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Selecting and Remunerating Advertising Agencies: A Signaling Theoretical Perspective

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Abstract

Advertising agencies have historically received a major share of their compensation as a commission or on the basis of one or more fee structures. However, during the last few years, agencies are under heavy pressure to demonstrate their accountability and prove the value of their contribution to the advertiser, by using some performance-based compensation. However, there are some conflicts between the advertiser and the agency mainly because of different objectives and risk preferences, which leads to favor of different courses of action. So far, most studies conducted with the aim of resolving these conflicts and reconciling the interests of both parties have relied on agency theory, but failed to lead to a stable equilibrium for both parties. In this study, we offer a theoretical model based on signaling theory, which leads to a stable optimal solution for both parties. We critically examine the motivations and conflicts arising in the evolvement of a suitable remuneration system and the means of resolutions available to both parties for a satisfying contract. Also, we develop an auction theoretical model for selecting full-service advertising agencies considering the interdependencies among evaluation criteria. Our findings provide practical guidelines for ad agency selection and compensation.

Keywords

Ad Agencies, Game Theory, Signaling Theory, Auction Theory, Pay-by-Results, Compensation

1. Introduction

"In the recent history of advertising, few topics have raised as much debate, disconsolation, and angst as that of agency fees, compensation or remuneration" (Beals, 2021).

Consider the following:

> "On February 2010, Coca-Cola unveiled its plan to impose a "value-based" compensation model on its agencies across the world. In short, Coke agencies are being promised profit mark-ups of up to 30 percent if certain targets are met. If they aren't, agencies will recoup nothing more than their costs. The world's sixth-largest advertiser, with an annual spend of around $2 billion, not only wants agencies to truly earn their money, but to spark a worldwide movement among advertisers to take a similar path" (Campaign, 2010).

There is much evidence in the extant literature like the labor market, salesman compensation, executives, and talent payments, that incentive-based compensation significantly improves performance (e.g. Hamm, 2022; Shahvari et al., 2022). The subject of advertising remuneration has always been a controversial subject despite the coexistence of advertisers and advertising agencies over a century. Many scholars have reported that there are major conflicts between the two parties that are rooted in their conflicting objectives (e.g. Horsky, 2006; Koslow et al., 2022; Turnbull & Wheeler, 2016).

Advertising agency selection and remuneration have changed dramatically over the past decade, mainly due to advertisers' dissatisfaction with commission-based or fixed fee-based compensation systems. The increasing dissatisfaction of advertisers with commission-based or fixed fee-based compensation systems may be attributed to the lack of a direct connection between performance and payment, since the calculated payment is a fixed proportion of media purchase volume, or simply a fixed fee. In any case, it has led both advertisers and agencies to seek to devise a new compensation method that will allow them far more flexibility and control over the efficacy of advertising investments (Horsky & Zeithammer, 2021). The pressure on advertising agencies to enhance their performance and deliver value is the result of several events: The Total Quality Management revolution of the 1980s to improve quality was extended to include supplier performance. Also, the increased pressure on justifying marketing budgets called for justifying all details in the advertising expenditures (Turow, 2018). Therefore, both advertisers and agencies sought to devise a new compensation method that would allow them far more flexibility and control over the efficacy of advertising investments (Hornik et al., 2017; Horsky & Zeithammer, 2021). "When media commissions were the prevailing method of agency compensation, it almost always resulted in either over or underpayment for advertising services. In theory, this methodology rewarded the agency for risking some of their profits for the prospects of future growth in their clients' businesses, based on the premise that advertisers would maintain a constant Advertising/Sales (A/Ss) ratio" (Beals, 2021).

For the advertiser, the implications were as follows: Advertising, like any other activity, must be managed better to obtain superior results at a lower cost. If the advertiser makes a poor agency choice, not only will his marketing goal not be achieved, but he might be forced to switch agencies. Selecting a new agency consumes much time and attention, as does creating a new working relationship. The disruption to marketing activities caused by a change in agencies can weaken results (Sims, 2021). Therefore, how to objectively and effectively select and compensate an ideal ad agency and avoid incurring switching costs is an important issue for most advertisers. Indeed, selecting the optimal full-service ad agency is a multi-criteria decision-making (MCDM) problem. Suitable criteria and strict screening are necessary to select an ideal ad agency (Cheong et al., 2016).

Most previous studies have attempted to model the advertising agency compensation problem on the basis of agency theory. Although the agency theory has been commonly used to describe the advertiser-agency relationship, we show in this paper, that this theory is inadequate in describing the complexities of the relationship. The primary problem is that the theory maximizes the advertiser's gains while the gains of the agency function merely as a constraint in the model.

Paper's Contributions

We suggest therefore approaching this subject from a different perspective. We model the interaction between the advertiser and the agencies as a signaling game where the contract offered by the agency serves as a signal of her suitability for the campaign. We analyze both the separating and the pooling equilibrium. In separating equilibria, advertisers can distinguish between a suitable and a less suitable advertising agency and decide on the most appropriate compensation system. In a pooling equilibrium, the less suitable agency mimics the able agency and the advertiser has no way to distinguish the two types of agencies. The agencies have different attitudes towards risk. A contract between an agency and an advertiser has two components: An up-front fee that the advertiser pays the agency and a percentage of the revenue increment generated by the agency. Different agencies have different utilities over possible contracts. A risk-adverse agency prefers a higher up-front fee and a lower percentage of the revenue increment. A risk-neutral agency is indifferent between two contracts that yield the same level of expected revenue. Due to the common practice that advertisers use an auction to select optimal agencies (Horsky, 2006; Horsky & Zeithammer, 2021), in the second stage, we use auction theory to model the selection and compensation structure (Kivetz & Tauman, 2010).

This research has both theoretical and practical contributions. From the theoretical point of view, our formulation allows us to study the impact of the asymmetric information between advertisers' and agencies' attitudes of agencies toward risk on the selection decision and the optimal contract. The originality of our research lies in the fact that it focuses on the interactive and strategic aspects of the relationship between the advertiser and the agency. We contribute to developing an understanding of the drivers of advertising agency selection and compensation, and add to the theoretical knowledge by taking into account the parties' objectives. Our application of a signaling game theory illustrates how an optimal agency selection process and an advertiser-agency relationship may form when the two parties behave strategically. The results of the applications of the proposed model will provide practical advice for both the advertiser and the advertising agency. To the best of our knowledge, we are the first to conduct the analysis of such a two-part tariff contract between advertisers and agencies, making our study a distinct addition to the literature. To achieve the paper's objectives, the paper was structured as follows: We start with a literature review which includes a short description of the common methods of ad agencies' remunerations methods. Followed by the theoretical framework, the analytical model, and the advertising auction, concludes with a conclusion section which includes with paper's limitations and future research.

2. Literature Review

Today's advertising agency is a full-service organization. Advertising agencies offer a wide range of marketing services that include market research, concept testing, demand forecasting, purchase of regular and electronic media time and space, production of artwork, billboards, direct mail and personal selling (Hornik, 1988). One of the interesting and debatable issues is the ad agency and client dynamics which entails agency selection and its compensation system. The basic premise of a well-crafted incentive compensation program is that it directs agency's performance toward achieving common advertising objectives. Ideally, the plan should reward results rather than action. Consequently, major advertisers are continuing to move away from commission to fees or other methods of compensation, including the "pay-by-results" (PbRs) incentive system.

Recently, some researchers have argued that in addition to the incentive effects of PbR, this method can act as a sorting or signaling device to identify and attract the most capable agencies. For example, Hao (2005) argued that more capable agencies would choose PbR, while less productive agencies would opt for a fixed payment. In a different field of studies, Lazear (2000) used data in labor economics to examine both sorting and incentive effects and found that PbR resulted in 44% increase in productivity, divided roughly equally between the two effects. Hao (2005) has stressed the need for more work investigating the link between sorting (signally) and incentive effects of compensation. He argued that the first issue is choosing an agency that is willing to be paid by PbR, and second establishing the PbR system.

In addition to agency performance differences, there are other factors that could potentially influence selection of a particular compensation scheme. Na et al (2003) hypothesized that a higher level of risk aversion would be associated with a preference for a fixed-pay versus a contingent-pay system. Following Milgrom and Roberts (1986: p. 187), we define risk-averse agencies as those who "would rather have a smaller income whose magnitude is certain than an uncertain income that somewhat larger on average but is subject to unpredictable and uncontrollable variability". Agency theory predicts that such agencies will require a risk premium to select PbR over fixed system. Empirical studies have largely supported this proposition (e.g. Spake et al., 1999). Following this logic, we suggest that more risk-averse agencies will require a higher risk-premium to select PbR. A higher level of expected performance implies higher expected PbR earnings and hence a higher expected risk premium. The rational expectations theory implies a positive relationship between expected and actual performance. Thus, for a given level of productivity and hence a given expected risk premium, a more risk-averse agency is less likely to choose PbR.

2.1. Selecting a Suitable Agency

Although different advertisers may have different ideas about what constitutes a suitable or less suitable advertising agency, empirical studies have shown (Li et al., 2008) that most advertisers agree on the importance of several agency characteristics, including creative skills, and strategic planning quality. Furthermore, advertisers may be looking for different characteristics for different campaigns. Therefore, an agency which may be judged to be suitable for one campaign may not be selected for another campaign. The common practice is to approach several agencies, and request a "bid" from a shortlist of three to four agencies. A respectable advertiser usually pays a nominal fee for a bidding presentation, although this inevitably does not cover the true costs of the agency's work (Horsky et al., 2016). Using an auction provides the advertiser with criteria to select the agencies and to distinguish between the more and less suitable advertising agency. It gives the advertising agency an opportunity to present its abilities for the specific campaign (Hornik & Rubino, 1981). Since the skills and labor invested by competing agencies may be very similar, the advertiser's decision might depend largely on the agency's compensation agreement and willing to adopt a contingent-pay system. Thus, signaling confidence in their performance (Cheong et al. 2016). In other words, it is postulated that the more an agency is willing to be paid by PbR it signals to the client that the agency has high confidence in its professionalism and values the client business.

2.2. Advertising Agency Remuneration Methods

Advertising agency remuneration has changed dramatically over the past few decades. A more detailed description of the methods is provided in Web Appendix A. Until recently, the widespread agency compensation method was the commission. In response to advertisers' dissatisfaction over the commission methods and the issue of trust between advertisers and their agencies, fixed fee methods were introduced (Horsky & Zeithammer, 2021) using, in most cases the cost+ system. The greatest problem with the fixed fee method is the disassociation between the compensation paid by the advertiser, and the agency's services. Therefore, advertisers sought to shift to an incentive-based method that effectively links advertising agency performance and remuneration. Thus, the expression "Payment by Results" is used to describe a service relationship in which some part of any associated remuneration is contingent on results or other performance assessments measured against pre-determined criteria. The nature of this seller-buyer relationship features certain elements of a "zero-sum game" (**Figure 1**). Where gains are not necessarily shared by both parties, the parties do not have the maximum incentive to share information and are not equally motivated to achieve maximum gains (Bilby et al., 2021).

