Corporate Manager's Behavior Restriction Model

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Abstract: The issues of investor protection and manager's behavior restriction have been discussed since the naissance of corporation. This paper will demonstrate the following basic hypothesis by a simple model: 1. Proper ownership structure has a restriction to corporate manager's behaviors, especially with the existence of large shareholder, ownership structure can monitor manager and reduce agency cost; 2. The protection of legal system to investor can restrict manager's behavior, then increase firm value; 3. Ownership structure and legal protection can restrict commonly manager's behavior, the more protection to investor, the more monitoring benefit will be realized under fixed monitoring cost, and large shareholder more like to monitor manager by increasing his shares; 4. The restriction of ownership structure to manager's behavior will be effected by the extent of investor protection, when the extent of investor protection increase, the volume of manager expropriating shareholder wealth, which arise from large shareholder' share increase each one unit, will decrease gradually, firm value will increase by degrees along with the strengthen of investor protection.

Key words: Ownership Structure, Investor Protection, and Manager's Behavior Restriction

I. Introduction

Research on the issues of manager's behavior restriction has been studied since Jensen and Meckling (1976) bring creatively manager's behavior and ownership structure into firm theory. Many people argue that if there exist incentive mechanism (manager hold shares) or restrictive mechanism (restriction on manager), then agency cost can be reduced, and firm performance will increase.

Fama and Jensen (1983) divided decision process into four stages: 1.decision initiation, 2.decision ratification, 3.decision implementation and 4.decision monitoring. They take stage 1 and 3 as decision management, because this is manager's responsibility; and regard stage 2 and 4 as decision control. In their opinion, 'the separation of owner right and control right' is not an exact meaning; the key that arose agency cost change is the separation of residual equity from decision management. In fact, if residual equity separate from decision management, then decision management should separate from decision control, then can restrict manager's behavior, and reduce agency cost. However, who possess decision control right to monitor manager? Shleifer and Vishny (1986) argue that under the condition of small shareholder choose 'free rider' for their own claim; large shareholder can monitor efficiently manager by exerting decision control right. Because large shareholder can get more profit from the increment of firm value by his large shares, this can offset monitoring cost.

Shleifer and Wolfenzon(2000) portray the effect of investor protection to manager limit and

firm value, and they got a series of useful results, such as with strong investor protection, can reduce agency cost, increase firm value and increase the scope of capital market. La Porta, Lopez-de-Silanes, Shleifer and Vishny(2000) proved that there is positive relationship between strong investor protection and high firm value.

From above literatures, we can get to know that it can increase firm performance to monitor manager efficiently, and the issues of free rider for small shareholder seem to inevitable, then it is reasonable for large shareholder to exert monitoring function. If firm value increase by monitoring, then large shareholder will be beneficial owner, his income can easily offset monitoring cost. More shares large shareholder has, more incentive to monitor manager, and more extent of separation of decision management and decision control right.

From the literatures of investor protection and manager's behavior restriction, the common idea we can get is that most regulations of financial markets are unnecessary because financial contracts take place between sophisticated issuers and sophisticated investors. Because entrepreneurs bear these costs when they issue securities, they have an incentive to bind themselves through contracts with investors to limit expropriation (Jensen and Meckling 1976). Stigler (1964) argues as long as these private contracts are enforced, financial markets do not require regulation. But in fact, the implementations of these private contracts need cost, when this cost big enough, it is maybe a more efficient way to monitor manager by replace private contract with legal regulation (La Porta , Lopez-de-Silanes , Shleifer and Vishny , 2000)_o

A great deal of study show that issues about ownership structure and manager's behavior, investor protection and manager's behavior are conducted independently. This paper argues investor protection not only act directly on manager's behavior, but also indirectly on manager's behavior by way of ownership structure. When investor protection strengthen, large shareholder will get more profit with fixed shares and fixed monitoring cost, then he will like to hold more shares, and like to pay monitoring cost.

This paper will incorporates elements of Becker's (1968) "crime and punishment" framework into a corporate finance environment of Jensen and Meckling (1976), to analyze the effect of ownership structure and investor protection to manager's behavior and firm value. When investor protection strengthens, manager will bear more cost if he expropriates shareholder wealth, then owner equity and firm value will increase.

