01	0.045	.0027668	.2412801
jime#exp						
1 1	-.3971556	.1324	-3.00	0.003	-.6566548	-.1376563
sc	.3760899	.063147	5.96	0.000	.2523241	.4998558
large	1.558758	.078996	19.73	0.000	1.403929	1.713587
es	3.04e-08	2.86e-09	10.63	0.000	2.48e-08	3.60e-08
tp	.0001153	.0000822	1.40	0.161	-.0000458	.0002764
indu						
2	-1.369756	.115182	-11.89	0.000	-1.595508	-1.144003
3	-.172606	.0692145	-2.49	0.013	-.3082639	-.036948
4	-.2539714	.117922	-2.15	0.031	-.4850943	-.0228485
5	-.3018877	.0735097	-4.11	0.000	-.4459641	-.1578114
7	-.5695107	.2849836	-2.00	0.046	-1.128068	-.0109532
_cons	13.46306	.0890536	151.18	0.000	13.28852	13.6376

Table A4: 0.4 Percentile Results

log_esop	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
1.jime	.2002087	.0997754	2.01	0.045	.0046526	.3957648
1.exp	.0155372	.0600207	0.26	0.796	-.1021013	.1331756
jime#exp						
1 1	-.2206915	.0931071	-2.37	0.018	-.4031781	-.038205
sc	.3392293	.073004	4.65	0.000	.196144	.4823146
large	1.519377	.049475	30.71	0.000	1.422408	1.616346
es	3.42e-08	2.61e-09	13.07	0.000	2.90e-08	3.93e-08
tp	.0001821	.000046	3.96	0.000	.0000919	.0002723
indu						
2	-1.048716	.7956316	-1.32	0.187	-2.608125	.5106935
3	-.0368502	.1020945	-0.36	0.718	-.2369518	.1632515
4	-.0586715	.0933365	-0.63	0.530	-.2416077	.1242648
5	-.1077155	.0952536	-1.13	0.258	-.2944091	.0789782
7	-.3557149	.1643296	-2.16	0.030	-.6777949	-.0336349
_cons	13.67605	.0862587	158.55	0.000	13.50698	13.84511

Table A5: 0.5 Percentile Results

log_esop	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
1.jime	.1508674	.0550056	2.74	0.006	.0430585	.2586763
1.exp	.0368774	.0476212	0.77	0.439	-.0564584	.1302131
jime#exp						
1 1	-.0638561	.051099	-1.25	0.211	-.1640083	.0362961
sc	.4210962	.0403089	10.45	0.000	.3420923	.5001002
large	1.329574	.0333495	39.87	0.000	1.26421	1.394938
es	3.77e-08	2.05e-09	18.35	0.000	3.37e-08	4.17e-08
tp	.0002157	.0000602	3.58	0.000	.0000976	.0003338
indu						
2	.2193237	.4953618	0.44	0.658	-.7515677	1.190215
3	-.0384883	.0682596	-0.56	0.573	-.1722747	.095298
4	.041453	.072845	0.57	0.569	-.1013206	.1842265
5	.0187047	.0433151	0.43	0.666	-.0661913	.1036006
7	-.2028391	.1662892	-1.22	0.223	-.52876	.1230817
_cons	13.87034	.0531356	261.04	0.000	13.76619	13.97448

Table A6: 0.6 Percentile Results

log_esop	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
1.jime	.1416186	.0491018	2.88	0.004	.0453808	.2378563
1.exp	.0484796	.0514427	0.94	0.346	-.0523462	.1493054
jime#exp						
1 1	-.0843801	.0800467	-1.05	0.292	-.2412687	.0725085
sc	.4141479	.0429633	9.64	0.000	.3299413	.4983545
large	1.146981	.0984386	11.65	0.000	.9540448	1.339917
es	4.01e-08	4.64e-09	8.65	0.000	3.10e-08	4.92e-08
tp	.0002091	.0000401	5.21	0.000	.0001305	.0002877
indu						
2	.2612151	.1055035	2.48	0.013	.0544321	.4679981
3	.0635746	.0510709	1.24	0.213	-.0365226	.1636717
4	.0995013	.0839406	1.19	0.236	-.0650192	.2640219
5	.005399	.0439566	0.12	0.902	-.0807543	.0915523
7	-.1355724	.1089018	-1.24	0.213	-.349016	.0778712
_cons	14.16616	.0525023	269.82	0.000	14.06326	14.26906