One of the main concerns in implementation the PbR is the definition of the measures to be used in estimating agency performance. The chosen measures must reflect the agreed goals. In practice, most schemes use several measures of performance from three performance categories: the advertiser's business performance (i.e. sales, volume growth), the performance of the advertising (i.e. awareness, brand image) and the performance of the agency (i.e. task competencies, service delivery). Each of these measures has distinct advantages and may be appropriate under certain circumstances. An appropriate PbR compensation plan for advertising agencies requires the proper weight to be given each of the above three categories to faithfully represent the agency's contribution. The advertiser combines the creative and financial aspects of each offer into an overall evaluation of each agency. The agency whose combination of creative quality and media price delivers the highest profit to the advertiser is expected to win the contract. The contemporary advertising contest has thus evolved to resemble a score auction—a mechanism often used in other procurement settings to facilitate competition among suppliers with different costs and qualities (Fang & Li, 2015; Hamm, 2022).

Payment by results (PbRs): The expression "payment by results" is used to describe a service relationship in which some part of any associated remuneration is contingent on results or other performance assessments measured against pre-determined criteria. This method is especially suitable for service products, such as advertising services, which are characterized as products whose value

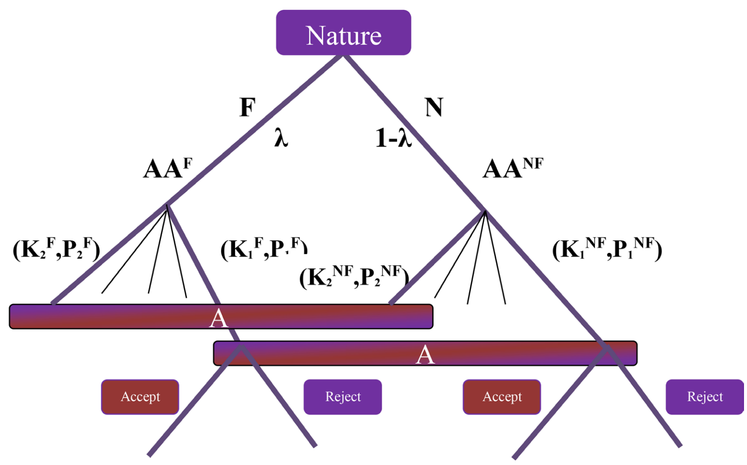

Figure 1. The game tree.

cannot be estimated prior to purchase. The PbR compensation method developed in response to the disadvantages of the commission and the fixed fee methods. The PbR system is designed to create incentives for agencies to act according to the advertisers' interests. Consequently, PbR creates a win-win situation for advertisers and advertising agencies, in that the more satisfied the advertiser is, the greater the compensation the agency receives. Such a system, some believe, will pave the way to a long-term working relationship (Hamm, 2022).

PbR can take several forms, incorporating varying degrees of risk and reward for advertising agencies. There are five basic forms of PbR:

1) Bonus for results above a base rate.

2) Cost recovery: All agency cost are covered, but margin is totally based upon performance.

3) Shared risk and reward: The agency and the client put forward matching funds into the PbR performance pool. The agency can risk all or part of its margin against the potential of an equal reward.

4) Earn-back: The agency can "earn back" revenue through performance.

5) Combination: This method combines the earn-back method and bonus approaches. Agency revenue is reduced by a relatively modest amount, and then the agency has the opportunity to earn an additional performance bonus, based upon the achievement of business objectives, agency performance and advertising objectives.

2.3. Agency Theory

As noted before, the issue of advertising agency remuneration has been traditionally modeled on the basis of agency theory because it solves issues of asymmetry of information and conflicts of interests of related parties such as suppliers and clients (Chohan, 2022; Spake et al., 1999). Although the agency theory has been commonly used to describe the advertiser-agency relationship in the advertising industry, some researchers showed that this theory is inadequate in describing the complexities of the relationship, primarily because the theory maximizes the advertiser's gains while the gains of the agency function merely as a constraint in the model (Zogning, 2017). This asymmetry leads to an inherent imbalance in the result, and as a result, both parties seek to deviate from the agency theory equilibrium to improve their position. According to agency theory, the motivation of the agent or the principal to act stems from personal interests and rational reasoning (Zogning, 2017). Utility for the principal is related directly to profits, whereas utility for the agent is inversely related to effort and directly to compensation. Hence, the principal is assumed to strive for maximum profit, whereas the agent seeks maximum compensation at minimum effort (Coughlan & Sen, 1989). Conflicts of interest between principal and agent generally arise because each has different objectives and different degrees of risk aversion, which lead them toward different courses of action. While advertisers are generally indifferent to risk, advertising agencies are risk averse. However, since both parties aim to maximize their benefits, and because each party is guided by its own priorities and interests, the equilibrium is not a stable one (Zogning, 2017). Thus, agency theory relates to behaviors in the context of cooperation and risk-sharing between two parties which have different aims and different risk preferences (Eisenhardt, 1989). The theory describes the situation in which a principal employs an agent to perform a project/job on the principal's behalf, while each party acts according to its interests and strives to maximize its own benefits. As a result, the agent does not always act in the principal's interests. According to agency theory, two main problems occur under asymmetric information.

The first problem is adverse selection, which arises before the principal enters into a relationship with the agent, when an advertiser wishes to embark on a new advertising campaign but does not know whether a given agency possesses the necessary ability and the skills for the task. Arrow (1985) characterizes the client's uncertainty with respect to the agency's characteristics (e.g. skills, creative ability, and service standard) as "hidden information". The second problem is the moral hazard issue, which arises when an advertiser begins to work with a certain advertising agency. The advertiser has no precise way of knowing that the agency is performing at an optimal level for maximizing the advertiser's income. Arrow (1985) suggested the term "hidden action problem" to describe this situation. According to agency theory, there is no stable equilibrium in either situation and the agency will always be motivated to deviate from the equilibrium and move to a point at which it maximizes its own income. Hence, the principal is assumed to strive for maximum profits, whereas the agent seeks maximum compensation at minimum effort (Spake et al., 1999; Zogning, 2017).

3. Theoretical Framework

The primary goal of this article is to provide advertisers with tools to distinguish between the more and less suitable ad agency with the compensation plan, among other criteria, as a signaling device. We offer a signaling game-theoretical approach, which deals with two equilibrium situations: separating and pooling. In addition, by suggesting a proper compensation context, the approach provides ad agencies with insights into how to compete for new accounts and keep existing accounts.

Signaling Game Theory

Asymmetric information exists between parties in various settings, including situations in which employers are uncertain about the abilities of employees (Spence, 1973), insurers are uncertain about the health of the insured (Rothschild & Stiglitz, 1978), organizational buyers are uncertain about vendors' abilities to meet contract terms (Stump & Heide, 1996), and between adverting agencies and their clients (Villas-Boas, 1994). In this study, our main focus is advertisers' uncertainty about advertising agencies' abilities and service quality.

We demonstrate a solution to adverse selection (i.e. the hidden characteristic problem), a lot of problem of information asymmetry in which one party falsely claims to possess the skills necessary to provide high quality (Eisenhardt, 1989; Misra et al., 2005). Although other truly skilled candidates may solve the problem using signals to reveal their true strengths and characteristics, weak parties may mimic strong parties to deceive the receiver about their true characteristics. Quality signals can be transmitted in many forms (e.g. building brand names, setting proper prices, offering warranties, advertising expenditure levels). Agencies signal their skills to prospective clients with the compensation plan they propose. In this case, under alternative assumptions, two equilibriums may develop. A separating equilibrium (Spence, 1973) arises when different types of agencies send different signals (i.e. take different actions) and a "rational" receiver correctly interprets true agency characteristics. In contrast, a pooling equilibrium develops when candidates send identical signals, independent of their true characteristics, and a Bayesian receiver who assigns probabilities to their types learns nothing about candidates' true characteristics from the signals (Orzach & Tauman, 2002). It should be noted that in certain circumstances, no equilibrium develops.

The main contribution of signaling literature to the problem of asymmetric information is that a separating equilibrium may be achieved if a strong candidate takes a costly action (signal), which is sufficient to demonstrate its true characteristics and distinguish itself from other weaker candidates and excessively costly for weaker candidates. Separating equilibrium is appealing, as it conveys the true type of the sender to the receiver, who can then act on accurate information. However, in some situations, it may be beneficial for the weak type to mimic the strong type's signal and deceive the receiver, despite the costs involved.

We focus on the case of one advertising agency and one advertiser. The advertiser, with a fixed budget to spend on a campaign, is uncertain of the agency's ability to achieve its objectives. The agency defines a two-part fee schedule that the advertiser can accept or reject: an up-front fee that can be either positive or negative (depending on whether the agency shares the risk) and a percentage of the advertiser's incremental revenue derived directly from the agency's performance.

4. The Model

Assumptions

1) There is a single advertiser in the market denoted by A. Let A's advertising budget, denoted by a, which is given exogenously.

2) There is a single agency in the market, denoted by AA, which is one of two types, F or NF, where type F is suitable for A's advertising campaign and NF is less suitable. We denote by AAF and AANF the agency of type F and NF, respectively.

3) AA's type is private information, meaning; that, AA knows its type but A does not. An assigns probability λ that AA is of type F and $(1 - \lambda)$ that AA is of type NF.

4) If the advertising agency is of type F, it will increase the advertiser's income

by ΔF; otherwise, it will increase the advertiser's income by ΔNF. It is assumed that ΔF > ΔNF.

5) A's total advertising expenses depend on AA's type. The total cost for AA^F to run the advertising campaign is C^F and the total cost for AA^{NF} is C^{NF}. Note that C^F can be smaller, equal to, or greater than C^{NF}. To avoid trivial results, it is assumed that Max $(\Delta^F - C^F - a, \Delta^{NF} - C^{NF} - a) > 0$, and $\Delta^{NF} > a$. At least one type of agency guarantees a positive surplus in this campaign.

6) All players are risk neutral.

4.1. The Game

The game consists of two stages, in which AA's type remains unchanged. In the first stage, AA proposes a two-part tariff (K, P), where K is an up-front fee independent of A's future revenue, and P $(0 \le P \le 1)$ is the percentage of A's revenue increment Δ that results from the advertising campaign.

