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Optimizing Accounting and Wage Design: A Principal-Centric Approach to Solving the Agency Problem

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Abstract:

Purpose: *This study aims to identify the optimal combination of accounting treatments and wage designs to address the agency problem. It presents a groundbreaking theoretical model by strategically integrating various accounting systems and wage designs.*
Design/Methodology/Approach: *Departing from conventional paradigms, the study adopts a principal-centric approach, leveraging accounting treatments and wage designs to address the challenges of the agency problem. The text introduces three distinct accounting systems and two wage designs, showcasing the efficacy of "conservative accounting" in alleviating agency conflicts and recognizing the need to complement this approach with a "performance wage system" for optimal effectiveness.*
Findings: *The research offers a fresh perspective on agency dynamics while providing actionable insights to decision makers.*
Practical Implications: *This article significantly contributes to the academic discourse on agency theory, enhancing our understanding of organizational governance and opening new avenues for research.*
Originality/Value: *This study embraces a holistic perspective by considering the effort of both the principal and the agent, reflecting on the natural world and yielding propositions that resonate strongly with practical scenarios.*

Keywords: *Agency problem, conservative accounting, neutral accounting, liberal accounting, wage design.*

JEL Classification: *J31, J54, M41, M52.*

Paper type: *Research article.*

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1. Introduction

This study aims to find the system that best solves the agency problem. By comparing and analyzing different accounting treatments and wage designs, it identifies the optimal combination to promote the agent's effort to address the agency's problem.

This study proposes a theoretical model that demonstrates how the principal encourages agents to work hard. This model considers three accounting treatments and two wage systems, forming six different structures of accounting treatments and wage systems. Explore the conditions that would make agents more willing to work harder to solve the agency problem. Since this model is purely theoretical and does not conduct empirical research, it provides a theoretical basis for future research directions.

The main research question of this study is the following: In past studies on solving agency problems or increasing the agent's effort, the principal always provided generous salaries or stock dividends to internalize the agent's efforts for the company. This study attempts to break away from this approach and determine whether accounting treatment choices can enhance the agent's effort.

This issue immerses itself in the foundational literature of the twentieth century. During this period, the agency problem, as articulated by Jensen and Meckling (1976), not only endures as a timeless enigma in contemporary society, but also as a focal point of rigorous scholarly investigation, garnering extensive attention. The persistent nature of this problem can be traced back to the inherent misalignment of interests between principals and agents.

Numerous precedent studies have delved into this intricate issue, underscoring its profound significance within academic circles and broader society due to its potential alleviation through the strategic design of incentive contracts. When carefully formulated, these contracts serve as a mechanism to reconcile the divergent interests of principals and agents, fostering a harmonious alignment.

In the current discourse on the agency problem within the existing literature, a set of assumptions has consistently prevailed: incomplete information, the absence of accounting treatment, and an exclusive focus on the agent's effort. These assumptions present a significant limitation, which prompts our study to deviate from the norm by challenging these three foundational premises.

This study specifically challenges the amalgamation of incomplete information and accounting treatment. When the agent lacks visibility into actual earnings, it results from the accounting treatment method exogenously determined by the principal (conservative accounting, neutral accounting, liberal accounting).

Additionally, this study introduces a challenge by considering the principal's contribution to actual earnings by his effort.

The scholarly community has devoted considerable attention to exploring the agency problem for an extended period, primarily interpreting it as a manifestation of information asymmetry. Existing literature operates on the premise that information asymmetry hinders the principal from fully understanding the behaviors or efforts of the agent based solely on surface-level information. Consequently, the specific incentive mechanisms are designed to motivate the agent to align with the principal's objectives.

In essence, an agency problem will arise when the principal and the agent harbor disparate objectives, giving rise to a conflict of interest and impeding the agent's ability to meet the principal's expectations. This persistent agency problem persists irrespective of the completeness of information, even when the principal can observe the agent's exertions.

Furthermore, the current scholarly discourse on the agency problem neglects any mention of accounting treatment, despite its profound impact on a company's financial records. As a narrative script, these records intricately influence the agent's wage, subsequently impacting the agent's level of effort. Thus, a comprehensive exploration of the agency problem requires a meticulous examination of accounting treatment practices.

Moreover, the existing body of literature remains lacking in addressing the principal's efforts within the agency problem. Despite delegating tasks to the agent, the principal is not responsible for overseeing the agent's endeavors. Within a broader context, the principal's efforts encompass a nuanced form of supervision over the agent. Consequently, meticulous investigation of the agency problem requires exhaustive exploration of the principal’s exertions.

Hence, this study endeavors to delve into the realm of optimal salary design bestowed upon the agent by the principal, considering the diverse degrees of accounting treatment observed across different companies. In addition, it aspires to scrutinize the levels of effort exhibited by the principal and the agent in this dynamic relationship.

Through this meticulous inquiry, our objective is to illuminate the nuanced interplay of accounting conservatism levels and both parties' exertions in exploring agency problems. The results of this investigation are expected to yield substantive contributions to academic scholarship, propelling innovative knowledge within this domain.

Kwon (2005) delineates conservative accounting as an accounting performance measure that systematically underestimates earnings, neutral accounting as an

accounting performance measure that accurately evaluates earnings, and liberal accounting as a measure that consistently overestimates earnings. In alignment with these conceptual distinctions, our research adopts the following definitions: conservative accounting is directly characterized as yielding figures lower than the actual earnings; neutral accounting is directly described as producing figures equivalent to the actual earnings; and liberal accounting is directly characterized as generating figures higher than the actual earnings.

This study posits that firms inherently adopt a specific accounting treatment: an intrinsic inclination toward conservative, neutral, or liberal accounting. The primary focus of this research is to elucidate how principals can strategically devise optimal wage mechanisms in various scenarios to mitigate agency problems, considering varying levels of accounting treatment. The degree of accounting treatment serves as the foundation for the salary mechanism in this study, with some variables introduced to enhance the realism of the model setting.

According to traditional accounting principles, conservative accounting dictates the selection of methods that are less advantageous to the entity's situation when discriminating against accounting matters. The degree of conservative accounting of the company encompasses three facets: conservative accounting denotes undervalued earnings, neutral accounting denotes accurate earnings, and liberal accounting denotes overvalued earnings.

These distinctive features are of considerable significance in both academic and practical contexts. Incorporating conservative levels as an assumption and establishing separate model theories with and without fixed wages extends the discourse on more favorable decision making under the salary mechanism between principals and agents.

Agency problems often lead to potential conflicts of interest between the principal and the agent, which stem from two primary reasons. First, as described by Rosenstein and Wyatt (1994), the varying levels of effort are the places where agents within a company, driven by personal considerations, can impact the interests of the company.

For example, when a company manager simultaneously holds directorship in another company, the level of effort may be influenced by the shares held in the company. This scenario poses potential threats to the interests of the principal. Second, issues during tenure, as affirmed by Dechow and Sloan (1991) and Murphy and Zimmerman (1993). They substantiate that problems during the agent's tenure often arise when facing imminent retirement. In such instances, the agent tends to opt for more conservative or short-term investments in research and development (R&D), substantially reducing the company's R&D expenses. This phenomenon occurs because higher net profits increase reward systems, prompting agents to sacrifice future research and development for their immediate interests.

However, compared to companies with a long-term development strategy, this approach places the agent in a less advantageous position.

The agent generally seeks to maximize the utility derived from the interplay between salary and effort. The principal and the agent invest their efforts in exchange for a wage, where exerting effort incurs costs and induces disutility, while a wage yields happiness. Consequently, the agent's wage (principal) increases the utility of the agent (principal), while the agent's effort (principal) decreases its utility.

