

Investor Protection and Ownership Decentralization

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Abstract: In this paper, on the premise that the expropriation of corporate assets by controlling shareholders would generate a residual loss, we studied how the laws of investor protection influenced on the decentralization of corporate ownership, the penalty and the cost of litigation. There are several interested conclusions we reached. At first, the effective protection of minority shareholders will lead to the decentralization of ownership, which is irrelevant to whether there is litigation cost or who should pay the cost. Second, if litigation costs remain unchanged, effective minority shareholder protection laws will evolve along a self-reinforcing path. On the other hand, if the penalty remains unchanged, effective minority shareholder protection laws will cause litigation costs to increase over time. These conclusions are irrelevant to who pays the litigation cost. Last, pay the cost by minority shareholders or controlling shareholders will cause litigation costs to increase or decrease with the penalty.

Keywords: Agency Behavior; Residual Loss; Investor Protection; Litigation Costs; Ownership Decentralization

JEL Classification: C61; G38; K22

I. Introduction

The evolution of the modern corporate structure can be traced back as early as Berle and Means (1932). They believed that the restriction of the prioritization of existing shareholders by law cleared an obstacle for the corporation to issue shares. Followed by the ownership decentralization of large corporations, the result is the separation of corporate ownership and control as well as the emergence of agency problems. Jensen and Meckling (1976) proposed the concept of agency costs, including monitoring costs, bonding costs and residual loss. According

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to Jensen and Meckling, entrepreneurs' expropriation of corporate assets for on-the-job consumption will lead to a decrease in the value of the corporation and thus lead to agency problems, whereas a reasonable capital structure can effectively reduce agency costs. Jensen (1986) studied the agency problem caused by free cash flow, suggesting that the abuse of cash flow by corporate management would lead to the loss of shareholder's wealth. These studies appeared to have deviated from Berle and Means' topic about the role of law in corporate finance and mainly focused on how contractual arrangements in this context reduce agency costs. However, jurists began to be concerned about the legality of the controlling shareholders' behavior (Clark, 1986). In the field of economics and finance, Shleifer and Vishny (1997) comprehensively reconsidered the impact of law on corporate finance. On the premise of the controlling shareholder's role in corporate governance (Shleifer and Vishny, 1986), they study the role of investor protection in corporate financing. Empirical studies by La Porta et al (1997, 1998) mean that investors would provide financing for the corporation when the law can effectively protect the interests of minority investors. Demirgüç-Kunt and Maksimovic (1998) obtained similar results. Since then, La Porta et al (1997, 1998) conducted empirical studies on ownership structures in different countries. The results of these studies mean that effective investor protection influences the corporate ownership structure. In addition, firm's having a higher ownership concentration is the result of the failure to protect minority investors. The results of these empirical studies make it clear that the origin of the law is very important. The English common law has a comparative advantage in the protection of minority investors over French civil law (La Porta et al, 2002), helping to decentralize ownership and to increase the value of corporations. Albuquerque and Wang (2008) present one of the first dynamic stochastic general equilibrium models to study the implications of imperfect investor protection for risk sharing and asset pricing. Their results indicate that effective investor protection can increase corporate value and reduce investment risk. However, they do not study the impact of investor protection on the decentralization of ownership (Shleifer and Wolfenzon, 2002).

Although these studies have obtained fruitful results, there are still two issues should be discussed. First, La Porta et al (1997, 1998) suggest that laws that effectively protect minority shareholders are the cause of the decentralization of corporate ownership; this is the opposite conclusion to that drawn by Bebchuk and Roe's (1999) study. Bebchuk and Roe believe that decentralization of ownership was the cause of the evolution of the law. This difference may

stem from the selected perspectives; economists and juriconsult adopt different perspectives, and their study results differ as a result. In this paper, based on the legislation "norm" defined by Coase (1960, 1977), assuming that the law is aimed at eliminating the waste of wealth caused by agency behavior, which is called residual loss in Jensen and Meckling (1976), we study the possible consequences of investor protection. The results mean that effective investor protection is an important cause of ownership decentralization. However, in the fourth part of this paper, the legal effectiveness will be discussed from *ipso facto* to show that minority shareholders' desire for greater value-added is the reason for the existence of investor protection legislation. If we consider demand of minority shareholders for greater value-added as the reproducible *ipso facto* in context of Hayek (1978), then the conclusions reached from studies based on fact or norm may not be the same. Second is the impact of the cost of litigation, which is neglected in the above-mentioned references. In Berle and Means' view, the desire to reduce the cost of litigation is the reason for which restrict the priority of old shareholders. Over the past three decades, the increase in the costs of litigation has been the concern of juriconsult (Jethro, 1981). According to Posner (1992), the increase in litigation costs will reduce the efficiency of law enforcement. Katz (1987) and Prichard (1988) compare the impact of how the cost of litigation is borne on the welfare of both parties in two Anglo-American judicial proceedings. Although Djankov et al (2003) mentioned the cost of litigation in their paper; they do not pay attention to the payment of litigation cost how to influence on the level of the wealth of minority shareholders and the decentralization of ownership. Our research results showed that effective investor protection is the cause of the decentralization of ownership. This conclusion is independent of whether the litigation cost exists or who will pay the litigation cost. Furthermore, after studying the judicial proceedings of the payment of litigation costs, we found that the "British" judicial proceedings result in decreases of litigation costs with penalty. If the penalty remains unchanged, regardless of who pay the litigation cost, it is difficult to avoid an increase in litigation costs. Fortunately, our results showed that if the law can effectively protect the legitimate rights and interests of minority shareholders, with the decline of the ownership ratio of controlling shareholders, litigation costs will decrease; this is precisely one of the important issues outlined by Berle and Means (1932).

The structure of the rest of this paper is as follows. The second part of the paper is the model. In this section, we will establish a continuous time finance model based on the method of

Albuquerque and Wang (2008) to study minority shareholder's wealth loss caused by agency behavior. Then, in the third part of the paper, we will investigate the characteristics and the outcome of effective investor protection. We will also study the impact of the judicial proceedings related to the payment of the litigation cost on the outcome. The fourth part of this paper will briefly discuss the *de facto* effectiveness of legal punishments, the private benefits of control and the composition of agency costs. The last part of this paper contains the conclusions.