This paper will be arranged as followed: section 2 present basic frame of model; section 3 study the effect of existence of large shareholder to manager's behavior and firm value, and proposition 1 will be proved; section 4 introduce investor protection to analyze the effect of it to manager's behavior and firm value, proposition 2-4 will be proved; Section 5 concludes.

II. The Model

We consider a firm in two date, at date 1, firm has a project, and this project need investment I. Firm has no other asset except for this project, this time firm value is $V_1 = I$. Suppose the profit ratio of project is a constant g, and g>i (market rate), then at date 2, discounted value of firm is $\bar{V} = \frac{1+g}{1+i}V_1$. Suppose firm only issue shares to financing, at date 2, all of earning be taken as dividend, and no tax exist. At date 2, manager can benefit themselves by expropriating firm wealth. Suppose the share of expropriating wealth by manager is $d \in [0,1]$, and then the volume of expropriating wealth is $d\bar{V}$. If expropriating behavior was found, then manager must not only return all of expropriate wealth to firm, but also was punished a great deal of fine, and volume of fine is $F = f(d) \cdot \bar{V}$, f is function of d, it is fine scale which was decided by expropriating shares. The amount of fine expressed by $F = f \cdot \bar{V}$ is relate to both fine scale f and firm value \bar{V} at date 2, its meaning is fine amount which relate to relative quantity of firm value d and absolute quantity $d\bar{V}$.

We make following assumptions for function f(d):

- 2.1 f(0) = 0,
- 2.2 f'(d) > 0 ,
- 2.3 f''(d) > 0,
- 2.4 $f'''(d) > 0_{\circ}$

Assumption 2.1 implies no fine is incurred when expropriation is zero; assumption 2.2 implies when expropriation increase, fine will increase, and f'(d) is increasing; assumption 2.3 implies that the marginal increase in the fine is increasing with the amount expropriated; assumption 2.4 is a more crucial fine, we will mainly use assumption 2.1-2.3 in the following argumentation, we will not use assumption 2.4 until to testify proposition 4.

We use large shareholder' share ($\alpha \in [0, 1]$) to express the divergence of decision management and decision control, more α , more divergence, and more efficient to limit manager's behavior.

Suppose at date 1, from the view of personal interest maximum, firm choose share α in the process of financing. Large shareholder chooses monitoring level according to his holding shares, suppose at date 1, manager's expropriation was found and to be fined with probability $k_1 \in [0,1]$, then manager maintain expropriating value with probability $1-k_1$. Because monitoring needs cost,

suppose cost function $C = c(k_1)V$, and suppose $c'(k_1) > 0$, this implies more monitoring action,

more costs happen. When size of firm \overline{V} increase, it is very difficult to monitor manager. This is

the meaning of $C = c(k_1)V$.

Because large shareholder need paying monitoring cost, so we take fine stemmed from manager as reward to large shareholder.

At date 2, discounted expectation value of firm is

$$V = \bar{V} - (1 - k_1)d\bar{V}$$
 (1)

 \overline{V} is discounted value of firm when manager does not expropriate wealth at date 2, $d\overline{V}$ is expropriating wealth, expectation expropriating volume is $(1-k_1)d\overline{V}$, final expectation value of firm will be the result of firm value at date2 subtract expectation expropriating volume.

Expectation expropriation net income for manager is

$$M = (1 - k_1)dV - k_1 f(d)V$$
 (2)

First item in the right of equation is expectation expropriation revenue; second item is expectation expropriation cost, and it equal to the product of fine sum $f(d)\overline{V}$ and fine probability k_1 .

Final expectation net income for large shareholder is

$$L = \alpha (V - V_1) + k_1 f(d) V - c(k_1) V$$
 (3)

First item in the right of equation is the income from firm expectation net income $(V - V_1)$ according to large shareholder' shares α in firm; second item $k_1 f(d) \bar{V}$ is expectation fine gained by large shareholder; third item is monitoring cost paid by large shareholder. We bring equation (1) and $V_1 = \frac{1+i}{1+g} \bar{V}$ to equation (3) then

$$L = \alpha [\bar{V} - (1 - k_1)d\bar{V} - \frac{1 + i}{1 + g}\bar{V}] + k_1 f(d)\bar{V} - c(k_1)\bar{V}$$