Table A7: 0.7 Percentile Results

log_esop	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
1.jime	.1305431	.0286863	4.55	0.000	.074319	.1867672
1.exp	.0230908	.0547862	0.42	0.673	-.084288	.1304697
jime#exp						
1 1	-.0302844	.0588996	-0.51	0.607	-.1457255	.0851568
sc	.4538927	.035279	12.87	0.000	.384747	.5230383
large	.9444172	.0723723	13.05	0.000	.8025701	1.086264
es	4.37e-08	4.61e-09	9.47	0.000	3.47e-08	5.27e-08
tp	.000303	.0000433	7.00	0.000	.0002182	.0003878
indu						
2	.2834633	.1168374	2.43	0.015	.0544662	.5124603
3	.0899969	.0552429	1.63	0.103	-.0182771	.1982709
4	.2103228	.0616684	3.41	0.001	.089455	.3311905
5	-.0113952	.0333515	-0.34	0.733	-.076763	.0539726
7	-.1581745	.0551815	-2.87	0.004	-.2663282	-.0500208
_cons	14.3802	.0523264	274.82	0.000	14.27765	14.48276

Table A8: 0.8 Percentile Results

log_esop	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
1.jime	.1238953	.0664568	1.86	0.062	-.0063575	.2541482
1.exp	.0712509	.0384026	1.86	0.064	-.0040168	.1465185
jime#exp						
1 1	-.0964766	.0595931	-1.62	0.105	-.213277	.0203237
sc	.2728383	.0355557	7.67	0.000	.2031505	.3425262
large	.6563804	.0893257	7.35	0.000	.4813052	.8314556
es	5.70e-08	5.99e-09	9.52	0.000	4.53e-08	6.88e-08
tp	.0003482	.0000438	7.95	0.000	.0002624	.000434
indu						
2	.3769885	.0889487	4.24	0.000	.2026522	.5513248
3	.1911443	.0820599	2.33	0.020	.03031	.3519787
4	.3554875	.0790571	4.50	0.000	.2005384	.5104366
5	.0925577	.0437572	2.12	0.034	.0067951	.1783204
7	.1401639	.1241874	1.13	0.259	-.1032389	.3835666
_cons	14.65155	.0590883	247.96	0.000	14.53574	14.76736

Table A9: 0.9 Percentile Results

log_esop	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
1.jime	.0757301	.0557508	1.36	0.174	-.0335394	.1849997
1.exp	-.0325132	.0580959	-0.56	0.576	-.1463791	.0813528
jime#exp						
1 1	.1062764	.0819478	1.30	0.195	-.0543384	.2668911
sc	.1994218	.0420051	4.75	0.000	.1170934	.2817503
large	.472925	.0498387	9.49	0.000	.3752429	.5706071
es	5.86e-08	3.27e-09	17.93	0.000	5.22e-08	6.50e-08
tp	.0005448	.0000357	15.26	0.000	.0004748	.0006147
indu						
2	.4222687	.1093854	3.86	0.000	.2078772	.6366601
3	.2137764	.0742386	2.88	0.004	.0682713	.3592814
4	.423892	.0902816	4.70	0.000	.2469432	.6008407
5	.2346511	.0702838	3.34	0.001	.0968973	.3724048
7	.2139566	.1254022	1.71	0.088	-.0318271	.4597403
_cons	14.99662	.0891996	168.12	0.000	14.82179	15.17144

APPENDIX B:

CHAPTER 3 DATA AND ESTIMATION

Table B1: ESOPs Development in the United States since 1970s

Year	# Plan	#Plan Participants (in,000)
1974	1600	250
1984	4200	3,100
1994	9220	7,500
2004	8450	9,300
2014	6717	10,342