II. The Model

In this section, we will establish a model to analyze the loss of social wealth caused by agency behavior, which is the residual loss. We first define that the corporate asset value follows the following stochastic process in the absence of agency behavior:

$$dV = (\mu V - c_1)dt + \sigma V dz \quad (1)$$

where V is the corporate asset value, μ is the expected rate of return of the corporate asset, c_1 represents the dividends for the shareholders paid by the corporation, σ is the standard deviation of the rate of return, and dz is the Weiner increment. By using the Bellman equation to find the solution of the optimal dividend payout (Merton, 1990), we can obtain the expected dividend value c_1 in the absence of agency behavior. We then assume that there is the controlling shareholder and that the controlling shareholder will expropriate the corporate assets (Johnson et al, 2000; Djankov et al, 2008), so that the stochastic process followed by asset value becomes

$$dV = [\mu(1-b)V - c_2]dt + \sigma V dz \quad (2)$$

where c_2 represents the paid dividends under this condition and μbV ($0 < b < 1$) is the value of the asset expropriated by the controlling shareholders. Based on the conclusions of Demsetz and Lehn (1985), we assume that ownership structure will not affect the level of return and the level of risk of the corporate assets, so μ and σ are constants. In this way, by establishing the Bellman equation we can also solve the optimal dividend payout c_2 when self-interested controlling shareholders expropriate corporate assets. We can define the residual loss coefficient as follows:

$$c_1 - c_2 = \eta_{12} \mu b V \quad (3)$$

If $\eta_{12} > 0$, this indicates that expropriation by the controlling shareholders will lead to a minority shareholder's wealth loss. Furthermore, we notice that the cash flow obtained by controlling

shareholders is $\omega c_2 + \mu bV$ in which ω is shareholding ratio by the controlling shareholder. If the following inequality holds:

$$c_1 > c_2 + \mu bV \quad (4)$$

this indicates that the controlling shareholder expropriate asset value bV will lead to a greater decline of dividend payout than bV . Correspondingly, when $\eta_{12} > 1$ at this time, the behavior of controlling shareholders has already caused the loss of wealth of society. Based on Jensen and Meckling (1976), we define the loss as residual loss. Therefore, $\eta_{12} = 1$ is a critical state. The use of dividends rather than the present value of dividends or Tobin's Q as the indicator of agency behavior is two reasons. First, dividends can reflect the residual loss at a certain time point in a timely manner, whereas the present value of dividends includes the information of a certain time interval; therefore, the information reflected by dividends is more accurate. Second, if solve the residual loss coefficient via the present value or Tobin's Q, the growth rate of the asset is different under different conditions, and the results obtained are difficult to use for describing the dynamic information of related variables. After understanding the framework of this model, we first examine the dividend payout in the absence of agency behavior, which is the benchmark for this paper.

2.1 Benchmark of research

Suppose the utility function of the corporate shareholders is $u(c) = c^\alpha$, of which c is the expected value of dividends that the corporation pays to its shareholders and $\alpha \in (0,1)$. According to Equation (1), we know that the corporate asset value follows the following stochastic process:

$$dV_1 = (\mu V_1 - c_1)dt + \sigma V_1 dz; \quad V_1(0) = V_0 \quad (5)$$

The optimal decision-making model of corporate shareholders is as follows:

$$\begin{aligned} & \text{Max}_{c_1} \int_0^{+\infty} e^{-rt} c_1^\alpha(t) dt \\ & \text{s.t. } dV_1 = (\mu V_1 - c_1)dt + \sigma V_1 dz, V_1(0) = V_0 \end{aligned} \quad (6)$$

We can obtain the expected dividend payment levels $c_1(t)$ by solving the Bellman equation:

$$\begin{cases} c_1(t) = A_1 V_1 \\ V_1 = V_0 \exp(B_1 t) \\ A_1 = \frac{r - \alpha \mu}{1 - \alpha} + \frac{\alpha \sigma^2}{2} \\ B_1 = \frac{\mu - r}{1 - \alpha} - \frac{(1 - \alpha) \sigma^2}{2} \end{cases} \quad (7)$$

Equation set (7) provides two pieces of information. First, if it is given that the corporate asset value does not change, then the dividend payout ratio is $c_1/V_1 = A_1$, $A_1 < 1$. Second, the growth rate of the corporate asset value in the absence of agency behavior is $\exp B_1 t$, assuming $B_1 > 0$. Next, we will examine the situation when the controlling shareholder is present.

2.2 Controlling shareholders behavior

We assume that shareholding ratio of the controlling shareholder is ω ($0 < \omega < 1$) and that he has the power to determine the corporate expected dividend payout level c_2 , and the ratio of the corporate asset expropriated by the controlling shareholder is μb . The cash flow obtained by the controlling shareholder is thus:

$$c_{21} = \omega c_2 + \mu b V_2 \quad (8)$$

According to Albuquerue and Wang (2008), the decision-making pattern of self-interested controlling shareholders is:

$$\begin{aligned} & \underset{c_{21}}{Max} \int_0^{+\infty} e^{-rt} c_{21}^\alpha dt \\ & s.t. dV_2 = [\mu(1-b)V_2 - c_2]dt + \sigma V_2 dz; \quad V_2(0) = V_0 \end{aligned} \quad (9)$$

Substitute equation (8) into equation (9) to obtain:

$$\begin{cases} c_{21}(t) = \omega(A_1 + \mu b A_{21})V_2 \\ V_2 = V_0 \exp(B_1 + \mu b B_{21})t \\ A_{21} = -\frac{\alpha(1-\omega)}{(1-\alpha)\omega} \\ B_{21} = \frac{1-\omega}{(1-\alpha)\omega} \end{cases} \quad (10)$$

Substitute (10) into (8) to obtain a dividend payout level:

$$\begin{cases} c_2 = (A_1 + \mu b A_{22})V_2 \\ A_{22} = -\frac{1-\alpha\omega}{(1-\alpha)\omega} \end{cases} \quad (11)$$

Relative to Equation (7), the expropriation of corporate assets by the controlling shareholders leads to a decline in the ratio of the dividend payment to the total asset, where the rate of this decline is $\mu b A_{22}$. The expropriation of the corporate asset by the controlling shareholder will cause them to pursue a larger asset scale, $V_2/V_0 > V_1/V_0$. We will not examine the economic consequences of the controlling shareholder's decision-making behavior. According to Equation (3), we can produce the residual loss coefficient:

$$\eta_{12}(t) = \frac{A_1(\exp(-\mu b B_{21}t) - 1)}{\mu b} - A_{22} \quad (12)$$

Equation (12) provides us with two pieces of information. First, the expropriation of corporate assets by controlling shareholders may cause them to pursue a larger corporation scale, and $V_1/V_3 = \exp(-\mu b B_{32}t) \leq 1$; therefore, $A_1(\exp(-\mu b B_{21}t) - 1)/\mu b$ represents the impact on the residual loss from the tendency of the controlling shareholder to expropriate assets rather than to pay dividends due to the expansion of assets. Second, the dividend policy made by the controlling shareholders may not accommodate the interests of the minority shareholders; on the contrary, due to the existence of the expropriation of assets, the share of dividends in total assets will reduce. From Equation (11), we know that $c_3/V_3 - c_1/V_1 = A_{22} < 0$. Based on the result when $t=0$, we can get proposition 1.

Proposition 1: From Equations (11) and (12) we know $\eta_{12}(0) = -A_{22} > -1$ and when $t = 0$, $\partial \eta_{12}/\partial \omega$.

Proposition 1 shows that the residual loss is difficult to avoid if the controlling shareholders expropriate corporate assets; it corresponds to $\eta_{12} > -1$. At the same time, if $\partial \eta_{12}/\partial \omega < 0$, and then it indicates that a higher holding ratio of the controlling shareholders indicates a lower residual loss. If $\omega = 1$, then $c_1 = c_2 + \mu b$; here, there is no residual loss. This condition corresponds to the situations in the study by JM where there are no agency costs. Consider the two situations $\eta_{12} = 0$ and $\eta_{12} = 1$, then we can obtain Proposition 2.