That is, the agency AA^t, $t \in \{F, NF\}$, collects a total of $K + P\Delta^t$ from A with net payoff of $K + P\Delta^t - C^t$; A's net payoff is $(1 - P)\Delta^t - K - a$ if it accepts AA^t's offer.

The preceding assumes that AA has full bargaining power to propose a take-it-or-leave-it offer (K, P). The advertiser in the second stage can only accept or reject the offer and cannot negotiate the deal. Using Harsanyi's (1968) approach to Bayesian games (i.e. with incomplete information), we model this game with three players: A, AA^F, and AA^{NF}. In the first period, AA^F offers A the two-part tariff deal (K^F, P^F) and AA^{NF} offers (K^{NF}, P^{NF}). A's strategy determines for *each* possible (*K*, P) whether to accept or reject it.

The contract (K, P) that AA offers is a signal to A of AA's suitability to successfully run the campaign. A lower up-front fee K and a higher percentage of the revenue increment P signals the stronger type F of AA.

There are two types of equilibrium points. First, in separating equilibrium, the two types of agency, AA^F and AA^{NF}, offer different pairs $(K^F, P^F) \neq (K^{NF}, P^{NF})$. To meet this condition, it is sufficient that the two offers differ in one component. Second, in pooling equilibrium, $(K^F, P^F) = K^{NF}, P^{NF}$. The difference between the two equilibrium outcomes is this: in any separating equilibrium, AA's type is revealed (through its decisions to offer (K^F, P^F) if it is of type F and (K^{NF}, P^{NF}) if it is of type NF. Because in equilibrium $(K^F, P^F) \neq (K^{NF}, P^{NF})$, if A is offered (K^F, P^F), then A knows that AA^F made the offer. If it is offered (K^{NF}, P^{NF}), then A knows that AA^{NF} made the offer. In a pooling equilibrium, A does not identify AA's type. When A observes the offer (K, P), it does not know which type of AA made this offer, as $(K, P) \equiv (K^F, P^F) = (K^{NF}, P^{NF})$.

A thus assigns probability λ that AA is type F and (1 − λ) that A is type NF.

4.1.1. Separating Equilibrium: When Both Types Generate Nonnegative Surplus

We start with the case where $\Delta^F - a - C^F \ge 0$ and $\Delta^{NF} - a - C^{NF} \ge 0$, where both types of AA run campaigns with nonnegative surplus.

First, in this case, in every separating equilibrium A accepts offers of both AA^F and AA^{NF}. Let $t \in \{F, NF\}$, and suppose to the contrary that, in equilibrium, A rejects the offer (K^t, P^t) of AA^t. Then it must be that A's payoff is either zero or negative: $(1 - P^t)\Delta^t - K^t - a \le 0$. The sum of the payoffs of A and AA^t is positive because $\left[\left(1-P^t\right)\Delta^t - K^t - a\right] + \left[P^t\Delta^t + K^t - C^t\right] = \Delta^t - a - C^t > 0$.

Thus, AA^t is better off deviating from its offer (K^t, P^t) to a contract in which both A and AA^t obtain positive payoffs, in which case a sensible advertiser A will accept A^{t}'s offer, a contradiction. The objective of AA^F is to choose a contract (K^F, P^F) that maximizes its payoff under certain equilibrium constraints.

$$
\begin{aligned}
&\text{MAX } P^F\Delta^F + K^F - C^F \\
&\left(P^F, K^F\right) \\
&\text{s.t} \\
&\text{(i) } P^F\Delta^{NF} + K^F \le P^{NF}\Delta^{NF} + K^{NF} && \left(IC_{NF}\right) \\
&\text{(ii) } \left(1-P^F\right)\Delta^F - K^F - a \ge 0 && \left(IR_{A,F}\right) \\
&\text{(iii) } P^F\Delta^F + K^F - C^F \ge 0 && \left(IR_{AA^F}\right)
\end{aligned}
$$

The first constraint guarantees that AA^{NF} has no incentive to mimic AA^F; the second, that the A that identifies AA's type accepts AA^F's offer; and the third, that AA^F offers a two-part tariff (K^F, P^F) that yields AA^F a nonnegative payoff. Similarly, AA^{NF}'s objective is as follows:

$$
\begin{aligned}
&\text{MAX } P^{NF}\Delta^{NF} + K^{NF} - C^{NF} \\
&\left(K^{NF}, P^{NF}\right) \\
&\text{s.t} \\
&\text{(i) } P^{NF}\Delta^F + K^{NF} \le P^F\Delta^F + K^F && \left(IC_F\right) \\
&\text{(ii) } \left(1-P^{NF}\right)\Delta^{NF} - K^{NF} - a \ge 0 && \left(IR_{A,NF}\right) \\
&\text{(iii) } P^{NF}\Delta^{NF} + K^{NF} - C^{NF} \ge 0 && \left(IR_{AA^{NF}}\right)
\end{aligned}
$$

Because $\Delta^F > \Delta^{NF}$, the slope of IC_{NF} is steeper than that of the other three parallel lines. The objective of AA^F is to maximize the constant in $P^F\Delta^F + K^F$ = constant, under the three constraints (the dashed area in **Figure 2**). This means shifting the line $P^F\Delta^F + K^F$ = constant upward in a parallel line until it hits point D (see **Figure 2**), where the objective function coincides with the $IR_{A,F}$ line. Any point on line $IR_{A,F}$ that is left of (or equal to) D is optimal. Note that if $P^{NF}\Delta^{NF} + K^{NF} \ge \Delta^F - a$, then any point on $IR_{A,F}$ is optimal. In both cases, the $IR_{A,F}$ constraint is binding (and becomes equality at the optimal solution).

Again, to maximize the constant of $P^{NF}\Delta^{NF} + K^{NF}$ = constant, AA^{NF} shifts this line upward in a parallel way until it hits the intersection of the (IC_F) and the ($IR_{A,NF}$) lines in case $\Delta^{NF} - a \le P^F\Delta^F + K^F$. Otherwise, the line $P^{NF}\Delta^{NF} + K^{NF}$ = constant shifts until it hits point E, which is ($P^F\Delta^F + K^F$, 0). Thus, either (IC_F) or ($IR_{A,NF}$) is binding, and ($IR_{A,NF}$) is binding at any point in the interval connecting H and I.

We conclude that either ($IR_{A,F}$) and (IC_F) must hold as equalities, or ($IR_{A,F}$)

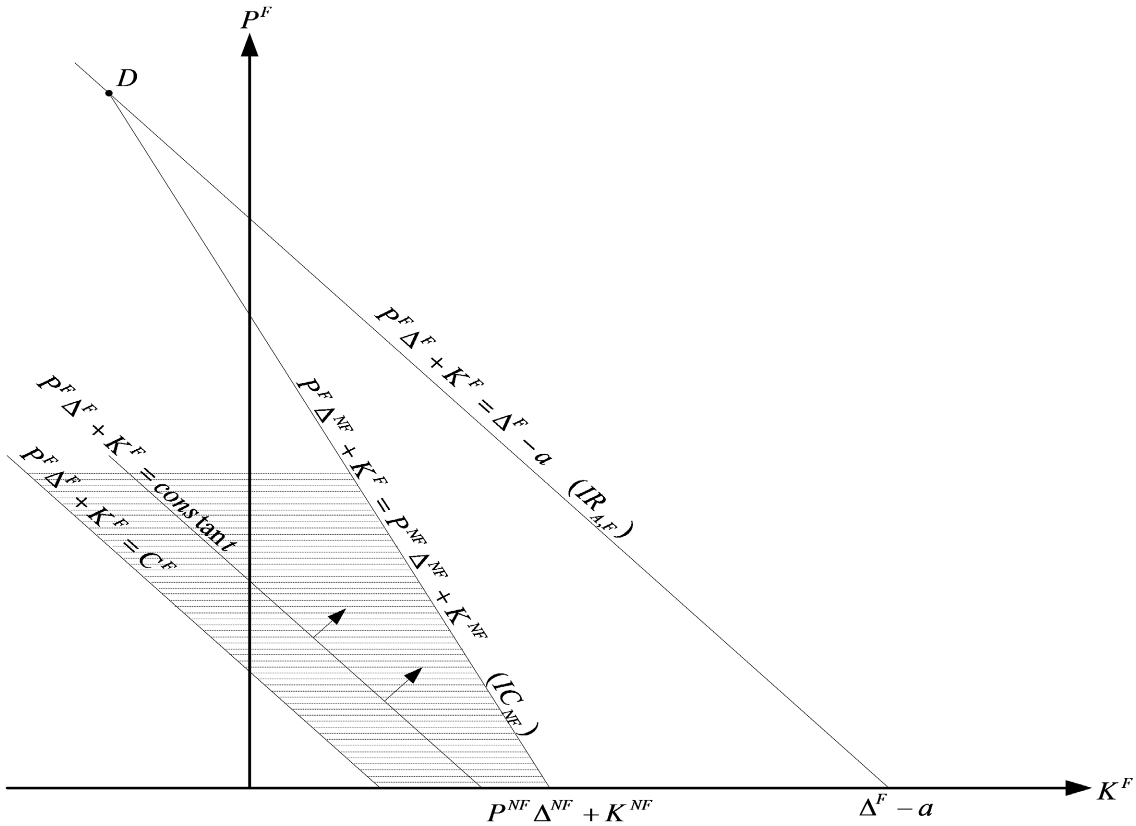

Figure 2. The first constrain under $\Delta^F > \Delta^{NF}$.