Data Source: National Center for Employee Ownership

Figure B1: Development of ESOPs in the United States from 1994 to 2014

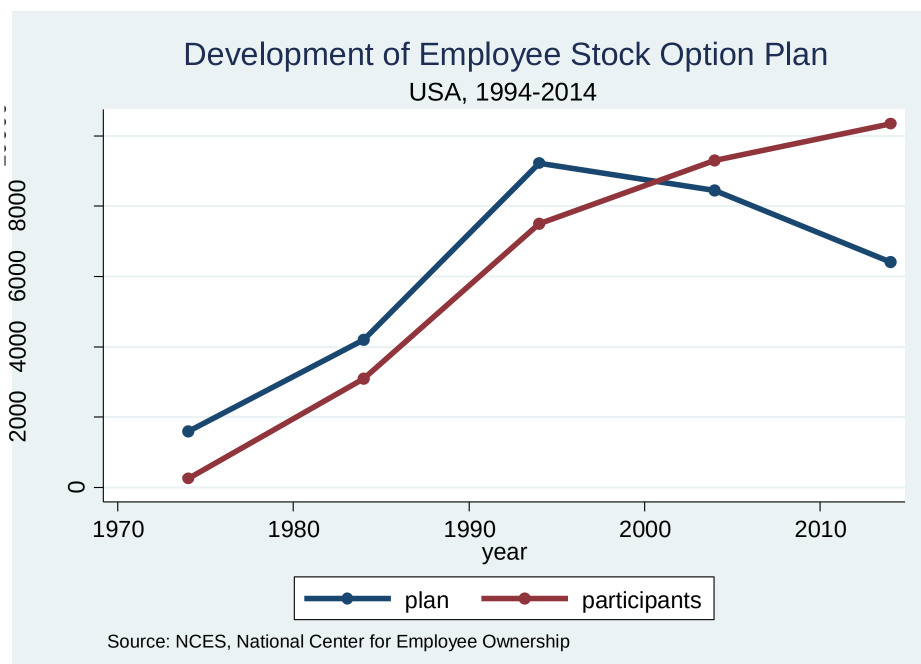


Table B2: Summary of ESOP statistics

	Plans	Active Participants	Total plan assets (millions)
Privately Held Companies	5,783	1,466,224	183,880
Publicly Held Companies	633	8,876,536	1,272,781
Leveraged ESOPs	3,149	1,537,154	256,627
non-Leveraged ESOPS	3,267	8,805,606	1,200,035
Small plans	3,363	109,967	16,093
Large plans	2,420	1,356,257	167,787
S-corporates	3,522	712,790	118,836
C-corporates	2,894	9,629,970	1,337,825

Note: small plans refer to plans under 100 participants, large are plans more than 100 participants.

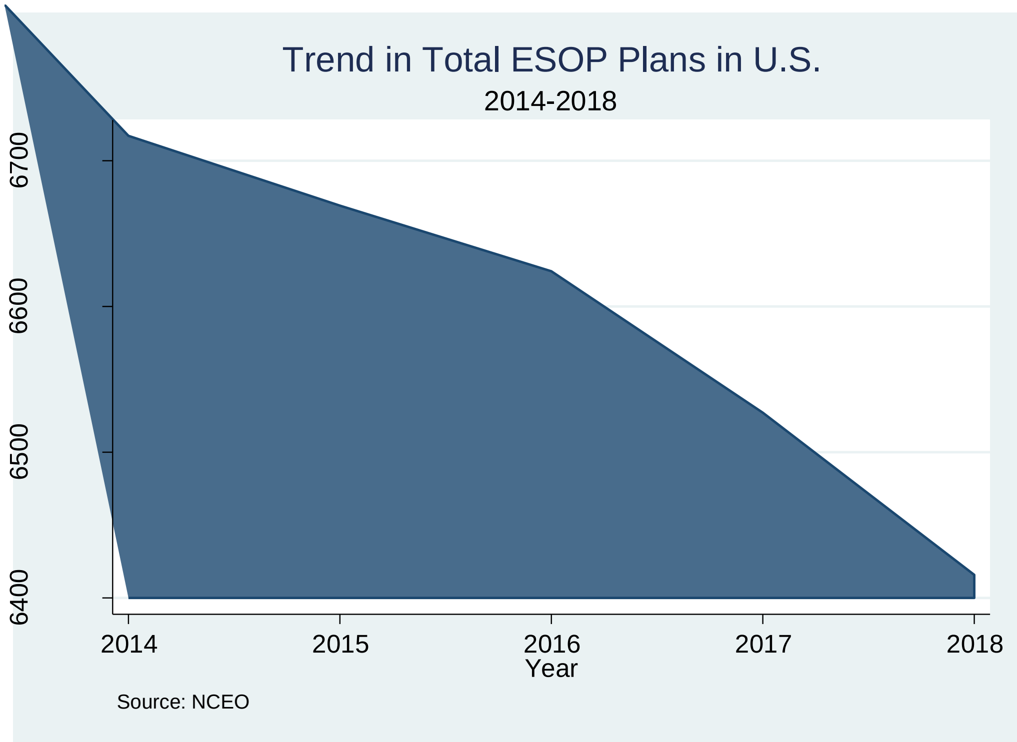
Source: National Centre for Employee Ownership