Proposition 2: (1) If $t \leq t_{21}$, then $\eta_{12} \geq 0$, in which $t_{21} = \frac{1}{\mu b B_{21}}[\ln \frac{c_1}{V_1} - \ln \frac{c_2}{V_2}]$; (2) If $t \leq t_{22}$, then $\eta_{12} \geq 1$, in

which $t_{22} = \frac{1}{\mu b B_{21}}[\ln \frac{c_1}{V_1} - \ln(\frac{c_2}{V_2} - \mu b)]$; (3) $\frac{dt_{21}}{db} > 0, i = 1, 2$ and $t_{21} > t_{22}$.

Part 1 of Proposition 2 provides the conditions for the wealth loss of minority shareholders. That is, up to t_{21} , the dividend paid to them can equal to the dividend payment level in the absence of agency behavior. Of course, the minority shareholders can choose to sell their shares on the market, but in the case of $\omega > 0.5$, the behavior of minority shareholders would not cause mergers and acquisitions to take place, which means that they need to be patient. Second, Part 2 provides the conditions for a residual loss to exist, meaning that in the time interval $[0, t_{22}]$, the agency behavior of controlling shareholders will lead to a residual loss, and this part of the loss will be borne by the minority shareholders. In order to explain Proposition 2 more clearly, we present Figure 1. In Figure 1, $\mu = 0.1$, $\alpha = 0.5$, $r = 0.06$, $\sigma^2 = 0.04$; these variables can describe the

annual corporate earning and risk levels in the above model. In Figure 1, an asterisk delineates the residual loss coefficient curve over the time when $b = 0.08$. Obviously, it takes 100 years to observe the absence of wealth loss of minority shareholders under the condition $b = 0.08$, whereas it takes 50 years for there to be no residual loss; this is very unfair for minority shareholders.

We now carry out marginal analysis. First, we are going to look at the impact of the expropriation of assets by controlling shareholders on η_{12} :

$$\frac{\partial \eta_{12}}{\partial b} = \frac{A_1}{\mu b^2} \left(1 - \frac{\mu B_{21} t + 1}{\exp(\mu b B_{21} t)}\right) \quad (13)$$

Equation (13) shows that $\frac{\partial \eta_{12}}{\partial b} \geq 0$, and only when $t = 0$ can the equality be true. In other words,

the minority shareholders' loss and the residual loss increased with the expropriation ratio.

Similarly, we can obtain the impact on the ownership structure:

$$\frac{\partial \eta_{12}}{\partial \omega} = \frac{1}{(1-\alpha)\omega^2} \left[\frac{A_1 t}{\exp(\mu b B_{21} t)} - 1 \right] \quad (14)$$

According to Equation (7), we know that $A_1 < 1$ and $B_{21} > 0$; Equation (14) then means

that $\partial \eta_{12} / \partial \omega < 0$. This indicates that if there is no minority shareholder protection and

compensation, a high degree of ownership concentration may be able to reduce the marginal loss caused by the agency behavior of controlling shareholders. Finally, we will examine the impact of time. From Equation (12), we know that

$$\frac{\partial \eta_{12}}{\partial t} = -A_1 B_{21} \exp(-\mu b B_{21} t) < 0 \quad (15)$$

In other words, with the continuation of the management, residual loss would gradually decrease.

Of course, here we only discuss the special situation there does not exist the investor protection.

The more general situation is that there is a factual or nominal legal system to protect the property rights of minority shareholders. Next, we are going to examine the issues related to investor protection law.

III. Investor Protection and Litigation Costs

In this section, we will study the laws of investor protection. We assume that there are external laws that can protect the interests of investors. According to Coase (1960, 1977), the reason for such protection laws is to reduce the social cost problems caused by the expropriation behavior of the controlling shareholders. Therefore, we will focus our study on the impact of law on reducing the residual loss. Furthermore, we define such a law as one that imposes a certain fine

to controlling shareholders when they expropriate the asset of corporate, and the purpose of the punishment as the reduction of the residual loss caused by agency behavior. Therefore, $\eta = 1$ is a very important critical state. Based on the above-mentioned model, we know that this external penalty will affect the decision-making behavior of controlling shareholders, thus affecting the residual loss coefficient. Subsequently, we will further discuss the compensation issues for investors. A certain cost is required to pay for the operation of law (Becker, 1968), so we will study the effect of the payment of the litigation cost on the residual loss coefficient. First, we assume that the minority shareholders will pay the investor protection-related litigation cost. This corresponds to the situation in Djankov et al (2003) when “Loser Pay Rule” is 0; we will study the effect of this kind of judicial proceeding on the residual loss coefficient. Then, we assume that the controlling shareholders pay these costs; this corresponds to the situation in Djankov et al (2003) when “Loser Pay Rule” is 1, and we will examine what has changed in the results.

3.1 The role of investor protection

From the study results of Section 2.2, we know that the expropriation of corporate assets can cause not only the wealth loss of minority shareholders ($\eta_{12} > 0$) but also other social costs, such as the waste of wealth ($\eta_{12} > 1$). Therefore, there is a need for law to control the behavior of the controlling shareholders to minimize the external effect of their behavior and the related social costs. According to Becker (1968) and Becker and Stigler (1974), the court can impose a fine to the controlling shareholders that can reduce their inappropriate behaviors. We followed the model of Albuguerue and Wang (2008), assuming that when the encroachment ratio of the controlling shareholders is μb , the fine they face will be $\frac{sb}{2}\mu bV$; therefore, the cash flow obtained by the controlling shareholders is:

$$c_{31} = \omega c_3 + \mu bV - \frac{s\mu b^2V}{2} \quad (16)$$

Similarly, the decision-making model of the self-interested controlling shareholders is:

$$\begin{aligned} & \underset{c_{41}}{\text{Max}} \int_0^{+\infty} e^{-rt} c_{31}^\alpha dt \\ & dV_3 = (\mu(1-b)V_3 - c_3)dt + \sigma V_3 dz \end{aligned} \quad (17)$$

By establishing Bellman equation to solve the above problems, we have:

$$\begin{cases} c_{31} = \omega(A_1 + \mu b A_{31})V_3 \\ V_3 = V_0 \exp(B_1 + \mu b B_{31})t \\ A_{31} = A_{21} + \frac{\alpha s b}{2(1-\alpha)\omega} \\ B_{31} = B_{21} - \frac{s b}{2(1-\alpha)\omega} \end{cases} \quad (18)$$

Substitute (18) into (16), we can get:

$$\begin{cases} c_3 = (A_1 + \mu b A_{32})V_3 \\ A_{32} = A_{22} + \frac{s b / 2}{(1-\alpha)\omega} \end{cases} \quad (19)$$

If we define the ownership ratio of the minority shareholders as $\varphi = 1 - \omega$, according to Equation (19), we know that if $s b > 2$, then under the condition $t \leq t_3$, ($t_3 = 1/(A_1 + \mu b A_{32})$), $\partial c_3 / \partial \varphi > 0$. That is, if the legal penalty is relatively severe ($s b > 2$), the wealth of minority shareholders will increase with the amount of holdings risky asset and relatively severe penalty will thus indirectly stimulate the minority shareholders to hold risky assets. This, in turn, will increase the demand for risky assets and the supply of funds. Similarly, if the rational minority shareholders wish to increase the holdings of risky assets to increase their wealth, then they would demand the law to punish or control the behavior of the controlling shareholders. We can also obtain the residual loss coefficient:

$$\eta_{13}(t) = \frac{A_1}{\mu b} [\exp(-\mu b B_{31} t) - 1] - A_{32} \quad (20)$$

By comparing this to Proposition 1, we can get Proposition 3.

