On optimal real estate commissions

Donald Bruce a,*, Rudy Santore b,1

a Center for Business and Economic Research and Department of Economics, University of Tennessee, Knoxville, TN 37996, USA
b Department of Economics, University of Tennessee, Knoxville, TN 37996, USA

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Abstract

When real estate agent effort is unobservable, home sellers do not prefer the lowest possible commission rate because such a rate does not induce sufficient effort from agents. As a result, the optimal commission from the seller’s perspective exhibits downward rigidity, even if there is free entry. The analysis shows that downward rigidity will occur if and only if the quasi-fixed costs of selling a house are small.

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1. Introduction

The relationship between a home seller and a real estate agent is one that is wrought with incentive problems. Moral hazard may arise because the agent’s effort is not verifiable, or because the agent has an incentive to provide the seller with inaccurate advice. Of course, it is well known that contingent payment schemes can help alleviate moral hazard problems, so it no surprise that sales commissions are the dominant form of compen-

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sations for real estate agents. This paper analyzes the optimal sales commission from the perspective of the home seller when agent effort cannot be verified, and derives the conditions under which the agent can earn informational rents despite an otherwise competitive market in real estate services.

Buyers in most markets prefer lower prices, but this is not true in markets with asymmetric information. When it is not possible to contract on effort (because it cannot be verified), a home seller faces a tradeoff: a smaller commission allows the seller to keep a larger share of the sale price. However, the agent provides less effort at a lower commission increasing the expected time the house is on the market. The optimal commission rate must balance these two considerations. As a result, a home seller may prefer a higher rate to a lower one because low rates fail to induce sufficient agent effort. 3

An important implication of our analysis is that real estate agents can earn informational rents on house sales even if they behave non-cooperatively as long as the quasi-fixed costs of selling a house are small. 4 In other words, the optimal commission rate will typically lie above an agent’s reservation rate. Competition does not remove the rents because the home seller is worse off at lower commission rates. It is often suggested that commissions are too high for a competitive market (see, for example, Yinger (1981) and Anglin and Arnott (1999)), but our model shows that above-normal commission rates are consistent with a high degree of competition. 5,6

In practice, commission rates typically fall between 5% and 7%, with 6% being by far the most common. Though it has become something of a stylized fact that real estate sales commission rates are uniform, recent studies (for example, Sirmans and Turnbull (1997)) suggest otherwise. In fact, the most recent evidence suggests that the average real estate commission rate in the US is down to about 5.1 percent from historic averages around six percent (Hagerty (2004)). One might speculate that the advent of new technology such as the internet and a possible decline in information asymmetry are responsible for the fall in rates. Our model does not predict uniform commission rates. On the contrary, the optimal commission rate, in principle, depends on the exact characteristics of a given house and relevant market. We are aware of no other theoretical research that predicts the same commission rate for different houses and different markets.

Finally, let us point out that in many circumstances the first-best contract requires that the agent purchase the house and then resell it using the optimal level of effort (Shavell, 1979). However, as discussed by Anglin and Arnott (1991), such contracts

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3 Our story is similar to the efficiency wage theory which postulates that employers may find it optimal to pay wages in excess of employees’ reservation wages when monitoring is either costly or imperfect (for example, see Shapiro and Stiglitz (1984)).

4 Yavas (2001) shows that “the prevalence of fixed costs... in the real estate brokerage industry makes it impossible to have competitive commission rates as the equilibrium outcome” (page 187). However, unlike the present analysis, Yavas does not allow for unobservable agent effort.

5 The most common explanation for the rigidity is that collusion of some sort (tacit or explicit) is at work. Zumpano and Hooks (1988, p. 3) write that “from the very inception of what might be called the modern real estate brokerage industry price competition was discouraged by explicit price-fixing agreements maintained by local boards of realtors.”

6 Santore and Viard (2001) use a similar model in which contingent fees for attorneys exhibit downward rigidity. The purpose of that paper, however, is to explain the American Bar Association’s prohibition on the purchase of legal claims by attorneys.
are likely to be infeasible in the real estate market and are rarely observed.\textsuperscript{7} Our paper contributes to this literature by showing that when it is not feasible for the agent to purchase the house, the optimal commission rate may lie above the agent’s reservation rate.