Table B3: Trend of ESOP development from 2014 to 2018

Year	Number of total ESOPs	Number of new created ESOPs
2014	6,717	230
2015	6,669	247
2016	6,624	268
2017	6,527	271
2018	6,416	289

Source: National Centre for Employee Ownership

Figure B2: Trend in total ESOPs and trend in new ESOP



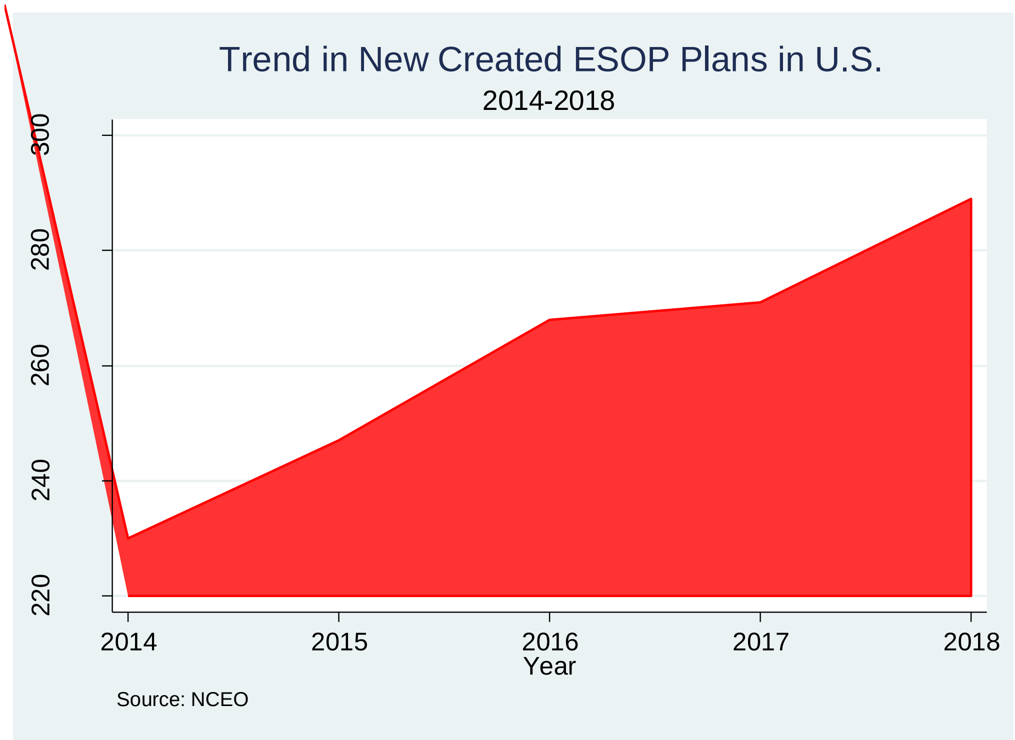


Table B4: Summary of Data Statistics

Variable	Observatio	Mean	Std. Dev.	Min	Max
year	3726	2015.5	1.708142	2013	2018
id	3726	225	129.6389	1	621
ROA	3726	0.201491	8.296338	-1.4341	430.62
ROE	3726	0.1909932	2.028562	-10.6667	93.26
tpa	3726	1.53e+09	4.51e+09	0	5.87e+10
leveraged	3726	0.2962138	0.4566712	0	1
large	3726	0.7171492	0.4504681	0	1
401k	3726	0.3051225	0.4605448	0	1
tax	3726	0.0311804	0.1738373	0	1
s-corp	3726	0.857461	0.349667	0	1
time	3726	3.5	1.708142	1	6

Table B5: Monte Carlo Study Results for N = 100

		Difference GMM	System GMM (one-step)	System GMM (two-step)	Indirect Inference
		T = 5 N= 100 α = 0.5 θ =1			
α	Mean	0.418	0.476	0.475	0.481
	Std	0.017	0.031	0.034	0.022
	RMSE	0.075	0.041	0.043	0.032
θ	Mean	1.098	0.985	0.982	1.005
	Std	0.034	0.063	0.067	0.032
	RMSE	0.051	0.042	0.042	0.038