However, the effort of the agent (principal) is instrumental in acquiring wages. For example, when the principal offers a lower salary to the agent to obtain asymmetric benefits, a scenario arises in which the agent exerts more effort, but experiences reduced satisfaction. In the context of asymmetrical information, this situation can motivate the agent to engage in fraudulent activities, compounded by the principal's inability to observe the agent's work behavior and the dependence solely on the outcome.

As a result, asymmetrical information and the potential for moral hazard through fraud become evident. However, previous research has indicated that these challenges can be mitigated through contract design, encouraging agent willingness to work, and reducing asymmetric information.

Research findings from Haugen and Senbet (1979), Grossman and Hart (1983), Lambert and Larcker (1987), and Smith and Watts (1992) reveal that a well-crafted reward contract possesses incentivizing effects, aligning the interests of the principal and the agent, thereby diminishing the likelihood of agency problems.

These reviews of the literature critically assess existing studies that focus predominantly on agency problems, placing a particular emphasis on the information asymmetry between principals and agents. Separating from these prevailing assumptions, our study posits that the main cause of agency problems is the inconsistency between the goals of the principal and the agent. The pertinent literature is discussed below.

Maskin and Tirole (1992) asserted that the former may possess pertinent private information when principals propose contracts to agents. They conducted a non-cooperative game analysis of the principal-agent relationship, positing that the information held by the principal significantly influences the agent's utility. This concept, termed an 'incentive compatible assignment', is defined as weakly interim efficient.

Myerson (1983) contended that if principals possess more information than agents, their information will impact their chosen mechanism. To address this issue, Myerson proposed a mechanism selection theory, concluding that any safe and undominated mechanism represents the most miniature set of unblocked

mechanisms. Furthermore, all such mechanisms are anticipated equilibrium and core mechanisms.

Sobel (1993) sought to compare the utility of the principal in an agency model with variations in the agent's access to information. Principals prefer informed agents over uninformed ones in cases with only two possible outcomes. However, this preference does not hold when more than two possible outcomes are considered.

Shavell (1979) analyzed a game in which principals pay fees to agents. When the principals only know the outcome of the agent's activities and possess information about them, the optimal payment becomes dependent on the risk preferences of both the principal and the agent.

Radner (1981) sought to reframe the agency problem as a multi-period sequential game, revealing that the average expected utility of each player would be at least his expected utility in a one-period cooperative arrangement minus a positive number. Rogerson (1985) discovered that principal-agent problems are generally ineffective when the agent is only required to choose actions with stationary utility.

Fudenberg and Tirole (1990) explored the possibility of contract renegotiation after the agent selects an action before observing its consequences. During this phase, the principal cannot force the agent to work at the highest level of effort, as the agent is allowed to renegotiate. Shapiro (2005) systematically organized agency theory and traced its diffusion into academic research across the disciplines of business, politics, and law. Furthermore, suggestions were made on how sociology could leverage agency theory to make valuable contributions.

Glover and Xue (2023) delved into the contractual dynamics between one principal and two agents in conservative accounting. Taking advantage of insights from the Kreps model (1996), they constructed a conservative measurement system and optimal contracts to delineate multiple equilibria and determine an optimal accounting treatment.

In a parallel vein, Glover and Lin (2018) delved into the intertemporal model of conservative accounting, presenting two distinct models. In the first model, conservative accounting benefits from the suboptimal performance of older managers in earlier periods and the comparatively superior performance of newer managers in the contemporary period.

The second model posits that the conservative accounting framework promptly acknowledges bad news while delaying recognition of good news, and timely recognition of adverse information is considered optimal, as it allows improvement through the 'incentive spillover' mechanism.

Lafond and Roychowdhury (2008) investigated the impact of management-level

ownership on financial reporting conservatism. They contended that conservative accounting might serve as a resolution to agency problems arising from the separation of ownership and management. Specifically, as management-level ownership decreases, agency problems intensify, necessitating a greater reliance on conservative accounting. Consequently, their findings suggest an inverse relationship, indicating that conservative accounting decreases as the ownership ratio at the management level increases.

The existing literature exclusively delves into the nexus between conservative accounting and salary, examining the intricate interplay between these two critical elements. Zwiebel (1995) contributed insights by highlighting that, during periods of low agent performance, discontinuities in salary design result in varying evaluations of accurate benchmarks, depending on the agent's profile. Agents with the highest and lowest abilities are more inclined to generate superior innovations than those with average skills.

Iwasaki, Otomasa, Shiiba, and Shuto (2018) extended this exploration by scrutinizing the relationship between conservative accounting and agent wages within Japanese firms. Additionally, they explored the impact of information quality on this relationship, discovering a positive association between conservative accounting and the performance wage rate. Interestingly, this positive relationship was more pronounced for companies with lower ex ante information quality. This suggests that firms with modest revenues exhibit a greater need for conservative accounting of agent wages.

Singh and Larkin (2015) explored the influence of managers' salaries on financial reporting and scrutinized auditors' recognition of manager financial reporting. Their findings revealed that (1) a closer linkage between managers' salaries and financial reporting diminishes the correlation between salary and actual performance, leading to suboptimal management efforts; (2) the conservatism of auditors ensures accurate performance measurement; and (3) increased penalties for managers who overestimate earnings diminish audit quality, potentially harming investors' interests. However, heightened penalties for auditors who expose managers' overestimations do not seem to affect investors' interests adversely.

Furthermore, O'Connell (2006) postulated that conservative accounting yields a lower (higher) correlation between returns and earnings on positive (negative) news. They hypothesized that CEO salary in the UK demonstrates a more robust (weaker) sensitivity to positive (negative) news, and empirical evidence supports this conjecture. Additionally, they noted consistent views among UK remuneration committees regarding the impact of conservative accounting when making salary decisions.

In a different exploration, Na, Zhang, and Zhang (2022) studied the properties of information obtained essentially for salary contracts. They used the salary income of

senior executives to infer the performance measurement preferences of the board of directors, revealing an overall absence of conservative accounting in salary income. Therefore, this suggests that the optimal salary design is not opportunistic.

Drawing from the existing literature on the agency problem, information asymmetry, the nexus between conservative accounting and the agency problem, and the association between conservative accounting and salary, there is a conspicuous absence of discourse on the varying degrees of conservative accounting with wage design in all literature. This omission becomes particularly relevant when considering the intricacies of addressing the agency problem, a focal point that aligns with the core objective of this study.

As mentioned above, conservatism implies opting for less advantageous accounting methods whenever there is a discrepancy in accounting matters. Conservative accounting represents a crucial characteristic in the management of a company's accounting affairs, which requires the maintenance of a prudent approach to uncertain matters. It involves acknowledging all potential risks to exclude the oversight of any latent threats.

Proactively addressing risks before their materialization allows companies to make informed decisions, ultimately improving their market competitiveness. Hence, it becomes imperative to promptly recognize potential expense losses while refraining from recognizing uncertain income benefits until their confirmation. This ethos encapsulates the essence of conservative accounting and underscores its importance in the promotion of sound financial practices.

Basu (1997) posited a compelling perspective in the realm of accounting, stating that ‘account conservatism is the difference between the gains caused by good news and the losses caused by bad news due to different recognition criteria.’ This nuanced distinction in the recognition criteria can significantly impact a company's earnings trajectory. Basu further elucidates this variance as the timeliness of asymmetric earnings recognition, positioning conservative accounting as a key indicator within the accounting earnings domain.

The inherent challenge arises from the asymmetry in information between the principal and the agent. As agent actions are not fully observable, the pursuit of self-interest can lead the agent to act against accurate accounting treatment. Typically, the agent’s wage index depends on accounting earnings. Consequently, the agent may opt for decisions that align with their personal interests, potentially exacerbating agency problems.