2. The basic model

A risk-neutral homeowner (hereafter seller) requires the services of a risk-neutral realty agent (hereafter agent) to sell a house.\textsuperscript{8} The market for realty services is competitive, except for the moral hazard problem discussed below.

We allow for the possibility that some quasi-fixed cost, denoted by $K$, must be incurred by the agent if the house is to be sold. This quasi-fixed cost should not be confused with the fixed costs of operating a realty business, such as overhead costs. Rather, $K$ consists of costs associated with listing and selling a house, the magnitude of which is not variable. Examples of quasi-fixed costs include the cost of learning about the house, researching comparable properties, listing it on the local MLS, and dealing with required paperwork or other issues such as writing up the sales agreement on behalf of the sellers. For simplicity, we assume that all quasi-fixed costs are observable.

The crux of the analysis, however, relies on the assumption that agent effort, denoted by $E$, is unobservable. For ease of exposition we also assume that the units of effort are such that the cost of effort is $E$. (All of our results continue to hold for a general convex cost of effort function.) The term ‘effort’ is used generically to refer to any costly unobservable input that increases the probability of selling the house, or decreases the time required to sell the house. At any given sale price, the seller prefers to sell the house as soon as possible, so future sales must be discounted accordingly. Throughout we hold the sale price of the house constant.

For any given sale price, the expected present discounted value of the house’s sales revenue, denoted by $V(E)$, is a function of the agent’s effort, $E$. (Here, we use a static model to establish our main points. However, Appendix B shows that our essential results continue to hold for a more general infinite horizon version of the model.) We assume that $V(E)$ is an increasing, strictly concave function of effort: $V_E(E) > 0$ and $V_{EE}(E) < 0$. In words, more effort on the part of the agent increases the expected present discounted value of the sales price, but at a decreasing rate. Finally, for ease of exposition, we assume $\lim_{E \to 0} V_E(E) = \infty$. However, even if this last assumption is not satisfied, the essential results continue to hold with only minor qualification.

Let $c$ denote the sales commission expressed as a percentage fee (the fraction of the sale price received by the agent). We assume that the seller and the agent are both risk-neutral and have the same discount rate. Since both the seller and agent maximize the expected present discounted value of their respective proceeds, the seller’s payoff is $(1 - c) \cdot V(E)$ and the agent’s payoff is $c \cdot V(E)$.\textsuperscript{9}

\textsuperscript{7} Henceforth, our use of “optimal” assumes that this first-best contract is not feasible. To be precise, an optimal contract will, therefore, be a second-best outcome for the seller.

\textsuperscript{8} Throughout the paper, we use the terms agent, realtor, and broker to refer to individuals who are hired by the seller to list and show the house, and abstract from any conventionally acceptable meanings of these terms.

\textsuperscript{9} Allowing the agent’s discount rate to differ from the seller’s would, under fairly general conditions, merely imply an additional multiplicative constant, and would not alter our results.
2.1. Agent effort choice

The unobservable nature of agent effort makes this a classic principal–agent problem, and creates the economic rationale for tying the agent’s fee to the sale price of the house. We now examine the agent’s optimal effort choice, at a given commission rate.

Assuming that the agent agrees to list the house, the agent’s effort is chosen to maximize the commission net of effort and quasi-fixed costs, as follows:

\[
\text{Max}_{E \geq 0} c \cdot V(E) - E - K.
\]

The first-order condition defining the agent’s (privately) optimal effort level is

\[
\frac{c}{C_1} V(E) = 1.
\]

Let the optimal effort, denoted by \( E(c) \), be implicitly defined by (1), where it should be understood that \( E(0) = 0 \).

Differentiating Eq. (1) with respect to \( E \) and \( c \) we find unsurprisingly that the agent’s privately optimal effort level is also an increasing function of the sales commission rate,

\[
\frac{\partial E(c)}{\partial c} = \frac{-V_E(E(c))}{c \cdot V_{EE}(E(c))} > 0.
\]

We define the agent’s surplus as

\[
S(c) \equiv c \cdot V(E(c)) - E(c) - K.
\]

Implicit in the above definition is the assumption that the agent chooses the privately optimal effort level \( E(c) \). Using Eq. (2) it can be shown that \( S(c) \) is an increasing function of \( c \).