Figure B3-1: Bias and Root-mean-square error (RMSE) for α when N = 100

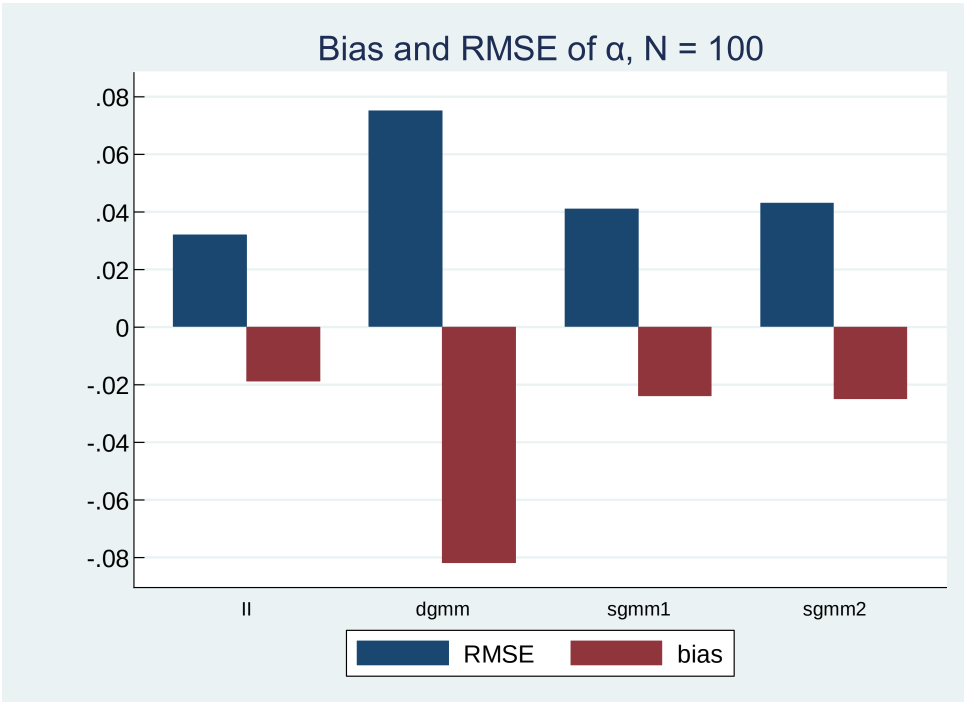


Figure B3-2: Bias and Root-mean-square error (RMSE) for θ when N = 100

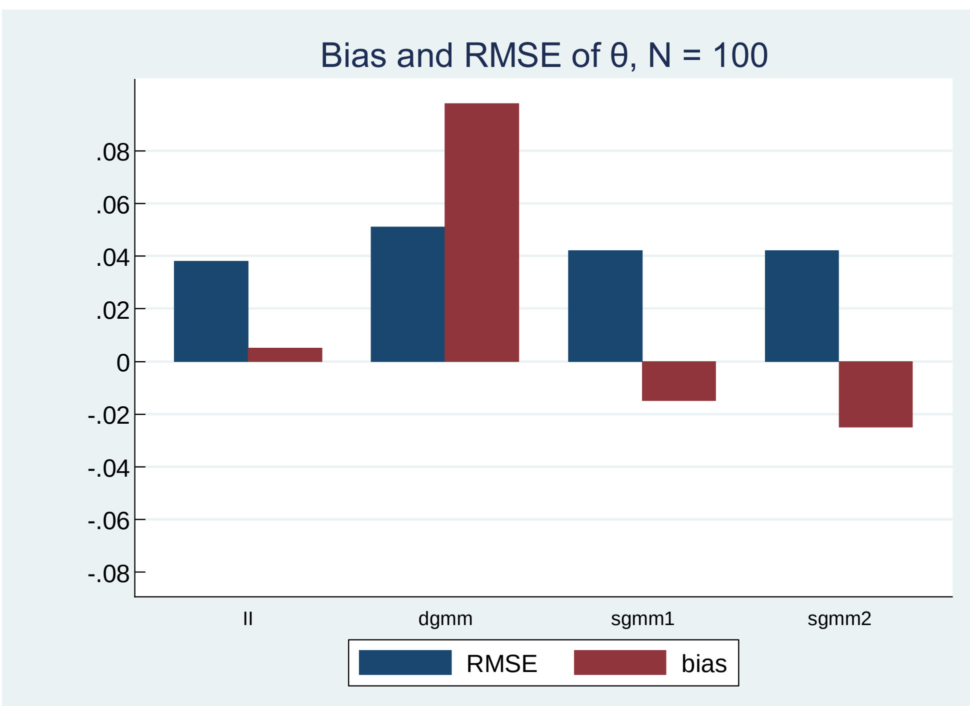


Table B6: Monte Carlo Study Results for N = 400

T = 5 N= 400 α = 0.5 θ =1					
		Difference GMM	System GMM (one-step)	System GMM (two-step)	Indirect Inference
α	Mean	0.416	0.492	0.492	0.498
	Std	0.011	0.012	0.014	0.012
	RMSE	0.075	0.019	0.021	0.011
θ	Mean	1.092	0.996	0.996	1.001
	Std	0.015	0.021	0.021	0.014
	RMSE	0.044	0.020	0.021	0.012