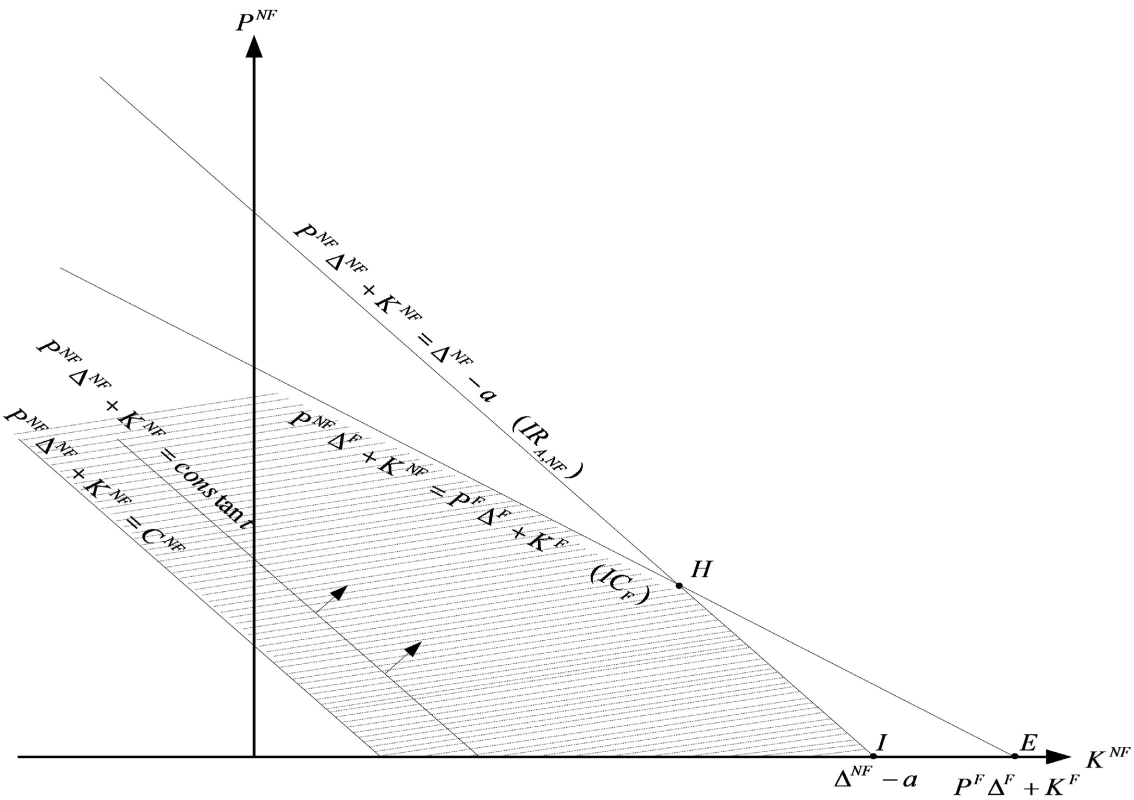

Figure 3. Constrain under $P^{NF}\Delta^{NF} + K^{NF} =$ constant.

and ($IR_{A,NF}$) must hold as equalities (**Figure 3**).

Case 1: The constraints ($IR_{A,F}$) and (IC_F) are binding: $P^{NF}\Delta^F + K^{NF} = P^F\Delta^F + K^F = \Delta^F - a$. Hence:

$$\begin{cases} K^{NF} = \Delta^F - a - P^{NF}\Delta^F \\ K^F = \Delta^F - a - P^F\Delta^F \end{cases}$$

Substituting this in (IC_{NF}), we have:

$$P^F\Delta^{NF} - P^F\Delta^F \le P^{NF}\Delta^{NF} - P^{NF}\Delta^F$$
$$P^F\left(\Delta^F - \Delta^{NF}\right) \ge P^{NF}\left(\Delta^F - \Delta^{NF}\right)$$

Because $\Delta^F > \Delta^{NF}$, we have $P^F \ge P^{NF}$. Using the ($IR_{A,NF}$) constraint, we have:

$$P^{NF}\Delta^{NF} + \Delta^F - P^{NF}\Delta^F \le \Delta^{NF}$$

or

$$P^{NF}\left(\Delta^F - \Delta^{NF}\right) \ge \Delta^F - \Delta^{NF}$$

Thus, $P^{NF} \ge 1$, and $P^{NF} = 1$. Because $P^F \ge P^{NF}$, it must be that $P^F = 1$ and $K^F = K^{NF} = -a$. But then $(K^F, P^F) = (K^{NF}, P^{NF})$, which cannot be the outcome of a separating equilibrium.

Case 2: ($IR_{A,F}$) and ($IR_{A,NF}$) are binding. That is:

$$\text{and} \begin{cases} P^F\Delta^F + K^F = \Delta^F - a \\ P^{NF}\Delta^{NF} + K^{NF} = \Delta^{NF} - a \end{cases}$$

Therefore,

$$\text{and} \begin{cases} K^F = -P^F\Delta^F + \Delta^F - a \\ K^{NF} = -P^{NF}\Delta^{NF} + \Delta^{NF} - a \end{cases}$$

Substituting this in (IC_{NF}) and (IC_F), we have:

$$P^F\Delta^{NF} - P^F\Delta^F + \Delta^F - a \le P^{NF}\Delta^{NF} - P^{NF}\Delta^{NF} + \Delta^{NF} - a$$

or equivalently,

$$\left(\Delta^F - \Delta^{NF}\right)\left(1 - P^F\right) \le 0$$

Because $\Delta^F > \Delta^{NF}$, it must be that $1 - P^F \le 0$. This, with the condition $P^F \le 1$, implies that $P^F = 1$. Substituting $P^F = 1$ into $P^F\Delta^F + K^F = \Delta^F - a$ implies that $K^F = -a$. That is, AA^F invests A's entire advertising budget but extracts the entire surplus $\Delta^F - a - C^F$. As for AA^{NF} the (IC_F) constraint becomes

$$K^{NF} \le \Delta^F\left(1 - P^{NF}\right) - a \tag{1}$$

Because $K^{NF} = -P^{NF}\Delta^{NF} + \Delta^{NF} - a$, we have $-P^{NF}\Delta^{NF} + \Delta^{NF} \le \Delta^F\left(1 - P^{NF}\right)$, or equivalently, $P^{NF}\left(\Delta^F - \Delta^{NF}\right) \le \Delta^F - \Delta^{NF}$, which always holds.

Combining (1) and ($IR_{AA^{NF}}$), any contract (K^{NF}, P^{NF}) is an equilibrium outcome if $0 \le P^{NF} \le 1$ and if $K^{NF} = (1 - P^{NF})\Delta^{NF} - a$.

Note that when $P^F = 1$ and $K^F = -a$, the two constraints (IC_{NF}) and ($IR_{A,NF}$) coincide. Also, for both t = F and t = NF, AA^{t}'s equilibrium payoff is $\Delta^t - a - C^t$, which means that both types of AA extract the entire surplus they generate and

A obtains zero.

Definition: Equilibrium is not sensible if, off the equilibrium path, A rejects an offer that guarantees it a positive payoff; otherwise, the equilibrium is sensible. In equilibrium, A will not reject an offer that yields a positive payoff, though A might reject offers not proposed in equilibrium to attempt to induce AA to offer better contracts. Such behavior is not credible or sensible (though possible in some equilibrium points, as we will discuss later).

We summarize the preceding in the following theorems:

Theorem 1: Suppose that $\Delta^t - a - C^t \geq 0$ for both t = F and t = NF. Then in every sensible separating equilibrium,

1) $K^F = -a$, $P^F = 1$, $K^{NF} = (1 - P^{NF})\Delta^{NF} - a$ and $0 \leq P^{NF} \leq 1$.

2) A accepts both offers (K^F, P^F) and (K^{NF}, P^{NF}).

3) Both AA^F and AA^{NF} extract the entire surplus and A obtains zero.

It is not surprising that A obtains zero, as agency AA has full bargaining power: the power of a take-it-or-leave-it offer without allowing A to bargain or to counteroffer. The strong AA type F offers to cover the entire budget campaign, a, in return for the campaign's full incremental profit. The weak AA type NF offers to cover less than a and, in the extreme case of $P^{NF} = 0$ and $K^{NF} = \Delta^{NF} - a > 0$, AA^{NF} charges A up front a positive amount, $\Delta^{NF} - a$, and collects nothing from the incremental profit.

Typically, in a separating equilibrium, the strong type wishes to reveal the type and must sacrifice part of the payoff to credibly signal the type. The amount sacrificed is the minimum that makes it unprofitable for the weak type to mimic the strong type. This phenomenon does not occur here. Both types of AA charge payoff by maximizing two-part tariffs, and still no one has an incentive to mimic the other.

4.1.2. Other Equilibrium Points

There are other equilibrium points at which A obtains positive payoff regardless of AA's type. As we argue, they are not sensible because off equilibrium the decision of A is irrational.

Consider the case where $\min(\Delta^F - a - C^F, \Delta^{NF} - a - C^{NF}) > 0$. Suppose that for some α, $0 < \alpha \leq \min(\Delta^{NF} - a - C^{NF}, \Delta^F - a - C^F)$, and A only accepts offers that provide certainty of at least α payoff. These are the offers (K, P) such that

$$(1-P)\Delta^{NF} - K - a \geq \alpha \tag{2}$$

Because $\Delta^F > \Delta^{NF}$, all offers (K, P) satisfying (2) and made by AA^F will yield A a payoff of at least α. Similar to the previous analysis, in a separating equilibrium, the following must hold:

$$P^t\Delta^t + K^t = \Delta^t - a - \alpha, \quad t \in \{F, NF\} \tag{3}$$

Also AA^{NF} will not mimic AA^F iff $P^{NF}\Delta^{NF} + K^{NF} \geq P^F\Delta^{NF} + K^F$. By (3) this is equivalent to $P^F\left(\Delta^F - \Delta^{NF}\right) \geq \Delta^F - \Delta^{NF}$ seilpmi hcihw ,that $P^F = 1$ and $K^F = -a - \alpha$. It is easy to verify that, irrespective of P^{NF}, $0 \leq P^{NF} \leq 1$, and AA^F has no incentive to mimic AA^{NF}. Hence, the separating equilibrium points ((K^F, P^F), (K^{NF},

P^{NF})) satisfy

$$\begin{aligned}&(\mathrm{i})\ P^{F}=1\\&(\mathrm{ii})\ K^{F}=-a-\alpha\\&(\mathrm{iii})\ 0\le P^{NF}\le 1\\&(\mathrm{iv})\ K^{NF}=\left(1-P^{NF}\right)\Delta^{NF}-a-\alpha\end{aligned}$$

As is evident, the more suitable agency AA^F finances the entire budget a, pays A up front α, and extracts remaining surplus. Thus, A obtains $\alpha > 0$ no matter AA's type. The payoff of AA^F is $\Delta^F - a - C^F - \alpha$, and AA^{NF} obtains $\Delta^{NF} - a - C^{NF} - \alpha$.

We next argue that if $\alpha > 0$, the separating equilibrium outcomes are not sensible. To support separating equilibriums, A's strategy is to reject any offer unless A obtains a certain payoff of at least α. In equilibrium AA^t, $t\in\{\mathrm{F},\mathrm{NF}\}$, offers a contract ($K^t$, P^t) that yields A a payoff α. Suppose that off equilibrium AA^{NF} offers a contract (K^{NF}, P^{NF}) such that

$$P^{NF}\Delta^{NF}+K^{NF}=\Delta^{NF}-a-\frac{\alpha}{2}$$

Off equilibrium, A does not know whether AA^F or AA^{NF} made the offer. If AA^{NF} made it, A obtains $\alpha/2 > 0$; if AA^F made it, A obtains more than $\alpha/2$. Hence, if A accepts the offer, it obtains at least $\alpha/2$. If A rejects the offer, it obtains zero. Thus, it does not make sense to reject such an offer. Nevertheless, such rejections can occur off the equilibrium path. A makes a (noncredible) threat to induce AA to offer only contracts of values to A that are greater or equal to α; otherwise, A will reject AA's offer. However, such a commitment is not credible: after making an offer to A of a positive value irrespective of AA's type, it does not make sense for A to reject it. The behavior of A that supports the equilibriums is not rational.