The magnitude of the quasi-fixed costs determines whether the agent agrees to sell the house for commission rate \( c \). Let \( c^0(K) \) denote the commission that yields zero surplus to the agent when the quasi-fixed costs are \( K \). It is implicitly defined by the following zero-surplus equation:

\[
c \cdot V(E(c)) - E(c) = K,
\]

which implies \( S(c^0(K)) = 0 \). By definition, the agent will not sell the house at commissions less than \( c^0(K) \). It is straightforward to verify that \( c^0(0) = 0 \) and that \( c^0(K) \) is an increasing function of \( K \). In other words, greater quasi-fixed costs associated with selling a particular house will require a higher commission rate in order to induce the agent to agree to list the house. The following lemma is proved in the Appendix.

**Lemma 1.** At any positive commission rate, the agent agrees to sell the house as long as the quasi-fixed costs are sufficiently small. In particular, the agent agrees to sell the house as long as \( K \leq c \cdot V(E(c)) - E(c) \).

**Proof.** See Appendix A.

To see why the above lemma is true, consider the special case when there are no quasi-fixed costs. As long as the marginal product of effort is large as \( E \) approaches zero, the marginal benefit to the agent, \( c \cdot V_E \), will be greater than unity, the marginal cost of effort. Thus, when there are no quasi-fixed costs, it is always optimal for the agent to list the house, because the agent can always receive positive surplus by choosing a low level of
effort. The same argument applies when the quasi-fixed costs are sufficiently small. Hence, the agent will agree to list the house at any commission rate as long as the quasi-fixed costs are small.

Having analyzed the agent’s behavior at any given commission rate, we now turn to determining the optimal percentage commission rate.

3. Optimal sales commissions

We envision a market in which identical agents compete for the right to sell the house. The optimal transaction-specific sales commission, denoted by $c^*$, can be obtained by maximizing the seller’s net sales revenue, denoted by $R(c)$, subject to the agent’s participation constraint, while recognizing that effort is unverifiable.  

\[
\max_{c \in [0,1]} R(c) = (1 - c) V(E(c)) \\
\text{s.t. } c \cdot V(E(c)) - E(c) - K \geq 0.
\]

Notice that the above maximization problem assumes that the agent puts forth effort level $E(c)$. This is because the agent cannot commit to any other effort level. To keep the discussion simple we make the assumption that $R(c)$ is quasiconcave in $c$. However, we stress that this is an assumption of convenience, not necessity.

Assuming the agent’s participation, the seller’s optimal commission is the one that maximizes $R(c)$. The function $R(c)$ is continuous and bounded at all $c \in [0,1]$, so it must achieve a maximum. The seller’s optimal commission, denoted by $\hat{c}$, is the solution to the following first-order condition.

\[
\frac{dR(c)}{dc} = (1 - c) V_E(\cdot) \frac{\partial E}{\partial c} - V(\cdot) = 0
\]

The optimal commission rate for the seller is positive, otherwise the agent has no incentive to provide effort, but must be less than 100% if the seller is to receive positive net revenue.

The fact that the optimal rate is less than 100% implies that the agent does not put forth maximum effort (see Eq. (2)). Indeed, when it comes to inducing agent effort, the home seller faces a tradeoff: a lower commission allows the seller to keep a larger share of the sale price, but the agent provides less effort at a lower commission, which implies a relatively lower value of $V(\cdot)$. The latter effect dominates the former at commissions below $\hat{c}$, yielding a lower net revenue to the seller than that which results from a commission rate of $\hat{c}$. As a result, the seller would prefer to pay $\hat{c}$ rather than any lower commission. Similarly, while more effort and higher values are brought about by commission rates above $\hat{c}$, the seller keeps a smaller share of the total sale price at these higher commission rates, resulting in lower net sales revenue for the seller. (Without the quasiconcavity assumption, the graph of $R(c)$ could have multiple peaks, but would still achieve a maximum at a strictly positive commission rate.)

As noted above, agents will never accept a commission rate below $c^0(K)$. Of course, they will gladly accept any higher rate. Further, given the seller’s constraints, a commission rate above $\hat{c}$ will not be offered unless the seller agrees to accept less than the maximum possible net sales revenue in order to satisfy the agent’s participation constraint. If $\hat{c}$ is higher

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10 Note, again, that we assume that the true first-best contract (agent purchase and resale) is not feasible.
than $c^0(K)$, it is the optimal commission. Conversely, if $\hat{c}$ is below $c^0(K)$, the agent does not accept the listing contract unless the seller agrees to pay the higher (zero-surplus) rate. The above discussion implies the following result.