= { $\alpha [\frac{g - i}{1 + g} - (1 - k_1)d] + k_1 f(d) - c(k_1)$ } \bar{V}
= [$\alpha (\frac{g - i}{1 + g} - d) + \alpha k_1 d + k_1 f(d) - c(k_1)$] \bar{V}

First item in equation is large shareholder' income from firm actual net income (equal to firm project net income $\frac{g-i}{1+g}\bar{V}$ minus expropriation wealth d) with his share α , other three items

 $[\alpha k_1 d + k_1 f(d) - c(k_1)]V$ is large shareholder' net income from monitoring, it include monitoring revenue $(\alpha k_1 d\bar{V} \text{ and } k_1 f(d)\bar{V})$ and monitoring cost $c(k_1)\bar{V}$.

III. The Role of Large Shareholder to Manager's Behavior Restriction

In this section, we will demonstrate the effect of large shareholder to manager's behavior and firm value by former models.

Suppose manager and investor are rational, and they know each other is rational also, manager must make expectation value of firm bigger than initial value of firm when he expropriate firm wealth, namely $V > V_1$.

Because \overline{V} is only a constant factor in above equations, and it has no effect to our conclusion,

therefore we will omit \overline{V} in following operations.

First consider manager's behavior, at date 2, in order to maximize income $M = (1-k_1)d - k_1f(d)$, manager will choose appropriate *d*, and with condition $V > V_1$, then issues will come down to following maximization problem:

$$\max_{d} M = (1 - k_1)d - k_1 f(d)$$
(4)

Such that $V > V_1$

The optimal *d* should satisfies the following first order condition:

$$k_1 f'(d) = 1 - k_1 \tag{5}$$

The left side of equation (5) is the marginal expectation cost of expropriation, it equal to the product of fine increment f'(d) and fine probability k_1 ; the right side is the marginal expectation income of expropriation, it equal to the product of expropriation income per unit from firm and keep expropriation wealth with probability $1-k_1$.

From equation (5), we get expropriation d is the function of k_1 , then derivate k_1 into both side of equation (5), we get:

$$f'(d) + k_1 f''(d) \cdot d'_{k_1} = -1$$

Bring $f'(d) = \frac{1-k_1}{k_1}$ (from equation (5))into above equation, and rearrangement:

$$d'_{k_1} = -\frac{1}{k_1^2 f''(d)} \tag{6}$$

From assumption 2.3 know f''(d) > 0, and $k_1^2 > 0$ obviously, then $d'_{k_1} < 0$, therefore we get following proposition.

Proposition 3.1 when monitoring level increase, expropriation extent will decrease, $d'_{k_1} < 0$.

When monitor level increase, expropriation income will decrease because the probability of manager keep expropriation income will decrease. More expropriation, more fine happen, therefore, given high monitoring level, manager will reduce expropriation action, and then we get following inference:

Inference 3.1 manager expectation expropriations $(1-k_1)d$ is decreasing for k_1

As stated above, expropriation d is decreasing for k_1 ; the probability of manager keep

expropriation $1-k_1$ is decreasing for k_1 also, and then $(1-k_1)d$ is decreasing for k_1 . Known

that expectation value of firm $V = 1 - (1 - k_1)d$ is decreasing for d, we get to know V will increase with the increase of k_1 , this implies that firm value will increase when monitor level increase. From above assumption that all of earning be taken as dividend, then shareholder's expectation value will increase also, therefore, we have following inference:

Inference 3.2 Expectation value of firm V is increasing for k_1 , then expectation dividend for

shareholder (include large and small shareholders) is increasing for k_1

How ever, how to get k_1 ? What factors will effect k_1 ? We will have a theoretical explanation by analyzing large shareholder's behavior.

At date 1, large shareholder should choose α and k_1 to maximize his net income, then we have following expression:

$$\max_{\alpha,k_1} L = \alpha \left[\frac{g-i}{1+g} - (1-k_1)d \right] + k_1 d - c(k_1)$$

as for equation (5), rewrite it we have $f'(d) = \frac{1-k_1}{k_1}$, to integrate both side with d, we have

 $f(d) = \frac{1-k_1}{k}d + c$ (c is a constant), from assumption 2.1 f(0) = 0, then c=0, $f(d) = \frac{1-k_1}{k}d$.