4.1.3. When Only AA^F Generates a Nonnegative Surplus

Consider next the case where $\Delta^{NF} - a - C^{NF} < 0$ and $\Delta^F - a - C^F \ge 0$. Here, the weak type of AA generates nonnegative surplus when it runs the advertising campaign and the strong type generates positive surplus. Hence, in a separating equilibrium A will accept AA^F's offer and reject AA^{NF}'s offer. Moreover, a rational A will reject any offer by AA^{NF} with nonnegative value to AA^{NF} (and thus negative value to A). Namely, whenever $P^{NF}\Delta^{NF} + K^{NF} - C^{NF} \ge 0$, then $(1 - P^{NF})\Delta^{NF} - K^{NF} - a < 0$. We can write this condition:

$$P^{NF}\Delta^{NF}+K^{NF}-C^{NF}\ge 0\Rightarrow P^{NF}\Delta^{NF}+K^{NF}\ge\Delta^{NF}-a \tag{4}$$

Similar to the previous case, we have:

$$K^{F}=\Delta^{F}-a-P^{F}\Delta^{F} \tag{5}$$

In addition, to prevent AA^{NF} from mimicking AA^F, the following must hold:

$$P^{F}\Delta^{NF}+K^{F}-C^{NF}\le 0 \tag{6}$$

In equilibrium, AA^{NF} obtains zero because either its offer is rejected or it will not offer any contract to A. By (5), condition (6) is equivalent to

$$C^{NF} \geq \Delta^{F} - a - P^{F}\left(\Delta^{F} - \Delta^{NF}\right) \tag{7}$$

Because $P^F \leq 1$ and $C^{NF} > \Delta^{NF} - a$, then (4) holds. We conclude that the only relevant constraint is (7), equivalent to

$$P^{F} \geq \frac{\Delta^{F} - a - C^{NF}}{\Delta^{F} - \Delta^{NF}}$$

Because $\Delta^F > \Delta^{NF}$ and $\Delta^{NF} - a - C^{NF} < 0$:

$$\frac{\Delta^{F} - a - C^{NF}}{\Delta^{F} - \Delta^{NF}} < 1$$

Consequently, any sensible separating equilibrium must satisfy the following:

$$K^{F} = \Delta^{F}\left(1 - P^{F}\right) - a \tag{8}$$

$$\max\left[0, \frac{\Delta^{F} - a - C^{NF}}{\Delta^{F} - \Delta^{NF}}\right] \leq P^{F} \leq 1 \tag{9}$$

As for AA^{NF}, either it offers no contract to A or it offers a contract (K^{NF}, P^{NF}), which yields AA^{NF} a nonnegative payoff:

$$P^{NF}\Delta^{NF} + K^{NF} - C^{NF} \geq 0 \tag{10}$$

A's equilibrium strategy is to reject any offer (K, P) that has negative value to A. Note that the equilibrium outcome is unique: A accepts AA^F's offer and rejects AA^{NF}'s offer, and it obtains zero in both cases. If AA is of type F, it extracts the entire surplus $\Delta^F - a - C^F$, leaving nothing to A. If AA is of type NF, there is no deal and both A and AA^{NF} obtain zero.

Here, too, there are nonsensible separating equilibrium points at which A obtains $a > 0$ iff AA is of type F and zero if AA is of type NF.

Theorem 2: Suppose that $\Delta^F - a - C^F \geq 0$ but $\Delta^{NF} - a - C^{NF} < 0$. In any sensible separating equilibrium:

1) A accepts AA^F's contract (K^F, P^F) and rejects AA^{NF}'s contract (K^{NF}, P^{NF}). Thus, if AA is of type NF, there is no deal between A and AA and both entities obtain zero.

2) If AA is of type F, it extracts the entire surplus $\Delta^F - a - C^F$ generated by AA^F's advertising campaign, leaving nothing to A.

3) The equilibrium contract (K^F, P^F) between AA^F and A satisfies

$$K^{F} = \left(1 - P^{F}\right)\Delta^{F} - a$$

and

$$\max\left[0, \frac{\Delta^{F} - a - C^{NF}}{\Delta^{F} - \Delta^{NF}}\right] \leq P^{F} \leq 1$$

In particular, the contract $K^F = -a$ and $P^F = 1$ can be an equilibrium contract between AA^F and A.

4.1.4. When Only AA^{NF} Generates a Nonnegative Surplus

Consider the case where $\Delta^{NF} - a - C^{NF} > 0$ and $\Delta^F - a - C^F < 0$: the net surplus generated by the weak type of AA is positive but negative for the strong type. This can happen if C^F is sufficiently high. Then, A accepts the offer (K^{NF}, P^{NF}) and rejects the offer (K^F, P^F). As previously:

$$K^{NF} = -P^{NF}\Delta^{NF} + \Delta^{NF} - a \tag{11}$$

and to prevent AA^F from mimicking AA^{NF}, the following must hold:

$$P^{NF}\Delta^F + K^{NF} - C^F \le 0$$

By (11) this is equivalent to $P^{NF}\left(\Delta^F - \Delta^{NF}\right) \le -\left(\Delta^{NF} - C^F - a\right)$. Because $\Delta^F > \Delta^{NF}$,

$$P^{NF} \le \frac{-\left(\Delta^{NF} - C^F - a\right)}{\Delta^F - \Delta^{NF}}$$

Note that $\Delta^F - C^F - a < 0$ implies the following:

$$-\frac{\Delta^{NF} - C^F - a}{\Delta^F - \Delta^{NF}} > 1$$

Therefore, there is no constraint on P^{NF}: any $0 \le P^{NF} \le 1$ satisfies the preceding. As for (K^F, P^F), for the existence of an equilibrium, A must reject any offer of AA^F that yields AA^F a nonnegative payoff. That is,

$$P^F\Delta^F + K^F - C^F \ge 0 \Rightarrow \left(1 - P^F\right)\Delta^F - K^F - a \le 0$$

equivalently,

$$P^F\Delta^F + K^F \ge C^F \Rightarrow P^F\Delta^F + K^F \ge \Delta^F - a$$

Because $\Delta^F - a < C^F$, the last condition certainly holds. We conclude that any pair ((K^F, P^F), (K^{NF}, P^{NF})) is a separating equilibrium iff

$$\begin{aligned}
&(\mathrm{i})\ 0 \le P^{NF} \le 1\\
&(\mathrm{ii})\ K^{NF} = \Delta^{NF}\left(1 - P^{NF}\right) - a\\
&(\mathrm{iii})\ P^F\Delta^F + K^F - C^F \ge 0\\
&(\mathrm{iv})\ \left(K^F, P^F\right) \ne \left(K^{NF}, P^{NF}\right)
\end{aligned}$$

Also, A rejects any offer (K^F, P^F) that satisfies (iii). Again, A obtains zero independently of the type of AA. AA^{NF} extracts the entire surplus $\Delta^{NF} - a - C^{NF}$ and the strong type of AA strikes no deal with A and obtains zero.

Note that $P^{NF} = 1$, $K^{NF} = -a$, $P^F = 0$, and $K^F = C^F$ is one example of a separating equilibrium outcome. Here, the suitable agency cannot compete with the less suitable agency because the suitable agency has relatively high costs of running a profitable ad campaign (e.g. as when superior professionals earn very high salaries).

Theorem 3: Suppose that $\Delta^F - a - C^F < 0$ and $\Delta^{NF} - a - C^{NF} \ge 0$. In any sensible separating equilibrium:

1) A accepts AA^{NF}'s contract (K^{NF}, P^{NF}) and rejects AA^F's contract (K^F, P^F). Hence, for AA^F, there is no deal between A and AA and both entities obtain zero.

2) If AA is of type NF, it extracts the entire surplus $\Delta^{NF} - a - C^{NF}$ generated by AA^{NF}'s ad campaign, leaving nothing to A.

3) The equilibrium contract (K^{NF}, P^{NF}) between AA^{NF} and A satisfies

$$K^{NF} = \left(1 - P^{NF}\right)\Delta^{NF} - a$$

and

$$0 \le P^{NF} \le 1$$

AA^{F} will either offer no contract or offer contract (K^{F}, P^{F}) such that $P^{F}\Delta^{F} + K^{F} - C^{F} \ge 0$ and (K^{F}, P^{F}) ≠ (K^{NF}, P^{NF}).

As we saw earlier, the sensible separating equilibrium generates an extreme outcome in that A obtains nothing from the surplus generated by AA regardless of type. It accepts AA's offer if it generates positive surplus and rejects it if it generates negative surplus. The results, however, resemble the outcome of several PbR methods. For example, with the earn-back method, agency revenue is reduced by some factor and the agency recovers revenue and profit through performance. Another example shared risk and reward, in which the agency and advertiser invest matching funds in a PbR performance pool. The agency can risk all or part of its margin for the chance to earn an equal share of incremental income. These PbR forms are risky for both parties; thus, they are less likely to be found in an existing relationship and more common among young companies and their agency partners (Institute of Canadian Advertising).

4.1.5. Pooling Equilibrium

We next analyze the pooling equilibrium. To restrict the set of pooling equilibriums, we confine the analysis to sensible equilibrium points. A pooling equilibrium contract (K^*, P^*) is one that both AA^{F} and AA^{NF} offer. Namely, (K^{F}, P^{F}) = (K^{NF}, P^{NF}) = (K^*, P^*).

When A is offered the contract (K^*, P^*), it cannot identify AA's type because both types choose the same contract. Hence, A assigns probability λ that AA is type F and (1 − λ) that AA is type NF. Thus, A's expected payoff from accepting contract (K^*, P^*) is

$$\Pi^* = \Pi\left(K^*, P^*\right) = \lambda\left(\left(1-P^*\right)\Delta^{F} - K^*\right) + (1-\lambda)\left(\left(1-P^*\right)\Delta^{NF} - K^*\right) - a \quad (12)$$

and if $\Pi^* \ge 0$, then A accepts the offer. To characterize the set of pooling equilibrium, it is important to determine A's response to any contract (K, P), even off equilibrium.