Proposition 3: From Equation (20), we know that when $t = 0$: (1) $\eta_{13} = -A_{32}$; (2)

If $2(1-\omega) < s b < 2(1-\alpha\omega)$, then $0 < \eta_{13} < 1$; (3) If $s b > 2(1-\alpha\omega)$, then $\eta_{13} < 0$; (4) If $s b < 2(1-\omega)$,

then $\eta_{13} > 1$; (5) $\frac{\partial \eta_{13}}{\partial \omega} = \frac{s b / 2 - 1}{(1-\alpha)\omega^2}$; (6) $\frac{\partial \eta_{13}}{\partial s} < 0$, $\frac{d b}{d s} < 0$.

Part 1 of Proposition 3 shows that if $2(1-\omega) < s b < 2(1-\alpha\omega)$, when $t = 0$, we can observe the wealth loss of minority shareholders; the residual loss Part 2 shows that if $s b > 2(1-\alpha\omega)$, when $t = 0$, we can not observe the wealth loss of minority shareholders. If $s b \geq 2$, it means that controlling shareholders will face at least a \$2 fine for every \$1 corporate asset they expropriate. $\eta_{13} < 0$ means that such a severe penalty can effectively protect the wealth of minority shareholders and reduce the residual loss at the same time. $s b \geq 2$ and $\partial \eta_{13} / \partial \omega \geq 0$ indicate that if

the holding ratio of controlling shareholders is too high, it will lead to an increase in marginal loss. Therefore, the decentralization of ownership is a rational choice to reduce residual loss and the minority shareholders' wealth loss. Finally, the penalty of the controlling shareholders will facilitate a reduction in the residual loss, and the encroachment of controlling shareholders will decrease with the penalty (Albuquerque and Wang, 2008). We will now examine how η_{13} changes over time. According to Equation (20), we know:

$$\frac{\partial \eta_{13}}{\partial t} = A_1 \left(\frac{sb}{2(1-\alpha)\omega} - \frac{1-\omega}{(1-\alpha)\omega} \right) \exp(-\mu b B_{31} t) \quad (21)$$

This reveals the dilemma faced by the penalty. According to Proposition 3, we know that if $sb < 2(1-\omega)$, then $\eta_{13} > 1$, which means at the beginning the residual loss can already be observed; however $\partial \eta_{13} / \partial t < 0$, which means that the residual loss will decrease over the time. If $sb > 2(1-\omega)$, then $\eta_{13} < 1$, at the beginning there is no residual loss; however, $\partial \eta_{13} / \partial t > 0$, which means that a residual loss will be observed over the time. Regardless of the penalty, areal parties are faced with a dilemma, so penalty is not a once-and-for-all approach. We will now conduct marginal analysis for η_{13} . From equation (20), we know:

$$\begin{cases} \frac{\partial \eta_{13}}{\partial s} = \frac{b}{2(1-\alpha)\omega} \left(\frac{A_1 t}{\exp(\mu b B_{31} t)} - 1 \right) \\ \frac{\partial \eta_{13}}{\partial \omega} = \frac{1-sb/2}{(1-\alpha)\omega^2} \left(\frac{A_1 t}{\exp(\mu b B_{31} t)} - 1 \right) \end{cases} \quad (22)$$

In Equation (22), from the above assumption, $A_1 < 1$, but B_{31} is affected by sb ; therefore, we can discuss this under three different situations. First, if $sb < 2(1-\omega)$, then $B_{31} > 0$, and from Equation (22) we know that $\partial \eta_{13} / \partial s < 0$ and $\partial \eta_{13} / \partial \omega < 0$. This means that residual loss will decrease with the increase of the penalty and that the residual loss will decrease with the ownership of the controlling shareholders. Second, if $2(1-\omega) \leq sb < 2$, then $B_{31} \leq 0$. From Equation (22), we know that legal penalty has timeliness; within $t \leq t^*$ ($A_1 t^* = \exp(\mu b B_{31} t^*)$) time interval, punishment can reduce the residual loss, that is, $\partial \eta_{13} / \partial s < 0$. The residual loss decreases with rise of the holding ratio of the controlling shareholders. In other words, $\partial \eta_{13} / \partial \omega < 0$. Finally, if $sb \geq 2$, within a $t \leq t^*$ time interval, penalty can reduce residual loss, which is $\partial \eta_{13} / \partial s < 0$. The residual loss will increase with the rise of the holding ratio by the controlling shareholders, which

is $\partial\eta_{13}/\partial\omega \geq 0$. Based on these three situations, the current study defines investor protection efficiency as follows.

Definition 1: If the penalty satisfies $sb < 2(1-\omega)$, we define such a law as an ineffective for protecting minority shareholders. If the penalty satisfies $2(1-\omega) \leq sb < 2$, we define such a law as a moderate in protecting minority shareholders. If the penalty satisfies $sb \geq 2$, we define such a law as an effective in protecting minority shareholders.

Based on Definition 1, ineffective minority shareholder protection ($sb < 2(1-\omega)$) means that a relatively high ownership of controlling shareholders can reduce residual loss. Instead, effective minority shareholder protection ($sb > 2$) combined with the decentralization of ownership can reduce the wealth loss of minority shareholders caused by the encroachment of controlling shareholders and the residual loss. If $\eta_{13} \equiv 1$, we can obtain the relationship between s and ω from Equation (22). We know that

$$\frac{ds}{d\omega} = \frac{sb-2}{b\omega} \quad (23)$$

Therefore, we can produce the following proposition.

Proposition 4: In the case of $\eta_{13} \equiv 1$, if $sb > 2$ then $ds/d\omega > 0$; if $sb \leq 2$ then $ds/d\omega \leq 0$.

Proposition 4 shows that if the law can provide effective protection for minority shareholders ($sb > 2$), the controlling shareholders will face an increased punishment when their holding ratio increases. In contrast, if the law is ineffective or moderately effective in protecting the minority shareholders ($sb \leq 2$), then the external punishment and the holding ratio of the controlling shareholders can be mutually substituted. The increase of the ownership of the controlling shareholders indicates a decrease in marginal punishment. Therefore, effective minority shareholder protection laws will indirectly lead to a decrease of the ownership of the controlling shareholders. Let us now look at the impact of the time factor, under the condition of $\eta_{13} \equiv 1$.

From Equations (21) and (22), we know:

$$\begin{cases} \frac{ds}{dt} = -\frac{\partial\eta_{13}/\partial t}{\partial\eta_{13}/\partial s} \\ \frac{d\omega}{dt} = -\frac{\partial\eta_{13}/\partial t}{\partial\eta_{13}/\partial\omega} \end{cases} \quad (24)$$

so we can now produce Proposition 5.

Proposition 5: In the case of $\eta_{13} \equiv 1$, (1) If $sb < 2(1-\omega)$, then $ds/dt < 0$, if $sb \geq 2(1-\omega)$ and $t \leq t^*$, $ds/dt \geq 0$; (2) If $sb > 2$ and $t \leq t^*$, if all other variables remain unchanged, then $dw/dt < 0$.