Addressing agency problems often involves designing reward mechanisms aimed at aligning the interests of the principal and the agent, fostering a collaborative environment where the agent is motivated to exert maximum effort. Recognizing the importance of accounting treatment in this context, this study categorizes accounting

treatment into three types: conservative accounting, neutral accounting, and liberal accounting.

In implementing accounting policies, the choice between conservative and liberal accounting practices can significantly influence the presentation of net profits in financial reports. A more conservative accounting policy tends to result in a lower net profit figure than the actual performance, whereas a liberal accounting policy may inflate the reported net profit. Given the intricate relationship between net profit and agent wage, the adoption of a conservative (liberal) accounting policy translates to lower (higher) net accounting earnings and, consequently, lower (higher) wages for the agent.

The interplay between accounting policies, net accounting earnings, and wages aligns with theoretical foundations such as the labor-managed firms and profit-sharing concepts put forth by Meade in 1972. According to these theories, companies are encouraged to embrace a dividend system as an incentive mechanism.

This mechanism is designed to enhance agent productivity, reduce production costs, and mitigate conflicts in labor-management dynamics. Consequently, a nexus emerges, emphasizing the integral connection between wages, net accounting earnings, and the exertion of effort by the agent.

In the context of performance evaluation serving as a reward system, the potential for agents to inappropriately manipulate a company's earnings introduces the risk of inaccuracies. Recognizing the uncertainty surrounding future earnings, this study employs conservative accounting as a mitigation strategy to mitigate the moral hazards that are likely to arise between the principal and the agent. More conservative accounting improves the accuracy of the performance evaluation but decreases its sensitivity.

Conversely, when the company excessively applies conservative accounting in recognizing earnings, it underestimates the agent's efforts. Introducing liberal accounting as an index for performance evaluation in such cases amplifies sensitivity.

The considerations make it clear that the earnings indicators of a company are closely related to the level of conservative accounting.

As Robbins (1992) posited, wage structures can be delineated into fixed and variable wages. According to the hypothesis embedded in his empirical model, a pivotal point is reached when the degree of conservative accounting surpasses a certain threshold, prompting a transition in the agent's behavior from a state of no effort to one of exerted effort.

This transition underscores the motivating influence of performance wage. In practical implementation, fixed wages, performance wages, and stock options

emerge as prevalent components within the landscape of performance-reward design. The conclusions of his empirical model are the same as our theoretical model.

Furthermore, insights derived from Lambert and Larcker (1987) and Sloan (1993) affirm a pronounced correlation between wage changes and earnings. However, a noteworthy caveat emerges: When the upper limit of performance wages is attained, the back curve of the labor supply curve in economics will cause the reward to not increase again.

In principle-agent relationships, the efficacy of information exchange and the ensuing agency problem hinge on the alignment or misalignment of interests between the principal and the agent. This study establishes the agency problem as a manifestation of incongruent interests, if both parties, the principal and the agent, can observe each other's efforts throughout their interactions.

The conceptual framework of this study delimits three distinct stages. In the first stage, the company faces the pivotal task of determining the degree of accounting treatment that it employs. Choices include conservative, neutral, or liberal accounting as distinct accounting treatments. This study treats the selected accounting treatment as an exogenous variable.

Advancing to the second stage, the principal takes centre stage, deciding on the level of effort of the principal and defining the wage structure provided to the agent. The wage structure encompasses the fixed wage and the performance wage rate. The performance wage rate, representing a predetermined share of company earnings, assumes that the total company earnings reflect both principal and agent efforts.

The third stage shifts focus on the agency dynamics, wherein the agent independently determines its level of effort. This tripartite structure forms the basis for a comprehensive exploration of the interplay between accounting treatment, principal effort, and agent effort in principle-agent relationships.

This study aims to investigate the effort of the agent and the principal and explores the accounting treatment and the wage system as two critical variables in the principal-agent relationships. The level of accounting treatment is classified into three categories: conservative accounting, neutral accounting, and liberal accounting. Simultaneously, the wage system is segmented into performance and fixed-wage systems.

The performance wage system delineates a wage structure that is devoid of the fixed wage, relying solely on performance wages. On the contrary, the fixed-wage system incorporates both the fixed-wage and the performance wages into the wage structure. The amalgamation of these three accounting treatment options and two wage system alternatives results in six distinct scenarios.

Drawing insights from these six situations, this study aims to identify the optimal wage system. The analysis aims to illuminate the interplay between agent and principal efforts, accounting conservatism, and the wage system within the context of the principal-agent relationship.

The findings of this study reveal several notable results. First, under the implementation of conservative accounting within a "performance wage system," there is a positive correlation between conservatism and the agent's effort. However, in the context of conservative accounting within a "fixed wage system," increased conservatism does not affect the efforts of the principal and the agent. Nevertheless, it leads to a reduction in the fixed wage.

Second, when a company adopts neutral accounting within a ‘performance wage system', it will result in the absence of an equilibrium solution. On the contrary, in the case of neutral accounting within a ‘fixed wage system', a negative fixed wage appears.

Third, under liberal accounting within the ‘performance wage system’, the propositions derived will find the absence of an equilibrium solution. Similarly, in the liberal accounting scenario within a ‘fixed wage system’, an increase in liberal accounting does not impact the efforts of the principal and agent and will decrease the fixed wage.

This study concludes that accounting treatment affects the agent's effort and a high degree of accounting conservatism will be an adequate method to solve the agency problem efficiently. However, it is worth noting that the effectiveness of this conservative accounting depends on its compatibility with the performance wage system.

2. Theoretical Framework and Analytical Approach

The model used in this study is grounded in the genesis of the agency problem; it focuses on the inherent conflict of interest between the principal and the agent.

This interactive simulation comprises three sequential stages. In the first stage, considered exogenous, the company strategically determines its accounting treatment, selecting from conservative, neutral, and liberal accounting treatments. This study treats this decision as an exogenous variable, conducting a comparative static analysis. The exogenous accounting treatment encapsulates the "private information" held by the principal, assumed to be invisible to the agent.

In the second stage of this dynamic model, the principal assumes a central role by deciding the principal's effort level and designing the wage system for the agent to maximize the principal's utility. The wage system comprises the performance wage rate and the fixed wage, categorized into the 'fixed wage system' and the

'performance wage system.' The fixed-wage system encompasses fixed and performance wages (fixed and variable components). In contrast, the performance wage system exclusively features the performance wage, excluding the fixed wage. The total wage provided by the principal to the agent is calculated as the sum of the fixed wage and the performance wage. Mathematically, this relationship is expressed as follows:

Total wage (fixed and variable components) = Fixed wage + Performance wage = Fixed wage + Performance wage rate × Accounting Earnings = Fixed wage + Performance wage rate × Accounting Information = Fixed wage + Performance wage rate × (Real Earnings − Degree of Conservative Accounting, or + Degree of Liberal Accounting) = Fixed wage + Performance wage rate × (Sum of Efforts of Principal and Agent − Degree of Conservative Accounting, or + Degree of Liberal Accounting).

In this context, the performance wage is calculated as the company's accounting earnings multiplied by the performance wage rate. It is assumed that the real earnings of the company are the sum of the efforts of the principal and the agent, the principal's salary being the real earnings of the company minus the agent's wage. The utility of the principal is defined as his salary minus the disutility associated with effort.

In the third stage, the agent strategically determines the level of effort with the goal of maximizing his own utility. The agent's utility is defined as his wage minus the disutility associated with effort.

The three-stage game described above investigates the influence of varying degrees of conservative accounting and wage design on agency problems. The model is structured to encompass six distinct situations for analysis. The first stage incorporates three accounting treatments: conservative accounting, neutral accounting, and liberal accounting. The second stage consists of two components: the fixed-wage system and the performance wage system.

In this study, the level of effort in production for the principal and the agent are denoted as e_P and e_A, respectively. The range of their effort levels is defined as e_P, $e_A \in \{e|0 \leq e < \infty\}$, assuming that the effort will be fully realized, reaching 100% in total company earnings.