Figure B4-1: Bias and Root-mean-square error (RMSE) for α when N = 400

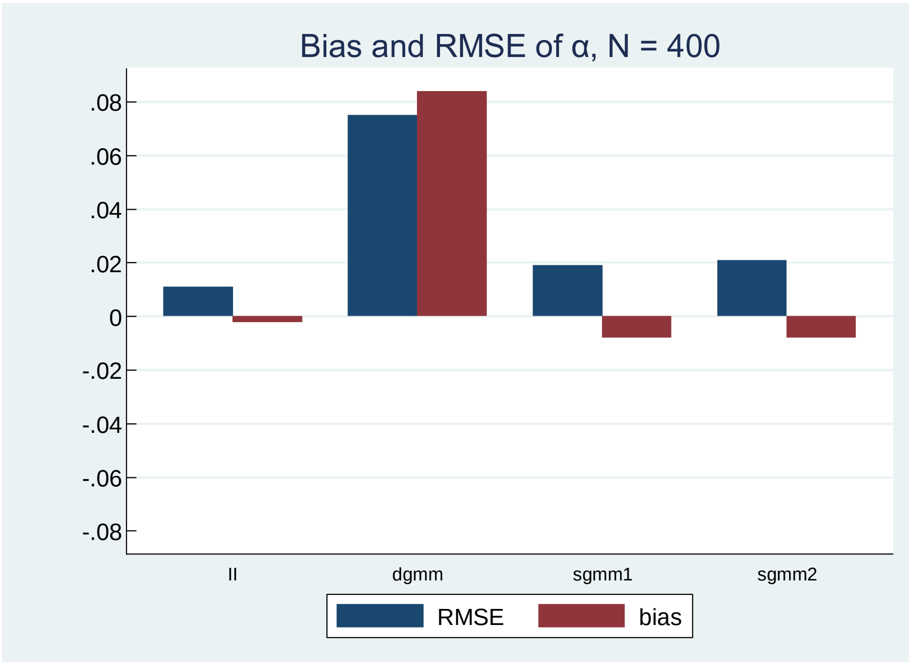


Figure B4-2: Bias and Root-mean-square error (RMSE) for θ when N = 400

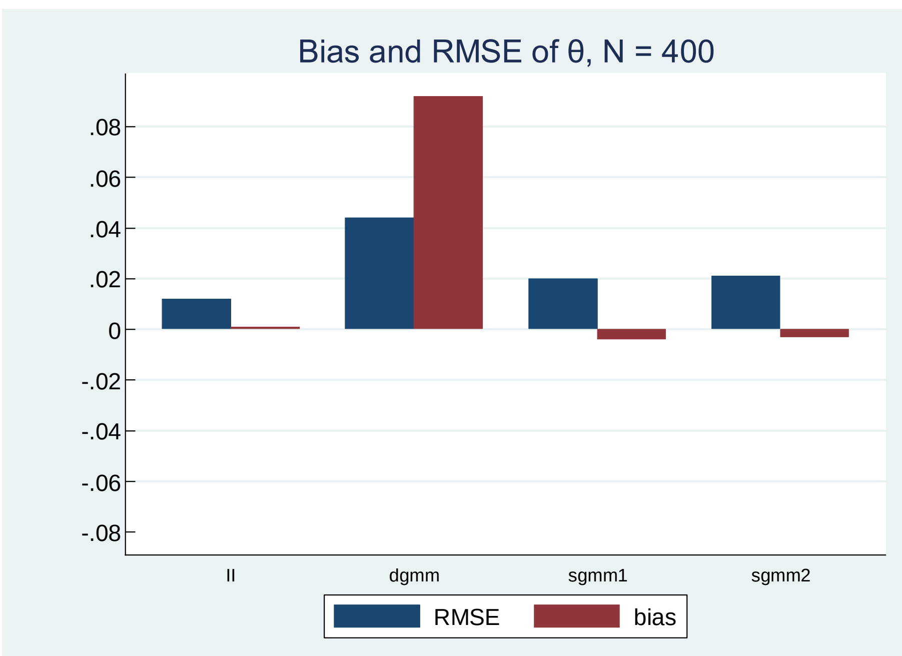


Table B7: First-Difference System GMM Estimation Results

	First-Difference GMM		System GMM (one-step)		System GMM (two-step)	
Estimator	ROA	ROE	ROA	ROE	ROA	ROE
tpa	1.29E-12	1.49e-10 **	4.75E-13	3.04E-11	4.31E-13	5.41e-09 *
	(0.38)	(2.46)	(0.95)	(1.62)	(1.27)	(1.83)
leveraged	-	-	-0.0047	0.2242 *	-0.0043	0.2439
			(0.94)	(1.94)	(0.57)	(1.43)
large	-	-	0.0171 **	0.1552	0.4361	0.106
			(2.52)	(1)	(0.26)	(1.14)
k	-	-	0.0053	0.1129	0.0109	0.0749
			(1.01)	(0.94)	(1.49)	(1.61)
tax	-	-	0.0019	0.0057	0.0002	0.0051
			(0.4)	(0.05)	(0.04)	(0.14)
s-corp	-	-	0.0381 ***	-0.1984	0.0259	-0.2239
			(2.92)	(0.66)	(1.39)	(0.97)
AR(1) (p-value)	0	0	0	0	0	0
AR(2) (p-value)	0.33	0.51	0.56	0.6	0.295	0.106
Sargan (p-value)	0.682	0.893	0.428	0.541	0.178	0.245

Absolute values of t statistics are in parentheses, standard errors are heteroskedastic-robust;
*** significant at 1% level, ** significant at 5% level, * significant at 10% level, respectively.
AR(1) and AR(2) are Arellano Bond tests for first order and second order autocorrelations in residuals, the statistics are asymptotically standard normal under the null of no serial correlation.