The results of proposition are very interesting. Part 1 shows that if the law is ineffective in protecting the minority shareholders ($sb < 2(1-\omega)$), then the punishment will become increasingly light to ensure there is no residual loss ($\eta_{13} \equiv 1$). If the penalty is relatively severe ($sb > 2(1-\omega)$), then the future punishment will become even more severe. Part 2 shows that effective investor protection ($sb > 2$) promotes the decentralization of the ownership ($dw/dt < 0$), as this would avoid residual loss. It would be clearer to understand Part 2 of Proposition 5 if we combine the results from Proposition 4. If the law can effectively protect the minority shareholders ($sb > 2$), it is very uneconomical for the controlling shareholders to encroach on the corporate asset. Because the marginal cost they pay is on the rise, the rational choice is to reduce the ratio of encroachment and at the same time decentralize the ownership; this will indirectly increase the supply of risky assets. Furthermore, based on Equation (19), we know that an effective protection of minority shareholders will encourage minority shareholders to hold more risky assets. Therefore, in a market where the investors are under better protection, the minority shareholders' demand for risky assets will increase (Shleifer and Wolfenzon, 2002), and the developmental pace of capital markets will be faster (Edward, Johnson and Shleifer, 2001).

Proposition 5 can also be understood from the perspective of the evolution of the law and the ownership structure. Part 1 of Proposition 5 suggests that if the initial stage of a certain law is given ($sb < 2(1-\omega)$ or $sb > 2(1-\omega)$), the judiciary and law enforcement actions will form and evolve following a certain specific pathway. Therefore, we can consider the investor protection law as a self-organizing system (Hayek, 1978), whose evolution has demonstrated path-dependent properties (Divid, 1985; Arthur, 1989; North, 1990). Part 2 of Proposition 5 indicates that the initial laws and rules are the reason to cause decentralization of the control; at the same time, the laws and rules have also showed path-dependence properties. Therefore, we can consider the law as the reason for the evolution of the control. This is slightly different from Bebchuk and Roe (1999). In the next part of the discussion, we will discover the reason behind this difference. Nonetheless, the origin of law has played a very important role in the protection of investors (Edward and Shleifer, 2002).

We now further assume that after the penalty of the controlling shareholders, the law enforcement agencies will compensate minority shareholders. We first assume that there is no litigation cost, which means that the punishment process does not carry any expense, to look at

the changes in the welfare of minority shareholders. If the compensated asset value for minority shareholders is $\frac{\mu sb^2}{2}V_3$, then the residual loss coefficient becomes :

$$\eta_{13}^1 = \eta_{13} - \frac{sb}{2} \quad (25)$$

From Equations (20) and (25), we know, $\eta_{13}^1 < \eta_{13}$, $\partial \eta_{13}^1 / \partial s < \partial \eta_{13} / \partial s$. This means that using the entire fine to compensate for the minority shareholders will not only increase the wealth of the minority shareholders but also reduce the total and marginal residual losses. Of course, the assumption used to reach these conclusions is that there is no litigation cost. Next, we will further discuss the effect of litigation cost on the wealth of both parties as well as on the residual loss.

3.2 Minority shareholders pay litigation cost

Assume that after the penalty of the controlling shareholders, the minority shareholders will be compensated for the amount of $\frac{(1-\beta)\mu sb^2}{2}V_3$, in which $\frac{\mu\beta sb^2}{2}V_3$ is the payment from the minority shareholders for the litigation cost. Under this condition, the residual loss coefficient becomes

$$\eta_{13}^2 = \eta_{13} - \frac{(1-\beta)sb}{2} \quad (26)$$

Equation (26) shows that the requirement for reducing residual loss by compensating minority shareholders is $\beta < 1$. If $\eta_{13}^2 \equiv 1$ remains unchanged, we will examine the relationship between β and ω , s . From Equation (26), we know

$$\begin{cases} \frac{d\beta}{d\omega} = \frac{1-sb/2}{(1-\alpha)sb\omega^2} \left(\frac{A_{41}t}{\exp(\mu b B_{42}t)} - 1 \right) \\ \frac{d\beta}{dt} = \frac{2d\eta_{13}}{dt} \end{cases} \quad (27)$$

According to Equation (27), we can make the following proposition.

Proposition 6: When $\eta_{13}^2 \equiv 1$ and s remains the same: (1) If $sb \leq 2(1-\omega)$, then $d\beta/d\omega \leq 0$, if $2(1-\omega) < sb \leq 2$ and $t \leq t^*$, then $d\beta/d\omega \leq 0$, if $sb > 2$ and $t \leq t^*$, then $d\beta/d\omega \geq 0$; (2)

If $sb < 2(1-\omega)$, $d\beta/dt < 0$; in contrast, if $sb > 2(1-\omega)$ then $d\beta/dt > 0$; (3) If $sb > 2$ and $t \leq t^*$, if all other variables remain unchanged, $d\omega/dt < 0$.

Part 1 of Proposition 6 shows that if the law is ineffective ($sb \leq 2(1-\omega)$), the litigation cost will decrease with the increase of the holding ratio of controlling shareholders, whereas the effective

protection of minority shareholders ($sb > 2$) means that the litigation cost will be on the rise with the the holding ratio of controlling shareholders. Similarly, the decrease of the ownership ratio of the controlling shareholders indicates a decrease in litigation costs, which is conclusions of Berle and Means. In contrast, if the law is not effective in protecting the minority shareholders' rights and interests ($sb \leq 2(1-\omega)$), having controlling shareholders who have a high ownership ratio can effectively reduce the litigation cost. Let us now look at Part 2 of Proposition 6 by combining it with Proposition 3. If the law can moderately protect the minority shareholders' ownership of property ($sb > 2(1-\omega)$), which indicates that we could not observe the wealth loss of minority shareholders at the initial stage, under this condition, the litigation cost borne by minority shareholders will increase over time. Once $\beta \geq 1$, it is not economical to get compensation through a lawsuit; therefore, the punishment mechanism will in fact lose its effectiveness, as any rational investor will not do business at a loss. Part 3 of Proposition 6 is similar to Part 3 of Proposition 5; effective investor protection is the reason for the decentralization of ownership. This result is irrelevant to litigation cost.

Similarly, according to Equations (22) and (26) and differentiating with respect to s , we can get

$$\frac{d\beta}{ds} = \frac{b}{2(1-\alpha)\omega} \left[2(1-\beta)(1-\alpha)\omega + 1 - \frac{A_1 t}{\exp(\mu b B_{42} t)} \right] \quad (28)$$

This shows that at $t=0$, if minority shareholders make a claim when $\beta < 1$, $d\beta/ds > 0$, litigation costs increase with the penalty. Moreover, with $t \leq t^*$, this relationship will remain unchanged. Therefore, if the minority shareholders pay the litigation cost, the increase in litigation costs with the penalty is the reality we have to face.