Because large shareholder is rational, he can forecast manager's behavior at date 2 from date 1, and take actions, then bring $f(d) = \frac{1-k_1}{k_1}d$ into L equation and rewrite it:

$$L = \alpha \frac{g - i}{1 + g} + (1 - k_1)(1 - \alpha)d - c(k_1)$$

As for different level α , different k_1 will be chosen by large shareholder, then k_1 is function of α , $k_1 = k_1(\alpha)$. To derivate both side of L with α , and let it equal to 0, we have the first order condition for large shareholder'net value maximization:

$$\frac{g-i}{1+g} - (1-k_1)d - \frac{dk_1}{d\alpha}[c'(k_1) - (1-k_1)(1-\alpha)d'_{k_1} + (1-\alpha)d] = 0$$

Rearrangement equation :

Rearrangement equati

$$\frac{dk_1}{d\alpha} = \frac{\frac{g-l}{1+g} - (1-k_1)d}{c'(k_1) - (1-k_1)(1-\alpha)d'_{k_1} + (1-\alpha)d}$$
(7)

When manager choose with d at date 2, he must obey condition $V > V_1$, namely $\frac{g-i}{1+g} - (1-k_1)d > 0$, then the numerator of (7) is positive. From assumption 2.2 $c'(k_1) > 0$, and from

proposition 1 $d'_{k_1} < 0$, then $-(1-k_1)(1-\alpha)d'_{k_1} > 0$, and $(1-\alpha)d > 0$, so the denominator of (7) is positive also, therefore, we get following proposition:

Proposition 3.2 when the shares hold by large shareholder increase, his monitor level will

increase also, $\frac{dk_1}{d\alpha} > 0$

According to above analysis, the expropriation level d is decreasing for k_1 , from proposition

3.2 we get $d'_{\alpha} = d'_{k_1} \cdot \frac{dk_1}{d\alpha} < 0$, then we have following inferences:

Inference 3.3 when the shares hold by large shareholder increase, the expropriation will decrease, $d'_{\alpha} < 0$

Inference 3.4 when the shares hold by large shareholder increase, expectation expropriation $(1-k_1)d$ will decrease also.

Inference 3.5 when the shares hold by large shareholder increase, expectation value of firm will increase, then expectation dividend will increase also.

From proposition 3.1-3.2 and inference 3.1-3.5, hypothesis 1 mentioned in above is tenable, this implies that large shareholder can monitor manager efficiently, the more shares he hold, the more monitoring he will do, and more value firm will realize.

VI. The Common Role of Ownership Structure and Investor Protection

to Manager's Behavior Restriction

Different investor protection induces different expropriating wealth. In this section, we will take investor protection into our model, to study the role of investor protection to manager's behavior, and its effect to the role of large shareholder' monitoring.

Suppose manager expropriation was found and to be fined and return wealth to firm with probability of k, this time k was influenced by not only monitoring level k_1 but also the extent of investor protection $k_2 \in [0,1]$, then k is the function of k_1 and k_2 , namely $k = k(k_1,k_2)$. Suppose k satisfy following assumption conditions:

4.1
$$k(k_1,0) = 0$$
,
4.2 $k(k_1,1) = k_1$,
4.3 $\frac{\partial k}{\partial k_1} > 0$,
4.4 $\frac{\partial k}{\partial k_2} > 0$,
4.5 $k_{12}''(k_1,k_2) > \frac{2\frac{\partial k}{\partial k_1} \cdot \frac{\partial k}{\partial k_2}}{k}$.

Assumption 4.1 implies that when there are no legal protections for investor ($k_2 = 0$), whatever monitoring level large shareholder take, manager can expropriate firm wealth with no fine; Assumption 4.2 implies that when there are legal protections for investor ($k_2 = 1$), the monitoring level is fine probability of expropriation; Assumption 4.3 implies that with a constant extent of investor protection, more level of monitoring, more fine probability of expropriation; Assumption 4.4 implies that with the enhancement of investor protection, fine probability of expropriation will increase even other conditions unchanged.