Therefore, the sum of the principal's and agent's effort levels equals the total company's real earnings, expressed as $x = e_p + e_A$. This study focusses on the agency problem that arises from a misalignment between the principal and the agent's objectives. Consequently, the principal seeks to design a wage system that incentivizes the agent to align with the principal's interests.

Specifically, our assumption posits that the principal cannot observe e_A, but the

agent cannot observe e_p.

Consequently, the principal has the flexibility to manipulate conservative, neutral, and liberal accounting practices. In essence, conservative and liberal accounting impacts earnings analogously to the error terms arising from uncertainty. That implies that the earnings observable by the agent are equivalent to real earnings adjusted by subtracting accounting conservatism or adding accounting liberal.

The 'accounting information' or 'accounting earnings' referenced in this article denotes the earnings observable by the agent, that is, accounting information' or 'accounting earnings' is the sum of e_A and e_p and subtracting accounting conservatism or adding accounting liberal. In essence, the principal has visibility into the agent's effort, while the agent lacks access to the principal's effort.

Consequently, the principal uses his position on accounting treatment to manage accounting earnings. That involves adopting one of three accounting treatment methods: conservative accounting, neutral accounting, or liberal accounting, each of which subsequently influences the wage awarded by the principal to the agent.

In this study, π_P represents the principal's utility, and π_A denotes the agent's utility. The utility of the principal is defined as the total real earnings of the company, denoted as x, minus the agent's wage $s(m)$, and further subtracted by the disutility of work $\gamma(e_p)$. The disutility mentioned above refers to the discomfort experienced in the effort process.

Following the model definitions of Newman, Patterson, and Smith (2005) and Laux and Newman (2010), the disutility is expressed as $\gamma(e) = e^2/2$. Therefore, the disutility of the principal is $e_p^2/2$, and that of the agent is $e_A^2/2$. The term $s(m)$ represents the total wage obtained by the agent, a function of the 'account information' m, where m corresponds to the company's financial statements, also known as 'account earnings.'

The total wage is assumed to be $s(m) = \alpha m + \beta$, where α is the 'performance wage rate' and is the 'fixed wage.' In other words, total wage = performance wage + fixed wage = performance wage rate × accounting information + fixed wage.' For the 'performance wage system', the total wage equation is $s(m) = \alpha m$, while for the 'fixed wage system', the wage equation is $s(m) = \alpha m + \beta$.

In addition to x, the "accounting information" m also incorporates three characteristics: (1) conservative accounting, (2) neutral accounting, and (3) liberal accounting, defined as follows: (1) conservative accounting: $m = x - c$, where $c > 0$. This implies that when conservative accounting is implemented, the accounting information m on the company's financial statements will be less than

the total real earnings x due to the conservative accounting level c.

This setting aligns with Basu's (1997) definition of conservative accounting, reflecting 'bad news' more promptly than 'good news'. (2) neutral accounting: $m = x$, indicating that neutral accounting results in accounting information m in the company's financial statements equal to the real earnings x due to the absence of a conservative level c. (3) Liberal accounting: $m = x + c$, where $c > 0$.

This means that when liberal accounting is implemented, the accounting information m on the company's financial statements will be higher than the real earnings x due to the liberal accounting level c. This setting defines 'liberal accounting' as the opposite phenomenon of Basu's (1997) definition, reflecting 'good news' more promptly than 'bad news'.

This exogenous accounting treatment embodies the 'private information' retained by the principal and is assumed to be imperceptible to the agent. Furthermore, Kwon (2005) characterizes conservative accounting as yielding figures lower than real earnings, neutral accounting as producing figures equivalent to real earnings, and liberal accounting as generating figures higher than real earnings.

2.1 The Best Solution

$$\begin{aligned} e_A{}^*, e_P{}^* &= \operatorname{argmax}_{e_A, e_P}\ \pi^P + \pi^A \\ &= \operatorname{argmax}_{e_A, e_P}[x - s(m) - \gamma(e_P)] + [s(m) - \gamma(e_A)] \end{aligned}$$

The following inferences and solutions from the optimization problem presented above are derived based on the necessary first-order conditions. $\partial[\pi^P + \pi^A]/\partial e_A = 1 - e_A = 0$, and $\partial[\pi^P + \pi^A]/\partial e_P = 1 - e_P = 0$. Therefore, $e_A{}^* = e_P{}^* = 1$, $e^* = e_A{}^* + e_P{}^* = 2$.

Considering the aforementioned discoveries, we have identified the optimal solution for social welfare, denoted as $e^* = e_A{}^* + e_P{}^* = 2$. The economic ramifications of this solution suggest its independence from conservative, neutral, and liberal accounting. An intriguing observation surfaces, indicating that a higher salary for the principal then aligns with a lower wage for the agent.

It should be noted that the strength of conservatism or liberalism does not demonstrate correlation; somewhat, it is solely influenced by the actual level of effort. Consequently, variations in accounting information do not affect modifications in the optimal solution for social welfare.

2.2 The Second-Best Solution

2.2.1 Conservative Accounting

(1) Performance Wage System:

$$\max_{\alpha,e_P} \pi_P = \max_{\alpha,e_P} x - s(m) - \gamma(e_P)$$

$$= \max_{\alpha,e_P} e_A + e_P - \alpha(e_A + e_P - c) - \frac{e_P^2}{2} \quad (1)$$

$$\text{subject to } \pi_A = s(m) - \gamma(e_A) = \alpha(e_A + e_P - c) - \frac{e_A^2}{2} \geq 0 \quad (2)$$

$$\frac{\partial \pi_A}{\partial e_A} = \alpha - e_A = 0 \quad (3)$$

$$\alpha > 0 \quad (4)$$

The performance wage system refers to the wage system that does not include the fixed wage but only the performance wage. Conservative accounting yields figures lower than real earnings. Equation (1) presented above serves as the objective function of wage design. At this point, the agent believes that the principal's effort is $e_P - c$, whereas, in reality, the principal exerts effort equal to e_P. Equation (2) represents the agent's participation constraint. Equation (3) outlines the incentive compatibility constraint, and Equation (4) reflects the assumption. The Lagrange equation and first-order conditions are derived from these four equations:

$$\mathcal{L} = (e_A + e_P) - \alpha(e_A + e_P - c) - \frac{e_P^2}{2} + \theta_1\left[\alpha(e_A + e_P - c) - \frac{e_A^2}{2}\right] + \theta_2\alpha \quad (5)$$

$$\frac{\partial \mathcal{L}}{\partial \alpha} = 1 - 2\alpha - e_P + c + \theta_1(2\alpha + e_P - c - \alpha) + \theta_2 = 0 \quad (6)$$

$$\frac{\partial \mathcal{L}}{\partial e_P} = 1 - \alpha - e_P + \theta_1(\alpha) = 0 \quad (7)$$

In Equation (5), θ_1 and θ_2 represent Kuhn-Tucker multipliers, yielding the following solutions:

$$\text{if } c < \frac{2}{3},\ e_A = \alpha = c,\ e_P = 1 - c$$

$$\text{if } c > \frac{2}{3},\ e_A = \alpha = \frac{2(1+c)}{5},\ e_P = \frac{4c-1}{5}$$

Proposition 1: If a company opts for a combination of 'conservative accounting' and a 'performance wage system', the strength of conservative accounting significantly influences the relationship between the levels of effort of the principal and agent. Specifically, when conservative accounting is below the 2/3 threshold, the principal's effort decreases with greater accounting conservatism, while the agent's effort increases with greater accounting conservatism.