3.3 Controlling shareholders pay the litigation cost

Suppose that the investor protection require the controlling shareholders to pay the litigation cost for court. If the encroachment ratio of controlling shareholders is μb , then their payment is

$\frac{(1+\beta)sb}{2} \mu b V$, in which $\frac{\beta sb}{2} \mu b V$ is the litigation cost paid for court. Such litigation cost payment

is in line with British judicial procedures. At this point, the cash flow obtained by controlling shareholders is:

$$c_{31}^\beta = \omega c_3^\beta + \mu b V_3^\beta - \frac{s(1+\beta)\mu b^2 V_3^\beta}{2} \quad (29)$$

By solving the optimal decision-making strategy of controlling shareholders, we get:

$$\begin{cases} c_3^\beta = (A_1 + \mu b A_3^\beta) V_3^\beta \\ V_3^\beta = V_0 \exp(B_1 + \mu b B_3^\beta) t \\ B_3^\beta = B_{21} - \frac{(1+\beta)sb}{2(1-\alpha)\omega} \\ A_3^\beta = A_{22} + \frac{s(1+\beta)b/2}{(1-\alpha)\omega} \end{cases} \quad (30)$$

In the case of compensation for minority shareholders, the residual loss coefficient is:

$$\eta_{13}^\beta = \frac{A_1[\exp(-\mu b B_3^\beta t) - 1]}{\mu b} - A_3^\beta - \frac{sb}{2} \quad (31)$$

By comparing to Proposition 1, we can produce Proposition 7.

Proposition 7: From Equation (31), we know, at $t = 0$: (1)

$$\eta_{13}^\beta = \frac{2(1-\alpha\omega) - sb(1+\beta+(1-\alpha)\omega)}{2(1-\alpha)\omega} < \eta_{13} - \frac{sb}{2}; \quad (2) \text{ If } sb \geq \frac{2(1-\alpha\omega)}{1+\beta+(1-\alpha)\omega}, \text{ then } \eta_{13}^\beta \leq 0; \quad (3)$$

$$\text{If } sb \leq \frac{2(1-\omega)}{1+\beta+(1-\alpha)\omega}, \text{ then } \eta_{13}^\beta \geq 1; \quad (4) \quad \frac{\partial \eta_{13}^\beta}{\partial s} = -\frac{b(1+\beta+(1-\alpha)\omega)}{2(1-\alpha)\omega} < \frac{\partial \eta_{13}}{\partial s} - \frac{b}{2} < 0; \quad (5) \quad \frac{\partial \eta_{13}^\beta}{\partial \omega} = \frac{sb(1+\beta)-2}{2(1-\alpha)\omega^2}.$$

Proposition 7 and Proposition 3 are very similar, except that after controlling shareholders pay the legal costs, at $t = 0$, the residual loss coefficient is even smaller. Moreover, the penalty can reduce more residual loss than pay the cost by minority shareholders. In addition, if $sb < 2/(1+\beta)$, $\partial \eta_{13}^\beta / \partial \omega < 0$, this also shows a difference compared to proposition 3's results.

Now let us look at the impact of the time factor. From (31) we know

$$\frac{\partial \eta_{13}^\beta}{\partial t} = \frac{A_1}{2(1-\alpha)\omega} [(1+\beta)sb - 2(1-\omega)] \exp(-\mu b B_3^\beta t) \quad (32)$$

This means that if $sb \geq 2(1-\omega)/(1+\beta)$, then $\partial \eta_{13}^\beta / \partial t \geq 0$; in other words, a relatively severe penalty will lead to an increase of the residual coefficient over time. Similarly, differentiating with respect to ω , β and s , respectively, we can get:

$$\begin{cases} \frac{\partial \eta_{13}^\beta}{\partial \omega} = \frac{1-(1+\beta)sb/2}{(1-\alpha)\omega^2} \left(\frac{A_1 t}{\exp(\mu b B_3^\beta t)} - 1 \right) \\ \frac{\partial \eta_{13}^\beta}{\partial \beta} = \frac{sb}{2(1-\alpha)\omega} \left(\frac{A_1 t}{\exp(\mu b B_3^\beta t)} - 1 \right) \\ \frac{\partial \eta_{13}^\beta}{\partial s} = \frac{(1+\beta)b}{2(1-\alpha)\omega} \left(\frac{A_1 t}{\exp(\mu b B_3^\beta t)} - 1 \right) - \frac{b}{2} \end{cases} \quad (33)$$

By observing Equation (33), we can get another legal timeliness t^β ($A_t t^\beta = \exp(\mu b B_3^\beta t^\beta)$). At the same time, the threshold penalty rate for reducing the residual loss has changed from $sb \geq 2(1-\omega)$ to $sb \geq 2(1-\omega)/(1+\beta)$. As a result, we can produce Definition 2 from Definition 1.

Definition 2: If the controlling shareholders pay the litigation cost, then we can get the following definition about the law protecting the minority shareholders. If the penalty rate satisfies $sb < 2(1-\omega)/(1+\beta)$, then we define such a law as ineffective to protect the minority shareholders; if the penalty rate satisfies $2(1-\omega)/(1+\beta) \leq sb < 2/(1+\beta)$, then we define such a law as a moderate minority shareholders protection; if the penalty rate satisfies $sb \geq 2/(1+\beta)$, then we define such a law as an effective minority shareholder protection.

As with proposition 6, we can produce proposition 8.

Proposition 8: When $\eta_{13}^\beta \equiv 1$ and $t \leq t^\beta$, (1) $d\beta/ds < 0$; (2) If $sb > 2/(1+\beta)$, when s remains the same, $d\beta/d\omega > 0$, $d\beta/dt > 0$; when β remains the same, $ds/d\omega > 0$, $ds/dt > 0$; (3) If $sb > 2$, when all the other variables remain unchanged $d\omega/dt < 0$.

Proposition 8 implies that, within the legal timeliness, the result of the controlling shareholders paying the litigation cost is $d\beta/ds < 0$, which indicates that litigation costs will decline with an increase in the penalty. Obviously, different cost-payment indicate different marginal litigation costs. The difference from the minority shareholders paying the cost is that the controlling shareholders paying the cost means the decrease of the marginal litigation cost ($d\beta/ds < 0$). Of course, the law should clearly state who would pay the cost; it belongs to the basic category of legislative activity, and this legislative activity determines the marginal cost of litigation. Second, the difference from the minority shareholders paying the cost is that now the penalty threshold is $1/(1+\beta)$ fold of the original, in other words, as long as $sb > 2/(1+\beta)$, the litigation cost borne by controlling shareholders will increase ($d\beta/d\omega > 0$) with the increase of their holding ratio, and the penalty they face would go up to ($ds/d\omega > 0$). Therefore, the controlling shareholders or the minority shareholders pay the cost would only affect the penalty threshold value. If we assume that the sentence of at least \$2 is reasonable for every \$1 corporate asset misused by the controlling shareholders, then there is no doubt that, regardless of the cost-payment, litigation costs and the faced penalties will both increase with the holding ratio of the controlling shareholders. Therefore, decentralization of the ownership is a selectable way to reduce litigation costs. Finally, Part 2 of Proposition 8 shows that the path for legislative activity

still exists. From the results of Proposition 6 and Proposition 8, if a severe penalty is taken against the controlling shareholders ($sb > 2/(1+\beta)$), then when s remains the same, the cost of litigation is on the rise ($d\beta/dt > 0$). This means that more severe penalties generate higher litigation costs. If the cost can be effectively controlled, which means keeping β unchanged, then the punishment will become more and more severe over time ($ds/dt > 0$). This result is independent of who will pay the cost. Therefore, if the penalty is not easily changed, then an effective investor protection system means the increase of the litigation cost. We have to accept the reality. Part 3 of Proposition 8 indicates that if the law can effectively protect the minority shareholders' interest, its outcome is the decrease of the ownership of the controlling shareholders over time. This is the decentralization of ownership, and this result is irrelevant to litigation cost.