Consider an off-equilibrium offer (K, P). If $(1 - P)\Delta^{NF} - K - a \ge 0$, then $(1 - P)\Delta^{F} - K - a > 0$; hence, in any sensible pooling equilibrium, A must accept the offer. However, if $(1 - P)\Delta^{NF} - K - a < 0$, then A's decision depends on its assessment (belief) of AA's type. A accepts (K, P) if it assigns relatively high probability that AA is of type F. **Lemma 1**: There is no sensible pooling equilibrium (K^*, P^*) such that $(1 - P^*)\Delta^{NF} - K^* - a > 0$, which means that ($K^*$, P^*) yields positive payoff to A independently of AA's type[1].

Proof: Suppose the contrary: (K^*, P^*) is a sensible pooling equilibrium such

[1]In practice, when the advertiser is unable to distinguish between the abilities of prospective agencies, the advertiser may appoint a professional committee to devise a method to choose between agencies.

that $(1 - P^*)\Delta^{NF} - K^* - a > 0$. Consider an off-equilibrium offer (K, P) with the following properties: $K > K^*$, $P > P^*$ and (K, P) is sufficiently close to (K^*, P^*) such that $(1 - P)\Delta^{NF} - K - a > 0$. Then, no matter what A believes about AA's type, it should accept (K, P) because it yields A a positive payoff. With this response from A, AA^F (and AA^{NF}) is better off unilaterally deviating from (K^*, P^*) to (K, P), a contradiction.

Remark: Note that (K^*, P^*) is a pooling equilibrium if

$$P^*\Delta^F + K^* - C^F \geq 0$$
$$P^*\Delta^{NF} + K^* - C^{NF} \geq 0$$
$$\text{and } \Pi\left(K^*, P^*\right) \geq 0$$

A can support (K^*, P^*) in equilibrium if it accepts (K^*, P^*) but rejects any offer other than (K^*, P^*). However, this behavior is not sensible, as described previously. Any sensible pooling equilibrium (K^*, P^*) is characterized by

$$\left(1 - P^*\right)\Delta^F - K^* - a > 0 \tag{13}$$

$$\left(1 - P^*\right)\Delta^{NF} - K^* - a \leq 0 \tag{14}$$

$$\left(1 - P^*\right)\left(\lambda\Delta^F + (1-\lambda)\Delta^{NF}\right) - K^* - a \geq 0 \tag{15}$$

$$P^*\Delta^F + K^* - C^F \geq 0 \tag{16}$$

$$P^*\Delta^{NF} + K^* - C^{NF} \geq 0 \tag{17}$$

$$\text{A accepts } \left(K^*, P^*\right)$$

Note that (13) and (14) follow from Lemma 1 (also, if $(1 - P^*)\Delta^F - K^* - a < 0$, then $\Pi(K^*, P^*) < 0$ and A will reject (K^*, P^*)). Inequality (15) asserts that A is better off accepting contract (K^*, P^*), and Inequalities (16) and (17) assert that AA^F and AA^{NF} obtain nonnegative payoffs in equilibrium (individual rationality condition).

Notation: Let $\Delta^\lambda = \lambda\Delta^F + (1 - \lambda)\Delta^{NF}$. Namely, Δ^λ is the average improvement of A's revenue due to AA's campaign. We can rewrite the above six conditions as follows:

$$C^F < P^*\Delta^F + K^* < \Delta^F - a \tag{18}$$

$$P^*\Delta^{NF} + K^* \geq \max\left(\Delta^{NF} - a, C^{NF}\right) \tag{19}$$

$$\text{A accepts } \left(K^*, P^*\right) \tag{20}$$

$$P^*\Delta^\lambda + K^* \leq \Delta^\lambda - a \tag{21}$$

Case 1: $\Delta^\lambda - a \leq C^F < \Delta^F - a$ and $C^{NF} < \Delta^{NF} - a$.

Figure 4 describes the region of contracts (K, P) that satisfies (19), (20), and (21). Clearly, though, there are no points (K, P) satisfying (19), (20), and (21). Hence, in this region there is no sensible pooling equilibrium.

Case 2: $\Delta^{NF} - a \leq C^F < \Delta^\lambda - a$ and $C^{NF} \leq \Delta^{NF} - a$.

Figure 5 describes the region of contracts (K, P) that satisfies (19), (20), and (21).

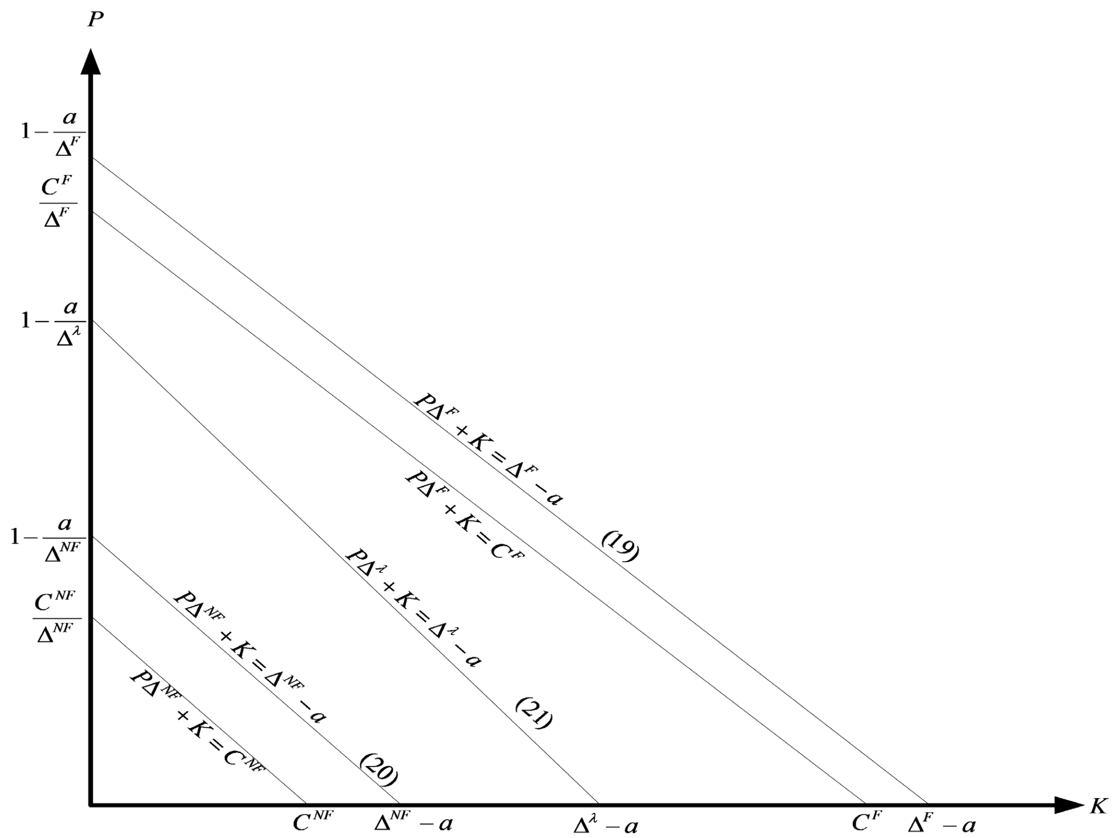

Figure 4. Description of region of contracts (K, P) that satisfies (19), (20), and (21).

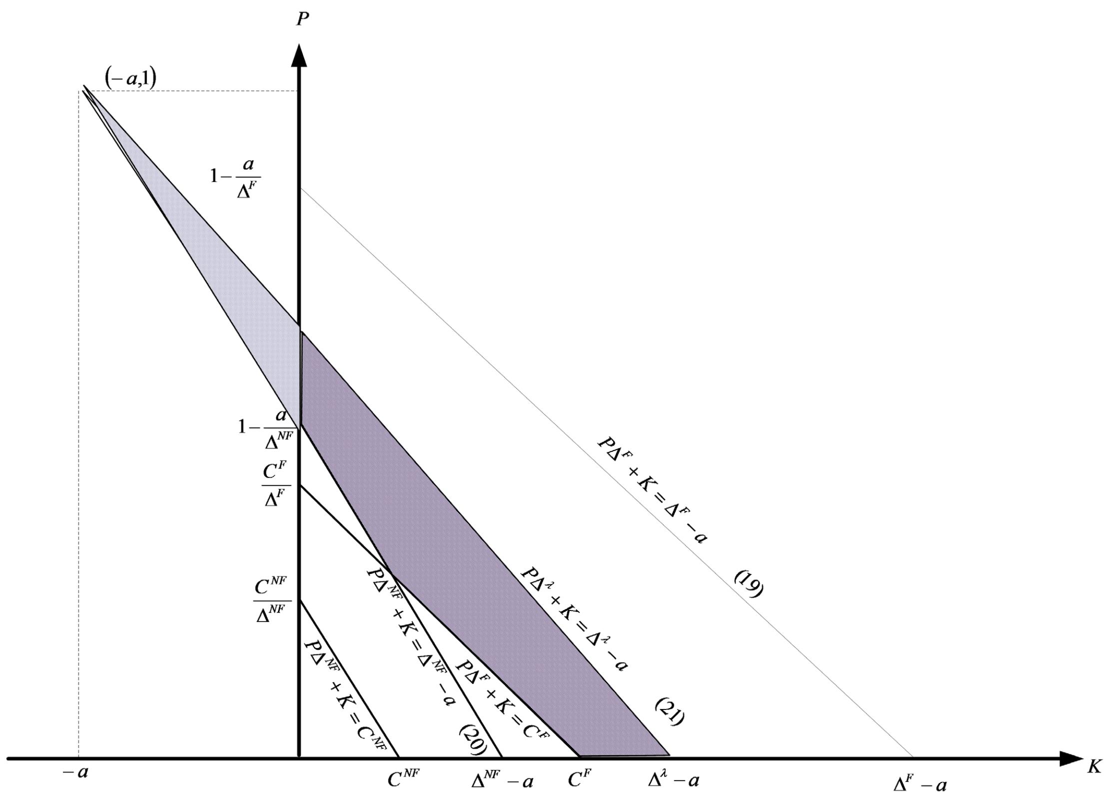

Figure 5. Description of the region of contracts (K, P) that satisfies (20), and (21).

The agency AA^t, $t \in \{F, NF\}$ is maximizing its payoff $P\Delta^t + K - C^t$ over the shaded area. Moving the line $P\Delta^F + K$ = constant upward in a parallel way (without changing its slope), the optimal feasible contract for AA^F is (−a, 1). Namely, $K = -a$ and $P = 1$.

In contrast, moving line $P\Delta^{NF} + K$ = constant upward in a parallel way, the optimal feasible contract for AA^{NF} is $(\Delta^\lambda - a, 0)$. Namely, $K = \Delta^\lambda - a$ and $P = 0$. So the pooling equilibrium (if it exists) must be either $(K^*, P^*) = (-a, 1)$ or $(K^*, P^*) = (\Delta^\lambda - a, 0)$.