**Proposition 1.** The optimal commission is $c^* = \max(\hat{c}, c^0(K))$.

In other words, the above proposition shows that **moral hazard can yield downward rigidity in the agent commission rate, which never falls below $\hat{c}$**. Competition need not drive the commission down to the agent’s reservation rate because the seller (and not just the agent) is worse off at any commission below $\hat{c}$.\(^{11}\) It is also possible to show that whenever the optimal commission rate is $\hat{c}$, the surplus for the agent decreases dollar-for-dollar with the quasi-fixed costs. For sufficiently large quasi-fixed costs we have $c^0(K) > \hat{c}$ implying an optimal commission rate of $c^0(K)$ and zero surplus for the agent. The next proposition relates the magnitude of the quasi-fixed costs to the possibility that the agent earns positive surplus.

**Proposition 2.** The optimal commission is $c^* = \hat{c}$ and the agent earns strictly positive surplus if and only if the quasi-fixed cost is sufficiently small.\(^{12}\)

If the quasi-fixed costs of selling a house are small, the optimal commission rate plateaus at $\hat{c} > c^0(K)$, even though agents behave competitively. This result is driven by the fact that higher commissions induce greater agent effort, thereby increasing both the expected present discounted value of selling the house and, most importantly, the seller’s revenue from the sale net of the agent’s commission.

4. Discussion

4.1. Long run equilibrium

In the present model, the number of agents alters neither the optimal commission rate nor the surplus earned on the sale of a given house—both are determined on a transaction-by-transaction basis. Entry nevertheless lowers profits by decreasing the number of sales contracts received by a typical agent. In the long run, one would expect entry to occur until the combined surplus from all houses sold just equals total overhead costs (not to be confused with the quasi-fixed costs), so that economic profits are zero. Even if there are modest barriers to entry, real estate agents might not earn positive economic profits due to non-price competition, a topic that has been analyzed by Miceli (1992) and Turnbull (1996). Given the relatively free entry, small firm size, and low salaries in real estate noted by Zumpano and Hooks (1988), this is perhaps not far from the reality of the industry.

4.2. Choosing the sale price

The previous analysis did not consider the role of the agent in the determining the sale price. Although there is evidence that agents do not have an appreciable effect on the sell-

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\(^{11}\) The transaction-specific nature of the optimal commission rate in our model precludes useful numerical simulation or comparisons with prevailing market commission rates.

\(^{12}\) By Proposition 1, $c^* = \max(\hat{c}, c^0(K))$. Since $S(c)$ is increasing in $c$, the agent will earn positive surplus if and only if $\hat{c} > c^0(K)$. However, using the fact that $\lim_{K \to 0} c^0(K) = 0$, it follows that for sufficiently small $K$ we have $c^0(K) < \hat{c}$. 
ing price (Zumpano et al., 1996), asymmetric information regarding market conditions may nevertheless give rise to additional agency problems. As explained by Levitt and Syverson (2005), the misalignment of incentives between the seller and the agent derives from the fact that “the real estate agent receives only a small fraction of the purchase price of the home, but bears much of the cost of selling the house” (2005, page 1). For example, a relatively low sale price would require less agent effort, possibly generating greater agent surplus in the face of lower net revenue for the seller (Arnold, 1992). Along these lines, Rutherford et al. (2005) and Levitt and Syverson (2005) find that agent-owned houses sell for more than client-owned houses. Asymmetric information problems regarding market conditions (if they exist) are likely to put additional upward pressure on commission rates.

The reason is that clients should find it optimal to more closely align the incentives of agents with their own.

4.3. More general payment schemes

Our model has assumed that agents are compensated entirely through simple sales commissions. Now suppose instead that we were to allow the agent to charge a positive fixed fee that is not conditional on the sale of the house (the agent receives the fixed fee even if the house is not sold). One can show that positive fixed fees of this sort would never arise in equilibrium because they are dominated by the simple sales commission. Whereas the simple sales commission induces effort from the agent in addition to compensating the agent, (unconditional) fixed fees do not induce agent effort. For any contract \((c, F)\) where \(F\) is a fixed fee paid to the agent regardless of whether or not the house is sold, there exists a simple sales commission \(c' > c\) yielding greater utility to the seller while providing the agent with the same expected profits. Thus, \(positive\) (and unconditional) fixed fees would not arise in equilibrium.