IV. Discussion

In this section, we will briefly discuss some issues uncovered in the previous sections. First, we will discuss the timeliness of punishment from a practical point of view. And then, we will then briefly analyze the factors that affect the private benefits of control. Finally, based on the American litigation cost-payment rules, we will discuss the relationship between monitoring cost, bonding cost and residual loss, the key elements of agency costs.

4.1 Timeliness of punishment

From the above study, we found that an external punishment could not completely and finally reduce residual losses, which indicates the timeliness of legal punishment. We now examine the effect of punishment from a *de facto* point of view. First, we analyze from a relative level how long the external punishment mechanism can increase the wealth of the minority shareholders compared to the no-punishment model. According to the above analysis, we know that from the minority shareholders' point of view, the effectiveness of punishment is represented by $c_3/c_2 > 1$. This is the factual premise for effective punishment. Based on the results from Section 2 and Section 3, this effectiveness means:

$$\frac{c_3}{c_2} = \left(1 + \frac{s\mu b^2}{2(1-\alpha)\omega(A_1 + A_{22}\mu b)}\right) \exp\left(-\frac{sbt}{2(1-\alpha)\omega}\right) > 1 \quad (34)$$

This indicates that only within the $t \in [0, t_{41})$ time interval the punishment of controlling shareholders increase the wealth level of minority shareholders, in which t_{41} is expressed as:

$$t_{41} = \frac{2(1-\alpha)\omega}{sb} \ln\left(1 + \frac{s\mu b^2 V_3 / 2}{(1-\alpha)\omega c_3}\right) \quad (35)$$

This also demonstrates that the external punishment can increase the wealth of minority shareholders only in a certain period.

Analyzed from the marginal point of view, the punishment can increase the marginal earnings of minority shareholders, which means that $\partial c_3 / \partial s > 0$. According to the solution from Section 3.1, within the $t \in [0, t_{42})$ time interval, the dividends paid to the minority shareholders is increased with an increase in the penalty rate, and the expression for t_{42} is

$$t_{42} = t_3 = \frac{1}{A_1 + A_{32}\mu b} = \frac{V_3}{c_3} \quad (36)$$

By observing Equations (35) and (36), we found that given the dividend paid to minority shareholders by the corporation is c_3 , then a greater corporate asset base increases the punishment's duration of timeliness. Moreover, we know that $t_{42} = t_3$, combined with Equation (19) leads to the conclusion that effective minority shareholder protection increases wealth not only by invoking external punishment but also by incentive businesses to hold more risky assets. From the point of view of minority shareholders, if they want to hold more risky assets to increase their wealth, they certainly demand effective legal protection, where this is very similar to Bebchuk and Roe (1999). In Section 3 of our paper, we used "norm" as a premise to discuss legal effectiveness. The obtained results demonstrated that the decentralization of ownership requires the effective protection of the investor's interest. It may be that when studying the issues from the "norm-" or "fact-" based perspectives, the obtained results are indeed not quite the same.

Finally, a smaller ratio of dividends paid to the shareholders over the corporate asset indicates a larger ratio of V_3/c_3 and a longer duration of effective punishment. This punishment mechanism is effective for selfish controlling shareholders with a poor reputation in the market. In contrast, controlling shareholders with a "generous" reputation in the capital market will make the punishment mechanism lose its effectiveness sooner. Therefore, for the law that protects the minority shareholders' wealth, "generous" is not a good connotation; it will make the punishment lose effectiveness in a shorter period. A "generous" dividend payment satisfies with a substitution model (La Porta et al, 2002). The additional private benefit of controlling shareholders is that the minority shareholders find that the penalty will only allow them to reap

their benefits in a very short period. As a result, the “generous” dividend payment becomes a selectable strategy for controlling shareholders seeking to avoid punishment.

4.2 Investor protection and the private benefits of control

The topic that is closely related to the controlling shareholders’ behavior is the private benefits of control. Studies from Barclay and Holderness (1989) have confirmed the existence of such benefits, and recent studies have shown that the investor protection laws can effectively reduce the private benefits of control (Craig, 2004; Dyek and Zingales, 2004). In the above sections, we have been focusing our study on the residual loss caused by the encroachment of the controlling shareholders as well as by investor protection without paying much attention of the private benefits of control. We are now going to present a brief discussion of this. From the results of Section 2.2, we know that the controlling shareholders will misuse corporate assets only when there is an incentive to do so. This means $c_{21} > \omega c_2$, we define the private benefit of each share for the controlling shareholder under this condition is:

$$\gamma_2 = \frac{c_{21}/\omega - c_2}{c_2} \quad (37)$$

So the private benefit can be expressed as:

$$\gamma_2 = \frac{\mu b V_2}{c_2} \quad (38)$$

From Equation (38), we know that $\partial \gamma_2 / \partial b > 0$ and $\partial \gamma_2 / \partial V_2 > 0$. This means that private benefits increase with the encroachment ratio and the asset size. At the same time, we noticed that V_2/c_2 could reflect the “generosity” of the controlling shareholders; Equation (38) implies that more “generous” controlling shareholders yields a lower level of private benefits. Therefore, although increasing dividend payments will make the penalty lose its effectiveness in a short period, it can also reduce the private benefits of the controlling shareholders.

Let us now have a look at the function of the investor protection. Similarly, we define the private benefit of each share for the controlling shareholder under this condition:

$$\gamma_3 = \frac{c_{31}/\omega - c_3}{c_3} = \frac{(1 - sb/2)\mu b V_3}{c_3} \quad (39)$$

From Equation (39), we know that $\partial \gamma_3 / \partial s < 0$. This means that the better protection of the investor implies a lower level of private benefits to the controlling shareholders (Dyek and Zingales, 2004). Therefore, the external legal system can help to reduce the private benefits of the

controlling shareholders. Meanwhile, only when $sb < 2$, $\partial\gamma_3/\partial b > 0$ and $\partial\gamma_3/\partial V_2 > 0$. If the investors are protected effectively ($sb > 2$), the situation will be exactly the opposite. In the case of $sb > 2$, a smaller V_3/c_3 yields a higher level of dividends paid to the minority shareholders by the controlling shareholders, a higher level of generosity that they demonstrate and a higher level of private benefits. Therefore, under this condition, the controlling shareholders appear to be generous in dividend payment for some ethical reason. We should understand this from not only ethical or emotional perspectives, but also paying attention to the effect of the legal system. Finally, stingy controlling shareholders can be more easily observed when the legal system is deficient, with their behavior indicating the degree of their private benefits.