We claim that $(K^*, P^*) = (-a, 1)$ is the only sensible pooling equilibrium in this region. If AA^{NF} deviates from $(-a, 1)$ to any better contract (for AA^{NF}), for instance, to its best contract $(\Delta^\lambda - a, 0)$, A will identify the deviant to be AA^{NF}, as only AA^{NF} can benefit from such deviation. But then by Lemma 1, A should reject the offer.

Suppose next that $(K^*, P^*) = (\Delta^\lambda - a, 0)$ is a sensible pooling equilibrium outcome. If AA^F deviates to $(-a, 1)$, A will identify the deviant as AA^F, as for AA^{NF} the contract $(-a, 1)$ is inferior to the contract $(\Delta^\lambda - a, 0)$. Hence, A will accept contract $(-a, 1)$ and AA^F will benefit from this deviation, a contradiction. We conclude that the only sensible pooling equilibrium outcome in this region is $(K^F, P^F) = (K^{NF}, P^{NF}) = (-a, 1)$; in this case, both types of AA extract the entire surplus and A obtains zero.

Case 3: $C^F < \Delta^{NF} - a$ and $C^{NF} < \Delta^{NF} - a$.

Figure 6 describes the region of contracts (K, P) satisfying (19), (20), and (21).

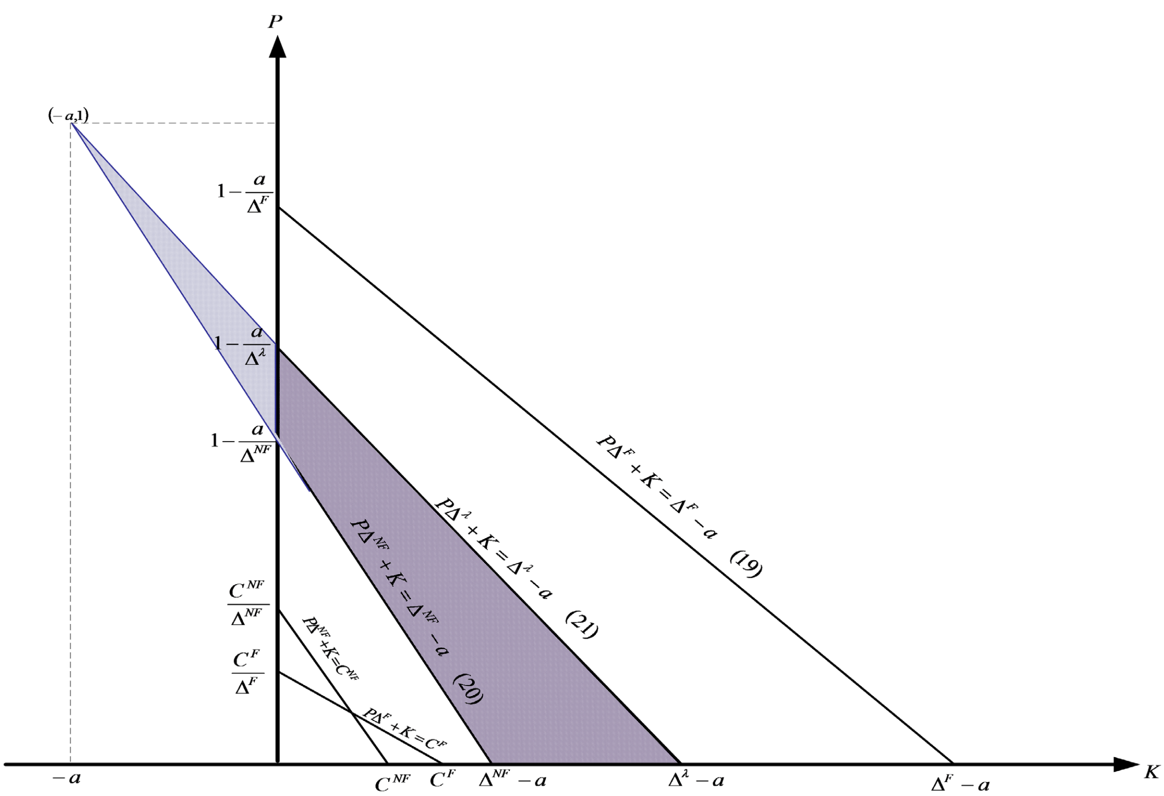

Figure 6. Description of region under $C^{NF} < \Delta^{NF} - a$.

The analysis of this case is exactly the same as the analysis of Case 2. The only sensible pooling equilibrium contract is $(-a, 1)$.

Case 4: $C^F < \Delta^{NF} - a < C^{NF} < \Delta^{\lambda} - a$.

See **Figure 7** for the region of contracts (K, P) satisfying (19), (20), and (21).

Shifting the line $P\Delta^F + K =$ constant upward with without changing its slope, the highest level of the constant is obtained at point B, the intersection of the two lines $P\Delta^{\lambda} + K = \Delta^{\lambda} - a$ and $P\Delta^{NF} + K = C^{NF}$ (see **Figure 7**). In contrast, the highest level of $P\Delta^{NF} + K =$ constant is obtained at $(\Delta^{\lambda} - a, 0)$ (point D in **Figure 7**). As in Case 2, if a sensible pooling equilibrium exists, it must accept the contract B. But we argue that B cannot be a sensible equilibrium. AA^F will improve its payoff if it deviates to B′ (see **Figure 7**) or slightly below B′, because AA^{NF} is worse off deviating from B to B′ while AA^F is better off, provided that A accepts B′. Hence, if A observes B′ (off equilibrium), A will assign probability 1 that AA^F makes this deviation and accepts B′. Consequently, AA^F benefits from this deviation, a contradiction. We conclude that in this region a sensible pooling equilibrium does not exist.

Case 5: $C^{NF} > \Delta^{\lambda} - a$.

In the region of contracts, (K, P) satisfying (19), (20), and (21) is empty and no sensible equilibrium exists. We summarize in the next theorem.

Theorem 4: A sensible pooling equilibrium exists iff $C^{NF} \le \Delta^{NF} - a$ and $C^F \le \Delta^{\lambda} - a$. In this case, both AA^F and AA^{NF} offer contract $K^* = -a$ and $P = 1$ and A accepts it. AA^F obtains $\Delta^F - a - C^F$, and AA^{NF} obtains $\Delta^{NF} - a - C^{NF}$. A obtains zero.

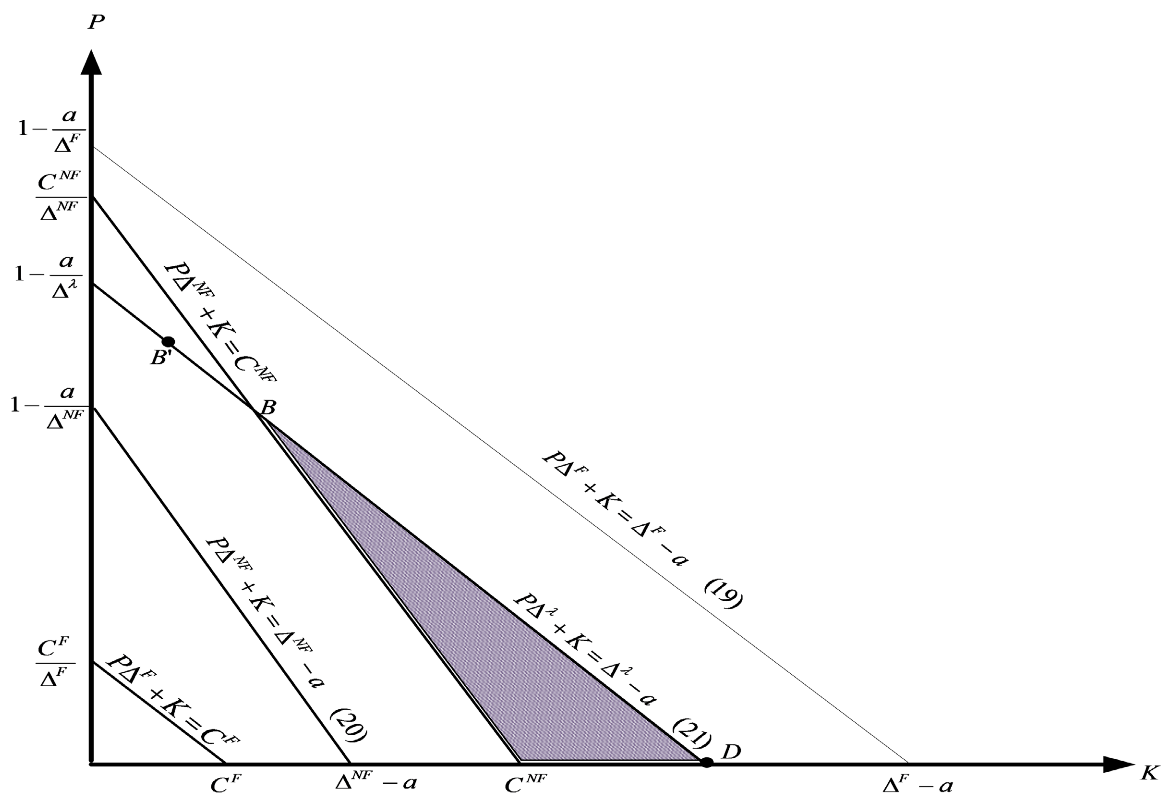

Figure 7. Description of region for $C^F < \Delta^{NF} - a < C^{NF} < \Delta^{\lambda} - a$.

The pooling equilibrium outcome is similar to that of the separating equilibrium. In both cases the agencies extract the entire surplus and the advertiser obtains zero. In both cases AA^{F} and A agree to the contract $K = -a$ and $P = 1$.

For the proof of Theorem 4, we need to specify sensible beliefs of A that support the pooling equilibrium outcome. Any strategy of A determines for every (K, P) (and not only for equilibrium (K^*, P^*)) whether to accept contract (K, P). Consider contract (K^*, P^*) in a dashed region for case 2, 3, or 4. These are non-empty regions of contracts that satisfy (19), (20), and (21). Let us show that (K^*, P^*) where $K^* = -a$ and $P^* = 1$ can be supported as a sensible pooling equilibrium. Consider the following strategy of A: it accepts (K^*, P^*) and rejects any contract (K, P) where (K, P) ≠ (K^*, P^*), such that (K, P) provides A with a negative payoff under A's beliefs that AA^{NF} made the offer (K, P). Namely, A rejects any (K, P) such that (K, P) ≠ (K^*, P^*), and

$$(1-P)\Delta^{NF} - K - a \leq 0 \tag{22}$$

A will accept, in addition to (K^*, P^*), every offer (K, P) that is strictly better for A than (K^*, P^*), no matter whether AA^{F} or AA^{NF} make it. In other words, A accepts every (K, P) for which $(1-P)\Delta^{NF} - K - a > 0$. It is easy to verify that with this strategy, (K^*, P^*) is a sensible pooling equilibrium outcome.