On the contrary, when conservative accounting exceeds the 2/3 threshold, the efforts of the principal and the agent will increase due to greater accounting conservatism. The optimal decision conditions are as follows: (1) when $c < 2/3$, $e_P = 1 - c$, then $e_A = \alpha = c$. (2) when $c > 2/3$, then $e_P = (4c - 1)/5$, $e_A = \alpha = 2(1 + c)/5$.

Proof: Organize Equations (6) and (7). Since Equation (4) is an inequality, then $\theta_2 = 0$, resulting in two equations: $(\theta_1 - 2)\alpha + (\theta_1 - 1)e_P = \theta_1 c - c - 1$ and $(\theta_1 - 1)\alpha + (-1)e_P = -1$.

Solve two solutions using Cramer's Rule: $\alpha = (-\theta_1 c + \theta_1 + c)/(-\theta_1^2 + \theta_1 + 1)$ and $e_P = (-\theta_1^2 c + 2\theta_1 c - c + 1)/(-\theta_1^2 + \theta_1 + 1)$. (a) If Equation (2) is an inequality $\alpha/2 + e_P - c > 0$, then $\theta_1 = 0$. This yields two solutions: $\alpha = c$, $e_P = 1 - c$.

Substituting these into the initial inequality results in $c < 2/3$. (b) If Equation (2) is the identity equation $\alpha/2 + e_P - c = 0$, then $\theta_1 > 0$. This yields two solutions: $\alpha = 2(1 + c)/5$, $e_P = (4c - 1)/5$. Substituting these into the original equation leads to $c > 2/3$. Q.E.D.

According to the findings of this proposition, the agent's effort level is positively correlated with the degree of conservativeness, regardless of its magnitude. This implies that as the level of conservatism increases, the exertion of the agent also intensifies. However, beyond the threshold, the impact of conservatism on agent effort decreases significantly, dropping from 100% original to approximately 40%. Meanwhile, its effect on the principal's effort increases; this result is reasonable.

The higher conservativeness indicates less accounting information below the threshold, suggesting an unfavorable financial situation. Intensified efforts are required to prevent the company from deteriorating in such circumstances. However, the real earnings of the company remain profitable, leading to a situation where the agent may not anticipate substantial wages and resulting in a free-riding phenomenon for the principal.

Beyond the threshold, an excessively high level of conservativeness raises doubts about the financial statements, limiting the rate of increase in agent effort. This forces the principal to work harder to compensate for the reduced effort of the agent. As an illustrative example, the renowned Japanese brand SONY adopted a performance wage system in 2004, initially yielding unexpected responses, but experiencing a decline in the latter years.

This study speculates that some companies could employ a highly conservative strategy, possibly exceeding the threshold outlined in this proposition, causing increased employee effort, but at a lower growth rate than below the threshold. While employees continue to work diligently for the company, the level of effort

may not reach the previous highs.

(2) Fixed Wage System:

$$\max_{\alpha,\beta,e_P} \ \pi_P = \max_{\alpha,\beta} \ x - s(m) - \gamma(e_P)$$

$$= \ \max_{\alpha,\beta} \ e_A + e_P - c - \alpha(e_A + e_P - c) - \beta - \frac{e_P^2}{2} \tag{8}$$

$$\text{subject to } \ \pi_A = s(m) - \gamma(e_A) = \ \alpha(e_A + \ e_P - c) + \beta - \frac{e_A^2}{2} \geq 0 \tag{9}$$

$$\frac{\partial \pi_A}{\partial e_A} = \ \alpha - e_A = 0 \tag{10}$$

$$\alpha > 0 \tag{11}$$

The fixed wage system refers to the wage system that includes the fixed wage and the performance wage. Conservative accounting yields figures lower than real earnings. Equation (8) above represents the utility design's objective function. At this point, the agent believes that the principal's effort is $e_P - c$, whereas, in reality, the principal exerts effort equal to e_P. Equation (9) denotes the participation constraint of the agent, and Equation (10) serves as the incentive compatibility constraint for the agent. Equation (11) encapsulates the assumption. The Lagrange equation and first-order conditions are derived from these four equations:

$$\mathcal{L} = \ e_A + e_P - \alpha(e_A + e_P - c) - \beta - \frac{e_P^2}{2} + \ \theta_1 \left[\alpha(e_A + e_P - c) + \beta - \ \frac{e_A^2}{2}\right] + \theta_2 \alpha \tag{12}$$

$$\frac{\partial \mathcal{L}}{\partial \alpha} = 1 - 2\alpha - e_P + c + \theta_1(2\alpha + e_P - c - \alpha) + \theta_2 = 0 \tag{13}$$

$$\frac{\partial \mathcal{L}}{\partial e_P} = 1 - \alpha - e_P + \theta_1(\alpha) = 0 \tag{14}$$

$$\frac{\partial \mathcal{L}}{\partial \beta} = -1 + \theta_1(1) = 0 \tag{15}$$

In Equation (12), both θ_1 and θ_2 serve as Kuhn-Tucker multipliers, and the ensuing solution is derived:

$$\alpha = \ e_A$$
$$\alpha = 1$$
$$e_P = 1$$

$\beta = c - \frac{3}{2}$

Proposition 2: In the case where the company opts for 'conservative accounting' coupled with a 'fixed wage system', the level of conservatism does not impact the efforts of the principal and the agent. However, a higher degree of conservatism leads to an increased fixed wage. The optimal decision conditions are as follows: $e_P = 1, e_A = \alpha = 1, \beta = c - 3/2$.

Proof: Rearranging Equation (15), we obtain $\theta_1 = 1$. Substituting this solution into Equation (14), we find $e_P = 1$. Furthermore, employing the solutions derived from Equations (14) and (15) in Equation (13), and considering that Equation (11) is an inequality, we conclude that $\theta_2 = 0$, and $\alpha = 1$ upon simplification. According to Kuhn-Tucker's theorem, when $\theta_1 > 0$, the constraint is given by $\alpha(e_A + e_P - c) + \beta - (e_A^2)/2 = 0$. Substituting the solutions obtained from Equations (13), (14), and (15) into this constraint equation, we determine that $\beta = c - 3/2$. Q.E.D.

The economic ramifications of Proposition 2 compared to Proposition 1 lie in the fact that when conservative accounting is low ($c < 2/3$), a fixed wage increases the agent's motivation to work diligently. On the contrary, when conservative accounting is high ($c > 3/2$), the fixed wage decreases the agent's incentive for hard work. When conservative accounting is sufficiently modest, a fixed wage improves the agent's motivation to exert effort. The wage system posited by this proposition primarily seeks to regulate financial statement presentation by incorporating conservative accounting.

Consequently, the company's financial statements will reflect figures lower than the actual amounts in this scenario. Therefore, the design of this system proves to be more effective in preventing principals from utilizing asymmetric information to manipulate earnings, potentially reducing the likelihood of related fraudulent activities. In Proposition 2, with a higher fixed wage compared to Proposition 1, there exists insufficient incentive to utilize the fixed wage for adjusting performance wages. The level of effort of the agent can be maintained at a specific equilibrium through the automatic adjustment function.

In Proposition 2, as the fixed wage outweighs that in Proposition 1, there exists an inadequate incentive to employ the fixed wage for adjusting performance wages. The automatic adjustment feature ensures the maintenance of the agent's effort level at a specific equilibrium.

2.2.2 Neutral Accounting

(1) Performance Wage System:

$\max_{\alpha, e_P} \pi_P = \max_{\alpha, e_P} x - s(m) - \gamma(e_P)$

$$= \max_{\alpha, e_P} \; e_A + e_P - \alpha(e_A + e_P) - \frac{e_P^2}{2} \tag{16}$$

$$\text{subject to } \pi_A = s(m) - \gamma(e_A) = \alpha(e_A + e_P) - \frac{e_A^2}{2} \geq 0 \tag{17}$$

$$\frac{\partial \pi_A}{\partial e_A} = \alpha - e_A = 0 \tag{18}$$

$$\alpha > 0 \tag{19}$$

The performance wage system refers to a wage structure with no fixed wage that covers only the performance wage. Implementing neutral accounting ensures that reported figures align with actual earnings, avoiding understatement and overstatement. Equation (16) represents the objective function of the principal. At this point, the agent believes that the principal's effort is e_P; in reality, the principal exerts effort equal to e_P.