Sargan statistics is the test for overidentifing.

Table B8: Indirect Inference Estimation Results

Estimator	ROA	ROE
tpa	5.91e-10 ***	1.48e-11
	(6.64)	(1.42)
leveraged	-0.004 ***	0.2117 ***
	(5.6e+10)	(2.5e+11)
large	0.011 ***	0.1271 ***
	(1.3e+10)	(1.5e+10)
k	0.0029 ***	0.1036 ***
	(4.7e+09)	(1.4e+10)
tax	-0.0015 ***	-0.0241 ***
	(7.5e+10)	(6.4e+09)
s-corp	0.0241 ***	-0.1638 ***
	(2.9e+09)	(2.8e+10)

Absolute values of t statistics are in parentheses;
*** Significant at 1% level, ** significant at 5% level, * significant at 10% level, respectively.

Table B9: Survey on ESOP firms during Covid-19

Industry	# Surveyed Companies	Average quit rate	
		Surveyed Companies	National Data
All	**148**	**9%**	**31%**
Wholesale trade	11	6%	17%
Manufacturing	42	9%	19%
Architecture	9	6%	-
Construction	25	8%	28%
Engineering	13	6%	-
Professional Services	13	9%	-
Technical Services	19	9%	-
All other services	16	8%	-

Source: National Center for Employee Ownership and Bureau of Labor Statistics

Table B10: Development of ESOP-like Plans

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
# ESOP-like Plans	1,676	1,985	2,231	2,528	2,898	3,241	3,373	4,075	4,468
Source: General Social Survey (GSS)									

Figure B5: Change in ESOP-like Plans from 2010-2018