5. Advertisers Auction for Agencies

It would be interesting to explore the competition between two or more advertising agencies within the above model, which is a common reality in the advertising industry (Horsky et al., 2016). Therefore, our next effort will be directed to introduce an advanced analytical model based on *auction theory* (Klemperer, 2004; Conitzer et al., 2022). Auction theory is important for practical and theoretical reasons. First, a large volume of goods and services, property and financial instruments are sold through auctions, and many new auction markets have been recently developed. The auction system is also becoming common in the advertising industry. Second, auctions provide a valuable testing-ground for economic theory, especially for games under incomplete information, whose theory has been advanced in recent years (Bichler et al., 2021; Conitzer et al., 2022; Milgrom, 2021). Finally, auction theory has been the basis of much fundamental theoretical work: it has been important in developing our understanding of unique methods of price formation, most prominently posted prices and negotiations in which both the buyer and the seller are actively involved in determining the price. In practice, when the advertiser is looking for an advertising agency to work with on a specific campaign, the advertiser might use an auction in the following manner: after selecting three or four agencies as candidate for the specific campaign, the advertiser asks them to prepare a presentation of their ideas and their proposed campaign strategy planning and to suggest a compensation system. Therefore, we intend to further develop our previous models by introducing an analytical approach for agency selection and compensations based on auction theory, in order to find the optimal remuneration mechanism for both the advertiser and the advertising agency. The case with multiple agencies:

Consider a simple complete information model with n agencies and a single advertiser. Let $N = \{AA_1, AA_2, \cdots, AA_n\}$ be the set of agencies and assume that AA_i improves the revenues of A by Δ_i. Without loss of generality announce that $\Delta_1 \geq \Delta_2 \geq \cdots \geq \Delta_n$. $\Delta_1 - a - C_1 \geq \Delta_2 - a - C_2 \geq \cdots \geq \Delta_n - a - C_n$.

Consider the following auction conducted by A. Every agency AA_i submits a bid (K_i, P_i). The winning bid is (K_i, P_i) which maximizes the payoff $(1 - P_i)\Delta_i - K_i - a$ of A. In case of a tie the advertiser determines the winner from the set of agencies which maximizes A's payoff.

Proposition: Suppose that $\Delta_1 - a - C_1 > \Delta_2 - a - C_2 \geq 0$ then AA_1 will win the auction with a contract (K_1, P_1) s.t.

$$(1 - P_1)\Delta_1 - K_1 - a = \Delta_2 - a - C_2 \tag{23}$$

and

$$(1 - P_2)\Delta_2 - K_2 - a = \Delta_2 - a - C_2 \tag{24}$$

Proof: Note that Δ_2-a-C_2 is the net surplus generated by (2). If in equilibrium

$$(1 - P_2)\Delta_2 - K_2 - a < \Delta_2 - a - C_2$$

Since $\Delta_1 - a - C_1 > \Delta_2 - a - C_2$ AA_1 is better off slightly increasing K_1 and P_1 so that $(1 - P_1)\Delta_1 - K_1 - a > (1 - P_2)\Delta_2 - K_2 - a$ and A will choose the new offer of AA_1 a contradiction.

We suggest to extend this model to the incomplete information case and to study how it affects the above results.

Next even though the two offers are identical for A, the advertiser in equilibrium chooses the offer of AA. Suppose to the contrary that A chooses the offer of AA_2. Then AA_1 is better of deviating and decrease (K_1, P_1) to (K_1^*, P^*) so that

$$(1 - P_1^*)\Delta_1 - K_1^* - a > \Delta_2 - a - C_2 = (1 - P_2)\Delta_2 + K_2 - a$$

$$P^*\Delta_1 + K_1^* - C_1 > 0$$

$$\Delta_1 - a - C_1 > \Delta_2 - a - C_2$$

In this case, A will choose the new offer of AA_1.

Corollary, the equilibrium outcome is efficient since A chooses the most efficient agency (the one with the highest net surplus).

6. Conclusion

"*Ad agency remuneration is an important and under-researched issue...*" (Kevin Roberts, President Satchi & Satchi Ad Agency). Ad agency compensation continues to be a controversial topic. The agency remuneration has changed dramatically in the past decade as existing methods fell short in the provision of more certain equitability and incentive in the new age of cost-cutting and accountability. PbR has captured the imagination of marketing and advertising executives as well as academicians. The relationship between advertisers and agencies involves a high level of interactivity. Because advertising belongs to the category of professional services, both partners need to make efforts to expand the relationship, and ensure satisfaction, trust, and stable relationships. We have designed a practical ad auction solution that guarantees the advertiser and ad agency value maximization.

The increasing need for advertisers to integrate their marketing communications and demonstrate a return on their communications investments is forcing shifts in the way advertisers operate and manage for improved competitive advantage. In a world of asymmetric information, where an agency knows more about its own abilities than a potential account, implementing a compensation system that attracts high-quality agencies is important. An agency selects a compensation contract based on its perceived risk compared to other available compensation options.

In this work, we have proposed analytical models of advertising agency selection and compensation that extends previous models. We first model the asymmetric information problem as a signaling game and then resolve the selection and compensation problem in both separating and pooling equilibrium. In a separating equilibrium, the advertiser can distinguish between a suitable and a less suitable advertising agency and can choose a better agency. In the first model, we focused on risk-neutral players (the advertiser and the advertising agency), where the agency makes a take-it-or-leave-it offer to the advertiser in the form of a two-part tariff menu. The first component of the menu is an up-front fee paid to the agency by the advertiser (which can be positive or negative) and the second component is a certain percentage of the incremental revenue of the advertiser that is paid to the agency. We find that for the case where only the suitable agency generates a positive surplus (the difference between the incremental net income of the advertiser and the cost of the agency), the advertiser in a separating equilibrium rejects the offer of the less suitable agency and accepts a wide range of offers of the suitable agency. Among them is the extreme offer where the agency finances the entire media budget (and bears the entire risk) and in return extracts all the incremental revenue of the advertiser. In the case where both types of agencies generate a positive surplus, the advertiser accepts both offers, even though they result in zero net income for the advertiser. The suitable agency finances the entire media budget while the less suitable agency has a wide range of acceptable offers, but each one of them finances nothing or only part of the media budget. In a pooling equilibrium, both types of agencies offer the same contract. The pooling equilibrium exists only if the two types of agencies generate a positive surplus. In this case, the only equilibrium contract is the one where the agency finances the entire budget but extracts the entire incremental revenue of the advertiser. There are two main reasons why the agency obtains the entire surplus if it generates a positive surplus. First, the agency has the entire bargaining power to make a take-it-or-leave-it offer. The second reason is our assumption that the utilities of the players are linear. When we depart from this assumption and allow for several agencies with different abilities and different utilities (not necessarily linear), we show that typically the selected contract is not a corner solution. The selected agency and the advertiser share the surplus and may or may not share the risk.

The originality of our research lies in the fact that it focuses on the interactive aspects of the relationship. The research adds to the substantive knowledge of the drivers of ad agency selection and compensation, while adding to the theoretical structure by taking account of the parties' objectives. This research has both major theoretical and practical contributions. From the theoretical point of view, the application of a game theory approach illustrates how to achieve an optimal agency selection process and stable advertiser-agency relationship. From the practical point of view, it offers advertisers and advertising agencies a detailed list of criteria, as inputs in designing an optimal PbR system. Our approach provides an opportunity for both, the advertiser and the agency, to work together towards stable relationships while each benefiting, the advertiser in meeting its advertising objectives, and the agency being rewarded adequately and fairly. It would be desirable for future scholarship to incorporate both financial evaluations and non-financial criteria such as creative evaluations, which frequently entail discussions of the effectiveness of the advertisements (Hornik et al., 2017).

6.1. Paper's Limitations

As a theoretical paper, the first limitation is that the research does not include empirical evidence to support arguments. Second, the paper does not include a discussion of cases of asymmetries in information uncertainty. Third, the paper does not discuss cases of different ad campaign objectives, for example, enhancing ad awareness, establishing brand recognition, and increasing revenue versus profit. Fourth, the paper does not include long-term campaign considerations. For example, optimal campaign duration, frequency of bidding for a campaign, and temporal contract constraints. Finally, the paper does not discuss splitting the campaign between more than one ad agency especially, for large advertisers with multiple brands.

6.2. Future Research

In this paper, we study the advertising agency contracting problem under model uncertainty. An approach is adopted, based on which we explicitly characterize the structure of the optimal contract. The model presented in this paper can be further extended in some ways. One direction is to consider a multi-period setting where the firm should provide incentives across different periods, and the payment to the agency in the current period depends on all the payments in previous periods. Besides, it is also of interest to consider other methods to capture model uncertainty. An important extension is to analyze the interaction of a single advertiser with multiple agencies with different abilities and different utilities over the set of all possible two-part tariff contracts, but this time with asymmetric information about their abilities. It might also be of interest to explore different bargaining methods within the advertiser-agency relationships. For example, in "take it or leave it" bargaining between an advertiser and an agency in which both have private information about the quality of the campaign, the agency aggregates two signals: his own signal and the one inferred from the advertiser's offer. Therefore, the lessons from our approach extend to other models as well. In auctions, bargaining, and pricing with rational expectations, players aggregate multiple signals that are either observed directly or inferred from the equilibrium (Piccione & Rubinstein, 2022).

Given that agency remuneration, budget setting, and accountability are inextricably linked it offers researchers some interesting investigations. For example, exploring the best methods that might constitute agency compensation as part of the overall budget setting. More specifically, linking one of the "budgeting by objective methods" (Kissan & Richardson, 2002) to compensation. In other words, asking the agency to offer the budget according to companies advertising objectives, and holding them responsible by suggesting that remunerations will be linked to the accomplished objectives. Such a model will provide advertisers more assurances that the budget will be a realistic proposal given that the agency will not be compensated according to the commission (percentage of budget), rather than reaching the proposed objectives and actual performance. Our basic auction model opens many interesting future extensions. For example, when the contract between the advertiser and the ad agency expires, the advertiser can choose between auctioning it and offering a retention option to the current agency. It would be enriching to compare an advertiser's revenue when it offers the retention option against when it does not. In each game, find the current agency's equilibrium retention strategy and the advertiser's expected revenue.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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