Equations (17) and (18) denote the agent's participation and the incentive compatibility constraint equations, respectively. Equation (19) encapsulates the previously mentioned assumption. The Lagrange equation and the first-order conditions are derived from the aforementioned equations.

$$\mathcal{L} = e_A + e_P - \alpha(e_A + e_P) - \frac{e_P^2}{2} + \theta_1 \left[\alpha(e_A + e_P) - \frac{e_A^2}{2}\right] + \theta_2 \alpha \tag{20}$$

$$\frac{\partial \mathcal{L}}{\partial \alpha} = 1 - 2\alpha - e_P + \theta_1(2\alpha + e_P - \alpha) + \theta_2 = 0 \tag{21}$$

$$\frac{\partial \mathcal{L}}{\partial e_P} = 1 - \alpha - e_P + \theta_1(\alpha) = 0 \tag{22}$$

Proposition 3: There are no equilibrium solutions if a company opts for both 'neutral accounting' and a 'performance wage system'.

Proof: (a) If $\theta_1 = 0$, substitute this into Equations (21) and (22). Since Equation (19) is an inequality, $\theta_2 = 0$. After rearranging Equations (21) and (22), we obtain $1 - 2\alpha - e_P = 0$ and $1 - \alpha - e_P = 0$. The solutions are $\alpha = 0$ and $e_P = -1$, but these results conflict with the assumption in Equation (19) that $\alpha > 0$ and the original setting of e in this study, where $e \in \{e | 0 \leq e < \infty\}$. Therefore, Equations (17), (18), and (19) need to include the condition $e_P \geq 0$.

As a result, Equation (20) is modified to

$\mathcal{L} = e_A + e_P - \alpha(e_A + e_P) - e_P^2/2 + \theta_1[\alpha(e_A + e_P) - e_A^2/2] + \theta_2 \alpha + \theta_3 e_P$, where $\theta_3 \geq 0$. The partial derivative $\partial \mathcal{L}/\partial \alpha$ is the same as Equation (21), and

$\mathcal{L}/\partial e_P = 1 - \alpha - e_P + \theta_1(\alpha) + \theta_3 = 0$, substituting into these two equations, and because Equation (19) is an inequality, $\theta_2 = 0$, , and after sorting the above 2 equations, results in $1 - 2\alpha - e_P = 0$ and $1 - \alpha - e_P + \theta_3 = 0$.

Then, $\theta_3 = -\alpha < 0$ is obtained, contradicting the earlier condition $\theta_3 \geq 0$. (b) If $\theta_1 > 0$, then $\alpha(e_A + e_P) - e_A^2/2 = 0$. Since $e_A = \alpha$, the constrained expression $\alpha/2 + e_P = 0$ leads to $e_P = (-\alpha)/2$. When the assumption in Equation (19) that $\alpha > 0$ is applied to this constrained expression, $e_P < 0$ is obtained, contradicting the set condition $e \in \{e|0 \leq e < \infty\}$ in this study. Therefore, no equilibrium solution exists for this proposition. Q.E.D.

(2) Fixed Wage System:

$$\max_{\alpha,\beta,e_P} \pi_P = \max_{\alpha,\beta,e_P} x - s(m) - \gamma(e_P)$$

$$= \max_{\alpha,\beta,e_P} e_A + e_P - \alpha(e_A + e_P) - \beta - \frac{e_P^2}{2} \quad (23)$$

$$\text{subject to } \pi_A = s(m) - \gamma(e_A) = \alpha(e_A + e_P) + \beta - \frac{e_A^2}{2} \geq 0 \quad (24)$$

$$\frac{\partial \pi_A}{\partial e_A} = \alpha - e_A = 0 \quad (25)$$

$$\alpha > 0 \quad (26)$$

The fixed wage system refers to the wage system that includes the fixed wage and the performance wage. Implementing neutral accounting ensures that reported figures align with actual earnings, avoiding understatement and overstatement. The objective function of the principal is represented by Equation (23). At this point, the agent believes that the principal's effort is e_P; in reality, the principal exerts effort equal to e_P. Equation (24) denotes the agent's participation constraint, (25) describes the incentive compatibility constraint, and Equation (26) encapsulates the assumption mentioned above. The Lagrange equation and the first-order conditions are derived from these four equations.

$$\mathcal{L} = e_A + e_P - \alpha(e_A + e_P) - \beta - \frac{e_P^2}{2} + \theta_1\left[\alpha(e_A + e_P) + \beta - \frac{e_A^2}{2}\right] + \theta_2\alpha \quad (27)$$

$$\frac{\partial \mathcal{L}}{\partial \alpha} = 1 - 2\alpha - e_P + \theta_1(2\alpha + e_P - \alpha) + \theta_2 = 0 \quad (28)$$

$$\frac{\partial \mathcal{L}}{\partial e_P} = 1 - \alpha - e_P + \theta_1(\alpha) = 0 \quad (29)$$

$$\frac{\partial \mathcal{L}}{\partial \beta} = -1 + \theta_1 = 0 \tag{30}$$

In Equation (27), both θ_1 and θ_2 serve as Kuhn-Tucker multipliers, and the solutions are as follows:

$\alpha = e_A$
$\alpha = 1$
$e_P = 1$
$\beta = -\frac{3}{2}$

Proposition 4: If a company adopts both 'neutral accounting' and a 'fixed wage system', the accounting information will not influence the efforts of the principal and agent. The principal effort level is 1, and the agent effort level is equal to the performance wage rate, which is also 1, while the fixed wage is negative. The optimal decision-making conditions are $e_P = 1, e_A = \alpha = 1, \beta = -3/2$.

Proof: From Equation (30), we determine $\theta_1 = 1$. Substituting this solution into Equation (29), we obtain $e_P = 1$. Combining the solutions from Equations (29) and (30) with Equation (28), and since Equation (26) is an inequality, we deduce $\theta_2 = 0$ and $\alpha = 1$ upon further examination. According to Kuhn-Tucker's theorem, when $\theta_1 > 0$, the equation $\alpha(e_A + e_P) + \beta - (e_A^2)/2 = 0$ is derived. Inserting the solutions obtained from Equations (28), (29), and (30) into the latter restriction equation, we find $\beta = -3/2$. Q.E.D.

The economic implications of this proposition arise when the fixed wage is negative. In such instances, the principal should adopt a wage structure based on the performance wage system and should devise complementary systems aimed at enhancing performance to elevate the agent's efforts. Consequently, the agent is motivated to intensify his work in accordance with the principal's interests. An illustrative scenario reminiscent of a real-life application is found in multilevel marketing, where members must pay membership dues upon entry.

Within the context of multilevel marketing, employees are required to remit specific fees annually or monthly as membership dues. To foster diligence among employees, the company must establish various performance wage systems, such as sales bonuses. Additionally, adopting a company system that incorporates neutral accounting practices is crucial. Such a system prevents the exaggeration of assets, the overestimation of liabilities, or the underreporting of financial statements. This approach leads to a more effective prevention of earnings manipulation and a substantial reduction in internal fraud.

However, the findings of this study indicate that when a company adopts neutral accounting and a fixed-wage system, the variables exhibit constancy, indicating a

lack of mutual influence. Consequently, under a neutral accounting framework, there is no discernible impact on the efforts exerted by the principal and the agent. Therefore, it remains essential for the company to formulate additional mechanisms that encourage employees to work more efficiently.