When other condition unchanged, we can get some expressions which similar with (1), (2) and (3)

At date 2, expectation value of firm
$$V = V - (1-k)dV$$
 (8)

Expectation expropriation value
$$M = (1-k)dV - kf(d)V$$
 (9)

Large shareholder' expectation net income $L = \alpha (V - V_1) + kf(d)\bar{V} - c(k_1)\bar{V}$ (10)

We study manager's behavior begin from date 2 also, at date 2, manager's behavior can be

come down to following expression (\overline{V} was omitted also):

 $\max M = (1-k)d - kf(d)$

Such that $V > V_1$

The optimal d should satisfies the following first order condition:

$$kf'(d) = 1 - k$$

Then we can get $d'_{k} = -\frac{1}{k^{2} f''(d)}$ from above equation. Obvious $d'_{k} < 0$, and $\frac{\partial k}{\partial k_{2}} > 0$ from assumption, then $\frac{\partial d}{\partial k_{2}} = d'_{k} \cdot \frac{\partial k}{\partial k_{2}} < 0$, therefore, we get following proposition:

Proposition 4.1 when other conditions unchanged, increase of investor protection can reduce expropriation

Since
$$\frac{\partial d}{\partial k_1} = d'_k \cdot \frac{\partial k}{\partial k_1} < 0$$
, we get

Proposition 4.2 with a constant extent of investor protection, more level of monitoring, less expropriation happen

Similar with section 3, we get following inferences.

Inference 4.1 when other conditions unchanged, increase of investor protection k_2 can reduce

expectation expropriation, then can increase firm value and dividend

Inference 4.2 with a constant monitoring level, the increase of monitoring level k_1 can reduce expectation expropriation, then increase firm value and dividend

As for difference level of investor protection, in order to maximize their income, large shareholder can choose different α and k_1 , so we will analyze large shareholder's behavior choice.

At date 1, large shareholder' income maximum issues can come down to following expression:

$$\max_{\alpha, k_1} L = \alpha (V - V_1) + kf(d) - c(k_1)$$

= $\alpha [\frac{g - i}{1 + g} - (1 - k)d] + kf(d) - c(k_1)$ (11)

Bring $f(d) = \frac{1-k}{k}d$ into (11), we get: $L = \alpha \frac{g-i}{1+g} + (1-k)(1-\alpha)d - c(k_1)$

Suppose k_2 is set, to derivate right side of L equation with α , and let it equal to 0, we get following first order condition for large shareholder maximum:

$$\frac{g-i}{1+g} - (1-k)d - \frac{dk_1}{d\alpha} [c'(k_1) - (1-k)(1-\alpha)d'_k \frac{\partial k}{\partial k_1} + (1-\alpha)d \frac{\partial k}{\partial k_1}] = 0$$

Then we get

$$\frac{dk_1}{d\alpha} = \frac{\frac{g-i}{1+g} - (1-k)d}{c'(k_1) - (1-k)(1-\alpha)d'_k \frac{\partial k}{\partial k_1} + (1-\alpha)d \frac{\partial k}{\partial k_1}}$$
(12)

We can get $\frac{g-i}{1+g} - (1-k)d > 0$ from such that $V > V_1$, so the numerator of (12) is positive.

$$c'(k_1) > 0$$
 from assumption, since $\frac{\partial k}{\partial k_1} > 0$, $d'_k < 0$, then $-(1-k)(1-\alpha)d'_k \frac{\partial k}{\partial k_1} > 0$, because

 $(1-\alpha)d\frac{\partial k}{\partial k_1} > 0$, then $\frac{dk_1}{d\alpha} > 0$. Therefore, we get following propositions:

Proposition 4.3 under condition of established investor protection, when large shareholder' shares increase, he more like to monitor manager

Combine proposition 4.3 with proposition 4.2, we get following inference:

Inference 4.3 under condition of established investor protection, when large shareholder' shares increase, expropriation will reduce ($d'_{\alpha} = \frac{\partial d}{\partial k_1} \cdot \frac{dk_1}{d\alpha} < 0$), firm value and dividend will increase

increase.

Suppose investor protection level is k_2^* , large shareholder chooses shares α^* and monitoring level k_1^* . Given that large shareholder' net income $L = \alpha(V - V_1) + kf(d) - c(k_1)$, If k_2 increase to $k_2^{**} > k_2^*$, large shareholder can chooses lesser $k_1^{**} < k_1^*$, and $k^{**} = k^*$, then large shareholder' monitoring cost $c(k_1)$ will decrease; Since k is unchanged, then d is unchanged, so kf(d) is unchanged also; if large shareholder want to increase his net income, he must chooses increase α , then we get proposition 4.4:

Proposition 4.4 if investor protection enhance, then large shareholder like to increase to hold more shares, namely $\frac{d\alpha}{dk_2} > 0$.