There is, however, reason to think that negative fixed fees should arise in equilibrium. Indeed, the moral hazard problem and any associated rents both disappear if the real estate agent (or firm) is able to buy the house and then resell it using the efficient level of effort. Buying the house is equivalent to a 100% sales commission and a negative fixed fee equal to the price paid by the realtor for the house. Though not as prevalent as might be expected, the purchase of the house by the agent is indeed efficient within the present model because the agent then internalizes the externality (see also Shavell (1979)). However, liquidity constraints (not formally modeled here) are likely to preclude the purchase of even a small number of houses. Purchasing houses with the intention of resale also shifts all of the risk to the agent, which may not be efficient. Shavell (1979) has shown that when the principal and agent are both risk averse, efficiency requires that each must bear part of the risk. The simple sales commission certainly does imply risk sharing, although it may not do so optimally.

Finally, there may exist non-linear contracts that are more efficient than simple sales commissions, at least in some circumstances. Our analysis is incapable of explaining why other more general payment schemes are not observed, although the relative simplicity of the sales commission is certainly an important factor. For whatever reason, there is no doubt that percentage commissions have become the industry standard and our paper has focused on understanding the optimal commission from the seller’s perspective.
4.4. Agent reputation

One might wonder if over time agents could develop a reputation for not shirking on effort. For example, even though effort is not directly observable, sellers may be able to observe price concessions on other houses the agent has sold as well as how long it took the agent to sell the house. However, there are difficulties with this reputation story. First, while a seller can observe time-to-sale and concessions on list prices (i.e., differences between initial list prices and final sale prices), it would be quite difficult to assemble a large enough data set for any particular agent that would enable any valid inferences to be drawn. Such data are not systematically gathered or made publicly available for consumers. Using only a small number of transactions would be an unreliable proxy for agent effort. Rather, sales numbers (closed sales) and transaction volume are typically the most available indicators of agent “success.” Those indicators are probably equally problematic. Second, the effort provided by the agent in the past may have been motivated by the commission rates that were paid by sellers and these transaction-specific rates are not readily available. There is no reason that the agent will put forth similar effort if he or she receives a lower commission. Third, if it were possible to build a reputation for not shirking, it would seem equally plausible to obtain a reputation for giving correct advice regarding market conditions. Yet, the empirical work by Rutherford et al. (2005) and Levitt and Syverson (2005) provides evidence that information problems of this sort remain.

5. Conclusion

We have provided a simple economic rationale for the observation that real estate sales commission rates seem to exhibit remarkable rigidity. Our explanation relies on a principal–agent model in which a real estate agent’s effort is not verifiable by the home seller. The key insight is that a home seller does not necessarily prefer a lower rate to a higher one since agents exert less effort at low rates. Consequently, the optimal sales commission never falls below the rate that maximizes the seller’s net sales revenue. When selling a house involves small quasi-fixed costs, the agent’s reservation rate lies below the optimal rate. Real estate agents may therefore earn informational rents, even though the market is competitive. Nevertheless, the rents are likely to be dissipated through entry and non-price competition, implying zero economic profits in the long run.

Several aspects of our discussion merit additional attention in future empirical research. Perhaps most importantly, the link between transaction-specific commission rates and effort (as proxied by time-to-sale and eventual sales prices) should be tested. A more difficult pursuit would be an exploration of the relationship between quasi-fixed costs and commission rates to determine whether agents facing higher costs (a) charge higher commission rates and/or (b) make efforts to reduce those costs in order to increase profits for a given commission rate. The ability to pursue these topics will depend, of course, upon the availability of transaction-specific data.
Appendix A. Proof of Lemma 1

It is sufficient to show that for any $c > 0$ we have $c \cdot V(E(c)) - E(c) > 0$, since for any $K$ that is not greater than $c \cdot V(E(c)) - E(c)$ the agent’s participation constraint is satisfied.