4.3 The composition of agency costs

In Section III, we studied the economic results when the litigation cost is paid either by the minority shareholders or by the corporate controlling shareholders. In fact, when the controlling shareholders expropriate corporate assets with irrefutable evidence, having the controlling shareholders pay the litigation cost is very common in the United Kingdom and the British Commonwealth nations. Therefore, the results in 3.3 correspond to the litigation cost of the British judiciary proceedings. The situation in the United States is slightly different. There, the litigation cost is paid by both parties and is independent of the results of the trial. Therefore, we need discuss the effect of who pay litigation costs on the residual loss in the judiciary process. Based on the American legal process, we define the litigation cost required to be paid by the controlling shareholders as β_1 and the cost required to be paid by the minority shareholders as β_2 , so Equation (31) becomes:

$$\eta_{13}^{\beta_1} = \frac{A_1[\exp(-\mu b B_3^{\beta_1} t) - 1]}{\mu b} - A_3^{\beta_1} - \frac{(1 - \beta_2)sb}{2} \quad (40)$$

In classical agency theory, litigation costs β_1 and β_2 have different meanings. Based on Jensen and Meckling (1976), β_1 can be considered the bonding cost of the controlling shareholders, and β_2 can be considered the cost of minority shareholders' monitoring controlling shareholders'

behavior using a legal process. According to Equation (40) we have:

$$\begin{cases} \frac{\partial \eta_{13}^{\beta_1}}{\partial \beta_1} = \frac{sb}{2(1-\alpha\omega)} \left(\frac{A_1 t}{\exp(\mu b B_3^{\beta_1} t)} - 1 \right) \\ \frac{\partial \eta_{13}^{\beta_1}}{\partial s} = \frac{(1+\beta_1)b}{2(1-\alpha\omega)} \left(\frac{A_1 t}{\exp(\mu b B_3^{\beta_1} t)} - 1 \right) - \frac{(1-\beta_2)b}{2} \\ \frac{\partial \eta_{13}^{\beta_1}}{\partial \beta_2} = \frac{sb}{2} \end{cases} \quad (41)$$

The first equation of (41) shows that within the legal timeliness ($t \leq t^{\beta_1}$, $\exp(\mu b B_3^{\beta_1} t^{\beta_1}) = A_1 t^{\beta_1}$) if $sb > 2/(1+\beta_1)$, the residual loss decreases with the bonding cost. This means that the bonding cost of the controlling shareholders leads to a decrease in the residual loss. Second, for legal timeliness, if the controlling shareholders' behavior is severely penalty ($sb > 2/(1+\beta_1)$), then the penalty will help to reduce residual loss; in other word, the purpose of the penalty can be reached. The third equation of (41) indicates that with the increase of monitoring cost paid by the minority shareholders, the residual loss is increased. This means that based on the litigation cost, we can observe the relationship between the monitoring cost, the bonding cost and the residual loss as part of agency costs. On the other hand, if the residual loss remains unchanged, we know from (41) that:

$$\left. \frac{d\beta_1}{d\beta_2} \right|_{t \leq t^{\beta_1}} = -\frac{\partial \eta_{13}^{\beta_1} / \partial \beta_2}{\partial \eta_{13}^{\beta_1} / \partial \beta_1} \geq 0 \quad (42)$$

This indicates that, within the legal timeliness, the monitoring cost and the bonding cost are positively correlated. Therefore, we can observe the relationship of the key elements of the agency cost during the litigation between the controlling shareholders and the minority shareholders; which reveal the details of the agency cost. In contrast, if the law is deficient or the legal timeliness is very short, in which t^{β_1} is close to 0, then from (41) and (42) we know that $d\beta_2/d\beta_1 < 0$. This means that the bonding cost decreases with an increase in monitoring costs. From this point of view, legal timeliness has a critical impact on agency costs.

V. Conclusions

Based on the conclusions of Coase (1960, 1977) that the purpose of law is to reduce social costs as the premise, our paper studied the relationship between investor protection and residual loss. The study results showed that the decentralization of ownership is the result of the effective legal protection of minority shareholders' rights and interest, and this result is irrelevant to whether there is a litigation cost or who pays for this cost. Second, effective investor protection

leads to lower private benefits of control; this is consistent with La Porta et al (1998, 1999) and Dyek and Zingales (2004). However, our study has a different perspective. La Porta et al is from the point of view of funds supplied and risky assets demanded; our perspective is the opposite, and considers the supply of risky assets. Of course, these are the two sides of the same coin; you can get the full view only when you turn over the coin. Third, our results demonstrated that an efficient investor protection system would evolve through a self-reinforcing pathway. This means that if the law can effectively protect the minority shareholders, then this protection will become increasingly strong. In contrast, if the investor protection system is ineffective, then this protection system will be practically dead in the end. Fourth, we studied the judicial procedure of how to share the litigation cost based on Djankov et al (2003). The results showed that if penalty remain unchanged, an effective investor protection would lead to the increase of litigation costs over time, while an ineffective investor protection would lead to a decrease over time. This result is independent of who will pay the cost. Finally, our results showed that if the minority shareholders within the legal timeliness of the investor protection law pay the litigation cost, an increase in the penalty rate would lead to an increase in litigation costs. The opposite result we obtain if the controlling shareholders pay the litigation cost; this will lead to a negative correlation between the penalty rate and litigation costs.

Of course, our study does not cover the protection of a creditor's wealth by law; however, we noticed that Leland's findings have already discussed the impact of opportunistic behavior by shareholders on liability value. It is still unclear whether a creditor's rights and interests protection law would affect asset substitution. Second, Chandler (1977) showed that antitrust laws are more important for the growth of modern enterprise. According to Allen, Qian and Qian (2005) who study the relationship between Chinese law and economic growth, another alternative system may exist to increase investors' wealth and economic performance, in which the reduction of competitive barriers has played an important role. Bebchuk (2002) showed that barriers to entry would cause investor protections to be at a suboptimal level. As a result, it is necessary to consider whether there is an appropriate legislative priority with regard to competition protection laws and investor protection laws, whether these laws need to evolve coordinately to effectively increase the wealth of minority shareholders.

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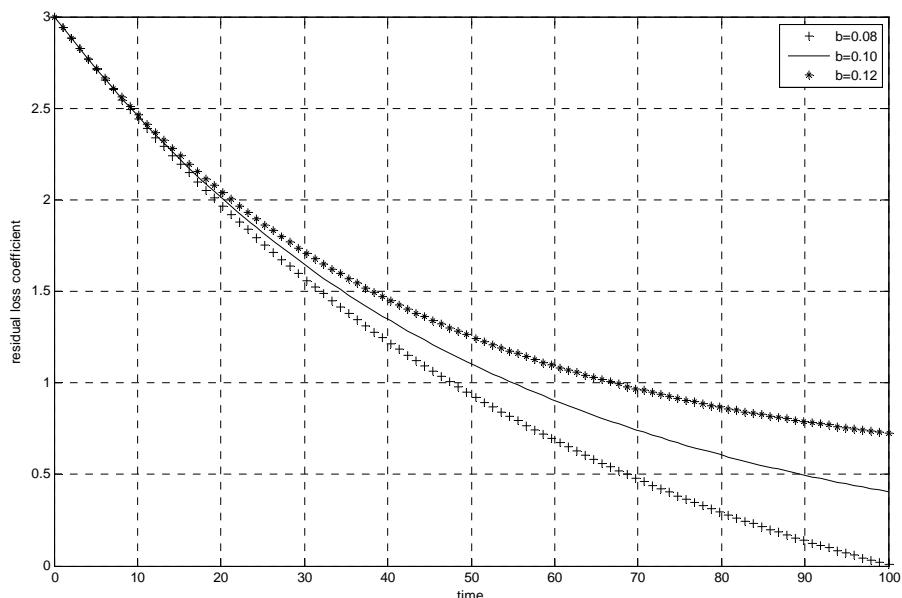


Figure 1