From proposition 4.3 we get k_1 is increasing with α , then we get inference:

Inference 4.4 if investor protection enhance, then large shareholder more like to monitor, namely $\frac{dk_1}{dk_2} = \frac{dk_1}{d\alpha} \cdot \frac{d\alpha}{dk_2} > 0$. Since $\frac{dk}{dk_2} = \frac{\partial k}{\partial k_1} \cdot \frac{dk_1}{dk_2} + \frac{\partial k}{\partial k_2}$, from assumption 4.3-4.4 and inference 4.4 we can get $\frac{dk}{dk_2} > 0$,

then we get inference 4.5:

Inference 4.5 if investor protection k_2 enhance, then k not only increase directly ($\frac{\partial k}{\partial k_2} > 0$), but also increase indirectly ($\frac{\partial k}{\partial k_1} \cdot \frac{dk_1}{dk_2} > 0$), firm value and dividend will increase.

So far, we have testified hypothesis 1,2 and 3.

As for equation kf'(d) = 1 - k, derivate both side with α , we get:

$$d'_{\alpha} = -\frac{\partial k}{\partial k_1} \cdot \frac{dk_1}{d\alpha} \cdot \frac{1}{k^2 f''(d)}$$

Because we consider only the direct effect of k_2 to d'_{α} by k, thus can let $\frac{dk_1}{d\alpha}$ equal to constant G, then we get $d'_{\alpha} = -G \frac{\partial k}{\partial k_1} \cdot \frac{1}{k^2 f''(d)}$, derivate partial both side with k_2 , we get following expression:

$$d_{ak_{2}}'' = -G \frac{k_{12}''k^{2}f''(d) - \frac{\partial k}{\partial k_{1}} [2k \cdot \frac{\partial k}{\partial k_{2}} \cdot f''(d) + k^{2} \cdot f'''(d) \cdot d_{k}' \cdot \frac{\partial k}{\partial k_{2}}]}{[k^{2} \cdot f''(d)]^{2}}$$
$$= -G \frac{k \cdot f''(d)(k \cdot k_{12}'' - 2\frac{\partial k}{\partial k_{1}} \cdot \frac{\partial k}{\partial k_{2}}) - k^{2} \cdot f'''(d) \cdot d_{k}' \cdot \frac{\partial k}{\partial k_{1}} \cdot \frac{\partial k}{\partial k_{2}}}{[k^{2} \cdot f''(d)]^{2}}$$
(12)

From assumption 4.5 we get $k_{12}'' > \frac{2\frac{\partial k}{\partial k_1} \cdot \frac{\partial k}{\partial k_2}}{k}$, thereby $k \cdot k_{12}'' - 2\frac{\partial k}{\partial k_1} \cdot \frac{\partial k}{\partial k_2} > 0$, because

f''(d) > 0, then the first item in numerator is positive; According to assumption and $d'_k < 0$, we get $-k^2 \cdot f'''(d) \cdot d'_k \cdot \frac{\partial k}{\partial k_1} \cdot \frac{\partial k}{\partial k_2} > 0$, then the second item in numerator is positive also, therefore,

 $d''_{\alpha k2} < 0 \, .$

Because $d'_{\alpha} < 0$, let $W = -d'_{\alpha} > 0$, then $W'_{k_2} = -d''_{\alpha k_2} > 0$, then we get proposition 4.5:

Proposition 4.5 if investor protection k_2 increase, W (expropriation decrement volume produced by α increase each one unit) will increase.

Proposition 4.5 demonstrate that when investor protection increase, the role of large shareholder to manager' behavior restriction will strengthens, firm value will increase, hypothesis 4 is tenable.

V. Conclusion

This paper demonstrate that large shareholder has incentive to monitor manager by a simple model, this urge manager to make great efforts for owner's interest, further, with the increase of large shareholder' shares, the extent of monitoring will strengthen, and firm value will increase. At the same time, strong investor protection can restricts manager's aberrancy, and reduce agency cost. When investor protection strengthens, large shareholder like to hold more shares, and enhance control manager's behavior. With the improvement of investor protection, the roles of large shareholder to manager's monitoring will strengthen.

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