By the assumption that $\lim_{t \to 0^+} V_E(E) = \infty$ we have $E(c) > 0$ for all $c > 0$. By the assumption that $V(E(c))$ is strictly concave in $E$ we have

$$E(c) \cdot V_E(E(c)) < V(E(c)) - V(0).$$

(A.1)

Multiplying (A.1) by $c$ we get

$$c \cdot E(c) \cdot V_E(E(c)) < c[V(E(c)) - V(0)].$$

(A.2)

From Eq. (1) we know $c \cdot V_E(E(c)) = 1$, which, when substituted into (A.2), implies

$$c \cdot V(0) < cV(E(c)) - E(c).$$

(A.3)

The left-hand side of (A.3) is non-negative, so it follows that $c \cdot V(E(c)) - E(c) > 0$.  

Appendix B. A more general infinite horizon model

Consider an infinite horizon model in which every period the probability of selling the house depends on the agent’s effort and the price. Let $x(e_t, P)$ be the probability that the house is sold in period $t$, when the realtor provides effort $e_t$ and the sale price is $P$. As specified, the probability of sale function is independent across time. Both the seller and agent have the common discount factor $d$ (we maintain this assumption only to conserve notation; relaxing it is straightforward).

Once the commission rate, $c$, has been chosen, the agent will choose a sequence of effort levels to maximize the expected discounted value of future sales commission less the expected discounted value of effort and less the quasi-fixed costs, denoted by $K$.

$$\sum_{t=0}^{\infty} (1 - x(e_t, P)) x(e_t, P) \delta^t [cP - e_t] - K.$$  

(B.1)

However, clearly the agent will choose $e_t^* = e_t^0$ for all $t \geq 0$ since, conditional on the house not being sold in period $t - 1$, the agent’s problem is exactly the same in period $t$ as it was in period 0. Thus, we are justified in treating the agent as choosing $e$ to maximize

$$\sum_{t=0}^{\infty} (1 - x(e, P)) x(e, P) \delta^t [cP - e] - K,$$

(B.2)

which reduces to,

$$\frac{x(e, P)}{1 - \delta + x(e, P) \delta} (cP - e) - K.$$  

(B.2')

At any given $c$, the agent chooses effort to maximize the above. The first-order condition is

$$(1 - \delta) \frac{cP - e} {[1 - \delta + x \delta]^2} - \frac{x}{1 - \delta + x \delta} = 0.$$  

(B.3)

At an interior solution, the agent’s optimal level of effort, denoted by $e(c)$, is implicitly defined by (B.3). The (local) second-order condition is
Nevertheless, if the surplus earned at $e(c)$ does not allow the agent to cover her quasi-fixed costs (in expectation), then the agent refuses to list the house. That is in order for the agent to list the house at commission $c$, we must have

$$
\frac{x(e(c), P)}{1 - \delta + x(e(c), P)\delta} (cP - e(c)) - K \geq 0.
$$

Assuming the agent does list the house, it is possible to determine the effect of an increase in $c$ on the agent’s effort by implicitly differentiating (B.3)

$$
\frac{\hat{c}e}{\hat{c}c} = \frac{P(1 - \delta)x_c}{[1 - \delta + x\delta]^2} > 0.
$$

So the agent chooses higher effort levels when receiving a higher commission.

The seller, on the other hand, wishes to maximize the expected present discounted value of revenues net of commission fees, subject to assuring the agent’s participation. However, the seller recognizes that a higher commission rate induces greater effort. As long as the agent agrees to list the house, the optimal commission rate from the seller’s perspective maximizes the following

$$
\frac{x(e(c), P)}{1 - \delta + x(e(c), P)\delta} (1 - c)P
$$

The necessary first-order condition reduces to

$$
[1 - \delta]x_c \frac{\hat{c}e}{\hat{c}c} (1 - c) - x = 0
$$

The above equation may have multiple solutions, but the optimal commission rate, $c^*$, necessarily solves it. (Note: we must have $1 > c^S > 0$, since at $c = 0$ the agent puts in zero effort and at $c = 1$ the seller receives zero proceeds.)

Now if the agent earns non-negative expected profits at $c^S$ (that is, if (B.5) is satisfied when evaluated at $c^S$), then it is the equilibrium commission. On the other hand, if the agent earns would earn negative profits at $c^S$, then it will be unacceptable to the agent. In this case, the seller must compensate the agent with a commission that allows the agent to earn exactly zero profits. This zero profit commission rate, $c^0$, is the one that allows (B-5) to hold with equality. Therefore the equilibrium commission rate is $c^* = \text{Max}\{c^S, c^0\}$.

References