2.2.3 Liberal accounting

(1) Performance Wage System:

$$\max_{\alpha, e_P} \pi_P = \max_{\alpha, e_P} \; x - s(m) - \gamma(e_P)$$

$$= \max_{\alpha, e_P} \; e_A + e_P - \alpha(e_A + e_P + c) - \frac{e_P^2}{2} \tag{31}$$

$$\text{subject to } \; \pi_A = s(m) - \gamma(e_A) = \alpha(e_A + e_P + c) - \frac{e_A^2}{2} \geq 0 \tag{32}$$

$$\frac{\partial \pi_A}{\partial e_A} = \; \alpha - e_A \; = 0 \tag{33}$$

$$\alpha > 0 \tag{34}$$

The performance wage system refers to the wage system that does not include the fixed wage but only the performance wage. Liberal accounting yields figures higher than real earnings. Equation (31) represents the objective function of the principal. At this point, the agent believes that the principal's effort is $e_P + c$, while in reality, the principal's effort is precisely e_P. Equation (32) denotes the agent's participation constraint, Equation (33) serves as its incentive compatibility constraint, and Equation (34) encapsulates the aforementioned assumption. The Lagrange equation and the first-order conditions are derived from these four equations.

$$\mathcal{L} = e_A + e_P - \alpha(e_A + e_P + c) - \frac{e_P^2}{2} + \theta_1 \left[\alpha(e_A + e_P + c) - \frac{e_A^2}{2}\right] + \theta_2 \alpha \tag{35}$$

$$\frac{\partial \mathcal{L}}{\partial \alpha} = 1 - 2\alpha - e_P - c + \theta_1(2\alpha + e_P + c - \alpha) + \theta_2 = 0 \tag{36}$$

$$\frac{\partial \mathcal{L}}{\partial e_P} = 1 - \alpha - e_P + \theta_1(\alpha) = 0 \tag{37}$$

In Equation (35), both θ_1 and θ_2 are Kuhn-Tucker multipliers, and the resulting solutions are derived:

$$\text{if } c > -\frac{2}{3}, \;\; e_A = \alpha = -c, \;\; e_P = c + 1$$

$$\text{if } c < -\frac{2}{3}, \;\; e_A = \alpha = \frac{2(1-c)}{5}, \;\; e_P = \frac{-4c-1}{5}$$

Proposition 5: When a company opts for both 'liberal accounting' and a 'performance wage system', the optimal decision conditions are as follows: (1) $c > -2/3$, $e_P = c + 1$, $e_A = \alpha = -c$. (2) when $c < -2/3$, $e_P = (-4c - 1)/5$, $e_A = \alpha = 2(1 - c)/5$. Since liberal accounting is based on $c > 0$, this model is absent from equilibrium solutions.

Proof: Since Equation (34) is an inequality, $\theta_2 = 0$ is obtained. The sorting Equations (36) and (37) yields: $(\theta_1 - 2)\alpha + (\theta_1 - 1)e_P = -\theta_1 c + c - 1$ and $(\theta_1 - 1)\alpha + (-1)e_P = -1$. Two solutions are derived using Cramer's Rule:

$\alpha = (\theta_1 c + \theta_1 - c)/(-\theta_1^2 + \theta_1 + 1)$ and
$e_P = (\theta_1^2 c - 2\theta_1 c + c + 1)/(-\theta_1^2 + \theta_1 + 1)$. (a) If Equation (32) is the inequality $\alpha/2 + e_P + c > 0$, then $\theta_1 = 0$. Substituting it into the previous equation yields two solutions: $\alpha = -c$, $e_P = c + 1$. Taking this into account for the inequality mentioned above results in $c > -2/3$. (b) If Equation (32) is the equality $\alpha/2 + e_P + c = 0$, then $\theta_1 > 0$. Substituting it into the previous equation leads to two solutions: $\alpha = 2(1 - c)/5$, $e_P = -(4c + 1)/5$. Taking this into account in the aforementioned inequality results in $c < -2/3$. Q.E.D.

(2) Fixed Wage System

$$\max_{\alpha,\beta,e_P} \pi_P = \max_{\alpha,\beta,e_P} x - s(m) - \gamma(e_P)$$

$$= \max_{\alpha,\beta,e_P} e_A + e_P - \alpha(e_A + e_P + c) - \beta - \frac{e_P^2}{2} \quad (38)$$

$$\text{subject to } \pi_A = s(m) - \gamma(e_A) = \alpha(e_A + e_P + c) + \beta - \frac{e_A^2}{2} \geq 0 \quad (39)$$

$$\frac{\partial \pi_A}{\partial e_A} = \alpha - e_A = 0 \quad (40)$$

$$\alpha > 0 \quad (41)$$

The fixed wage system refers to the wage system that includes the fixed wage and the performance wage. Liberal accounting yields figures higher than real earnings. Equation (38) represents the objective function of the principal. At this point, the agent believes that the principal's effort is $e_P + c$, while in reality, the principal's effort is precisely e_P.

Equation (39) serves as the agent's participation constraint, Equation (40) as its incentive compatibility constraint, and Equation (41) encapsulates the aforementioned assumption. The Lagrange equation and the first-order conditions are derived from this set of four equations.

$$\mathcal{L} = e_A + e_P - \alpha(e_A + e_P + c) - \beta - \frac{e_P^2}{2} + \theta_1 \left[\alpha(e_A + e_P + c) + \beta - \frac{e_A^2}{2}\right] + \theta_2 \alpha \quad (44)$$

$$\frac{\partial \mathcal{L}}{\partial \alpha} = 1 - 2\alpha - e_P - c + \theta_1(2\alpha + e_P + c - \alpha) + \theta_2 = 0 \quad (45)$$

$$\frac{\partial \mathcal{L}}{\partial e_P} = 1 - \alpha - e_P + \theta_1 \alpha = 0 \quad (46)$$

$$\frac{\partial \mathcal{L}}{\partial \beta} = -1 + \theta_1 = 0 \quad (47)$$

In Equation (44), both θ_1 and θ_2 serve as Kuhn-Tucker multipliers, yielding the following solutions:

$\alpha = e_A$
$\alpha = 1$
$e_P = 1$
$\beta = -c - \frac{3}{2}$

Proposition 6: If a company opts for both 'liberal accounting' and a 'fixed wage system', the accounting information will not affect the efforts of the principal and the agent, and the performance wage remains unaffected. However, the more liberal the accounting, the smaller the fixed wage. The optimal decision-making conditions are $e_P = 1, e_A = \alpha = 1, \beta = -c - 3/2$.

Proof: From Equation (47), we determine $\theta_1 = 1$. Substituting this solution into Equation (46), we obtain $e_P = 1$. Since Equation (41) is an inequality, $\theta_2 = 0$. By substituting the solutions from Equations (46) and (47) into Equation (45), we derive $\alpha = 1$. According to Kuhn-Tucker's theorem, when $\theta_1 > 0$, the constrained Equation (39) becomes an identity: $\alpha(e_A + e_P + c) + \beta - (e_A^2)/2 = 0$. Solutions obtained from Equations (45), (46), and (47) are incorporated into the constrained equation aforementioned, giving $\beta = -c - 3/2$. Q.E.D.

The economic implication of this proposition is that as liberal accounting becomes higher, accounting information will no longer influence the efforts of the principal and the agent, although with a negative impact on the fixed wage. Consequently, the wage structure will prioritize the performance wage rate, reducing the weight of the fixed wage.

The results of this proposition model indicate that whether accounting is highly liberal or minimally liberal, it does not impact the efforts exerted by the principal and the agent. To address this challenge, the company must motivate the agent to

work diligently through alternative systems, thereby inducing greater effort. This study reasonably concludes that within such a wage system, the company can enhance the agent's wage by presenting favorable financial statements and promoting the agent's motivation to work hard, avoiding the need for direct manipulation through conservative or liberal accounting.

However, embellishing the financial statements and increasing the agent's wage indirectly improves the agent's morale. In a more liberal financial statement scenario within the company, the agent's fixed wage decreases proportionally to the degree of liberal accounting.

2.3 Comparative Analysis and Discussion

This study explores three accounting treatments: conservative accounting, neutral accounting, and liberal accounting. Additionally, it delves into two wage systems, namely, the performance wage system and the fixed-wage system, thereby studying six distinct scenarios.

In the scenario where the company adopts 'conservative accounting' along with a 'performance wage system', the optimal equilibrium is outlined as follows: (1) when $c < 2/3$, $e_P = 1 - c$, $e_A = \alpha = c$; (2) when $c > 2/3$, $e_P = (4c - 1)/5$, $e_A = \alpha = 2(1 + c)/5$, where c represents the degree of conservative accounting. On the contrary, for 'conservative accounting' paired with a 'fixed wage system', the optimal equilibrium is $e_P = 1$, $e_A = \alpha = 1$, $\beta = c - 3/2$, with c signifying the degree of conservative accounting.

For the choice of 'neutral accounting' and 'performance wage system', there is no equilibrium. On the contrary, if the company adopts 'neutral accounting' with a 'fixed wage system', the optimal equilibrium is $e_P = 1, e_A = \alpha = 1, \beta = -3/2$.

In the scenario of 'liberal accounting' combined with a 'performance wage system', there is no equilibrium. Meanwhile, for the selection of 'liberal accounting' and a 'fixed wage system', the optimal equilibrium is $e_P = 1, e_A = \alpha = 1, \beta = -c - 3/2$, where c signifies the degree of liberal accounting.

Based on the analysis aforementioned, this study concludes that the adoption of a fixed wage system by the principal for the agent's wage does not improve the agent's effort. This remains consistent across different accounting treatments, be it conservative, neutral, or liberal accounting—indicating that $e_A = 1$.

However, this study reveals that when the principal opts for the performance wage system to compensate the agent, the adoption of conservative accounting with a degree exceeding 3/2 leads to an improvement in the agent's effort, denoted as $e_A = 2(1 + c)/5 > 1$.

Hence, this study concludes that a high degree of conservative accounting is an effective accounting treatment for the agency problem. However, it is crucial to note that the effectiveness of conservative accounting is contingent on its combination with a performance wage system.

3. Conclusions

This study makes a breakthrough by using three accounting treatments and two wage designs to address the agency problem where the interests of the principal and the agent are inconsistent. The innovation of this study lies in filling the gap in past literature, which lacks research on the incentives of accounting treatment for the agent's effort, with most focusing solely on the agent's effort.

This study introduces the effort of the principal as a factor in the relationship between the principal and the agent, thus advancing the existing literature. The cooperative environment also successfully enhances the agent's efforts through decision-making interaction.

In conclusion, this study distinguishes itself within the scholarly discourse by introducing novel elements that combine accounting treatment, wage design, and the principal's effort. Exploring agency problem dynamics takes a groundbreaking turn as the causes of incomplete information find innovative translation into the domain of accounting processing.

This research bestows a pivotal role on private details within the fabric of agency relationships, deviating from the conventional portrayal of merely focusing on the agent in existing literature. Embracing a paradigm shift, this study adds a principal-centric perspective, thus contributing an innovative viewpoint to understanding agency problems.

In the prevailing literature, agency problems are conventionally ascribed to asymmetric information. However, this study presents a distinctive point of view, acknowledging that the fundamental source of the agency problem emanates from the inherent conflict of interest between the principal and the agent.

This intrinsic conflict impedes the agent’s ability to synchronize with the principal’s objectives, thus constituting the crux of the agency problem. As a departure from traditional perspectives, this study takes a direct approach to the agency problem, emphasizing the discordance in goals between the principal and the agent.

Furthermore, while agent wage is recognized as a crucial determinant of their effort, accounting treatment is often neglected in the current literature. This study elevates its investigation by integrating the company’s accounting treatment, which includes conservative, neutral, and liberal accounting methods, into the examination of the agency’s problem.

Moreover, whereas the prevailing literature mainly concentrates on the exertion of effort by the agent, this study takes a more expansive approach by incorporating the principal's effort. Principal efforts, which include work and agent supervision, emerge as pivotal contributors to the improvement of company profits and serve as a compelling incentive for the exertion of effort by the agent.

"Not overestimating assets and earnings, not underestimating liabilities and losses" is a definition of conservative accounting, while liberal accounting embraces the opposite approach to conservative accounting. The company formulates financial statements based on the degree of conservative, neutral, or liberal accounting.

The interconnected factors include the level of conservative, neutral, or liberal accounting, the wage design, and the efforts exerted by both the principal and the agent. This study primarily investigates the extent to which the accounting treatment of the agent's wage structure and how the efforts of the principal and the agent evolve under different conditions.

Hence, this study explores six models by combining conservative, neutral, and liberal accounting with the performance wage and fixed-wage systems. The objective is to discern the impact of accounting treatment on the company. The research findings give the company guidelines for designing agent wages in various systems.

This study focusses on the influence of accounting systems and wage design on the agency problem. Furthermore, incorporating the effort level of the principal as a crucial variable in the model aligns more closely with the actual effects of the accounting system and the hierarchical dynamics within the company.

This study reveals that under different degrees of conservative accounting and wage systems, the following conclusions can be inferred: (1) under 'conservative accounting' and a 'performance wage system', stronger conservative accounting leads to higher levels of agent effort; (2) under 'conservative accounting' and a 'fixed wage system', accounting information does not impact the efforts of the principal and agent, but a more conservative approach results in a higher fixed wage; (3) under 'neutral accounting' and a 'performance wage system', no equilibrium solution exists; (4) under 'neutral accounting' and a 'fixed wage system', accounting information does not affect the efforts of the principal and the agent, but the fixed wage is negative; (5) under 'liberal accounting' and a 'performance wage system', no equilibrium solution exists; and (6) Under 'liberal accounting' and a 'fixed wage system', the accounting information does not affect the efforts of the principal and the agent, and the performance wage remains unaffected, with a lower fixed wage associated with a more liberal accounting.

Based on the observations above, this study concludes that adopting a fixed wage system by the agent's principal for the agent's wage does not improve the agent's

effort, regardless of whether the company employs conservative, neutral, or liberal accounting practices. However, the study reveals that if the principal opts for the performance wage system in compensating the agent and uses conservative accounting, especially when conservatism is substantial, it improves the agent's effort.

Consequently, the study suggests that a high degree of conservative accounting is a practical approach to addressing agency problems. It emphasizes, however, that such accounting practices should be accompanied by the implementation of a performance-wage system.

This study embraces a holistic perspective by considering the effort of both the principal and the agent, reflecting on the natural world and yielding propositions that resonate strongly with practical scenarios. The implications drawn from this study offer valuable information for companies seeking to establish an optimal degree of conservative accounting.

Moreover, it provides a nuanced understanding of crafting a performance wage system that fosters a mutually beneficial relationship between the principal and the agent, thus effectively alleviating agency costs. Within academic realms, this research lays the groundwork for empirical investigations and contributes to the foundational framework of scholarly discourse.

In particular, this study redefines conventional accounting treatment in the context of traditional asymmetric information and introduces a groundbreaking consideration of the principal's effort. This novel approach has profound and far-reaching implications, substantially impacting the academic landscape.

Declaration of generative AI and AI-assisted technologies in the writing process:
In preparing this work, the author used ChatGPT to improve language and readability. After using this tool, the author reviewed and edited the content as needed and took full responsibility for the publication's content.

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