Setting Referral Fees in Affiliate Marketing

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Affiliate programs offer affiliates referral fees in return for directing potential customers into a merchant's Web site. Affiliates are commonly paid based on the number of leads converted by the merchant into customers (pay-per-conversion) or based on the number of leads referred to the merchant (pay-per-lead). Given the prevalence of both, interesting questions for research are as follows: Why do both formats prevail? Under what conditions is one format preferred over the other? The authors find that pay-per-lead is more profitable when a merchant negotiates a separate deal with an affiliate. In this case, pay-per-conversion is not optimal for the affiliation alliance because it leads to suboptimal pricing by the merchant. In contrast, pay-per-lead is less profitable than pay-per-conversion for a merchant that works with a large number of affiliates all under the same terms because it is susceptible to bogus referrals that cannot be converted into customers.

Keywords: *Affiliate marketing; customer referrals; customer acquisition; pay-per-conversion; pay-per-lead*

> Every time you send us a customer from your site, you earn up to 15% of each sale.
>
> (Amazon.com 2001)

> We don't want to carry the risk of a campaign in which the client's website fails to convert our members.
>
> (David Tolmie, YesMail, cited in Wathieu 2000, p. 9)

Affiliate marketing is becoming an important source of customer acquisition. Using the Internet, a merchant can create a network of affiliate organizations that refer customers to its site. Possible affiliates include sellers of products and services, Web sites connecting a group of customers with joint interests, or professional referral services. Many online merchants use affiliate marketing (Dysart 2002; Fox 2000; Oberndorf 1999), and industry observers expect it to become a major source of customer acquisition (Fox 2000; Helmstetter and Metivier 2000; Ray 2001).

Many merchants pay affiliates a referral fee for every referral that is converted into a customer (*pay-per-*

We are grateful to the editor and two anonymous reviewers for their helpful comments and to Michal Gerstner for her help in editing the article.

Journal of Service Research, Volume X, No. X, Month 2003 1-
DOI: 10.1177/1094670503251111

conversion). For example, Amazon pays its affiliates up to 15% commission on sales made to a converted customer. Pay-per-conversion is sometimes considered to be a form of pay-for-performance because it reduces the merchant's risk of paying for referrals that do not convert into buyers.

Another commonly used method is *pay-per-lead*, whereby affiliates are paid for referrals regardless of whether their referrals are converted into buyers. YesMail, a company that specializes in opt-in programs for targeted e-mail promotions, refuses to be paid based on actual purchases made by referrals it sends to merchants. According to CEO David Tolmie, "We don't want to carry the risk of a campaign in which the client's website fails to convert our members" (Wathieu 2000, p. 9). YesMail demands a flat rate per thousand promotional e-mails sent, despite the fact that the response to its opt-in e-mail is 5 to 10 times larger than conventional direct mail. Chuck Davis, CEO of BizRate, expresses similar sentiments. Believing that the quality of BizRate's referrals is high, Mr. Davis says, "I'd rather get paid for my performance, without being hurt by someone else's non-performance" (Moon 2000, p. 11). BizRate collects referral fees that are based on the number of clicks (instead of taking a commission out of the resulting purchases).

Given the prevalence of both pay-per-conversion and pay-per-lead formats, two interesting questions are as follows: (a) Why do both formats continue to exist? (b) Under what conditions is one format preferred over the other? In this article, we investigate these two questions. We show that when a merchant deals with each affiliate separately to determine the referral fee, pay-per-conversion leads to suboptimal pricing, and therefore pay-per-lead is more profitable and efficient than pay-per-conversion. In contrast, when the merchant works with a large number of affiliates and determines the referral fee collectively for all, pay-per-lead is no longer more profitable than pay-per-conversion. In addition, if opportunistic affiliates refer bogus leads to the merchant because it is inefficient to monitor a large number of affiliates closely, pay-per-conversion becomes superior to pay-per-lead. On the basis of these results, we derive recommendations to the merchant and the affiliate regarding which referral fee method should be used.

Our study relates to the growing emphasis of businesses on referrals as a source for customer acquisition. Although referrals have long been recognized as a potential source for customer acquisition (e.g., Kotler 1997; Money, Gilly, and Graham 1998), managers often avoided managing the referral process because many view referrals as part of hard-to-control interpersonal communications (Silverman 1997). Most efforts in this regard have been devoted to finding ways to persuade a firm's customers to refer it to others (O'Malley 2000; Buttle 1998); however, tracking the effectiveness of those efforts has proved difficult. The emergence of the Internet and sophisticated customer database management systems has made the tracking and rewarding of referrals easier. Indeed, in the business-to-consumer market, there is recent growth in the use of referral rewards programs (Murphy 1997; Biyalogorsky, Gerstner, and Libai 2001). Biyalogorsky, Gerstner, and Libai (2001) investigated when referral rewards programs should be used in a business-to-consumer framework. In this article, we address the issues concerned with business-to-business referral and, in particular, affiliate marketing.

AFFILIATE MARKETING PROGRAMS

One-to-Many and One-to-One Programs

Perhaps the most famous affiliate marketing program is Amazon's "Associates Program." Amazon offers Web sites the opportunity to link to the Amazon.com site and earn up to a 15% referral fee on any sales resulting from customers channeled from the affiliate Web site to Amazon.com. Launched in July 1996, the program has more than half a million associates. Amazon's program is an example of a *one-to-many* affiliate program. In such programs, the merchant sets the terms of the arrangement, and each potential affiliate decides whether to join under these terms. Such programs are typical when a merchant wants to link with numerous affiliates. For example, CDNOW reportedly had 250,000 participating sites by 2000 (Hoffman and Novak 2000). Negotiating referral terms with these many sites is clearly cost and time prohibitive. To avoid this, the merchant sets the terms, and the potential affiliates only decide whether to participate in the program. The large number of affiliates makes it difficult to monitor their actions; thus, there is opportunity for affiliates to misuse the program. By referring people who do not intend to buy, affiliates can collect referral fees for bogus leads. A major concern is how to prevent such free-riding behavior. For example, Amazon expressly forbids and guards against the use of the associate programs for personal orders.

A second type of affiliate marketing programs is *one-to-one* arrangements. In these types of programs, the merchant and the affiliate negotiate a specific contract that governs the referral of customers from the affiliate site to the merchant site. For example, AOL had specific agreements with eBay and 1-800-flowers to refer customers to their sites. One-to-one contracts are typically signed with affiliates that have access to a large number of potential customers and usually involve large sums of money, some of which are paid up-front. For example, in 1997,

CDNOW signed a 2-year contract with a major portal for $4.5 million. Affiliates in one-to-one arrangements are powerful companies that have substantial negotiating power in determining the terms of affiliate arrangement. Free riding is less of a concern because of the adverse consequences of such behavior to reputation, fear of litigation, and the loss of future business.

Referral Fees: Variable Versus Fixed (Sunk) Cost

Affiliate marketing can be viewed as a customer channel in which customers (rather than products) are passed along the channel. In this "affiliate channel," the merchant pays the affiliate for referred customers and then profits by selling them products and services. The referral fee is analogous to the wholesale price in a vertical distribution channel. However, from the merchant's point of view, the referral payment can be a variable cost or a fixed (sunk) cost, depending on the type of payment used.

Under pay-per-lead, the merchant pays for the leads and then tries to convert them to customers (e.g., by setting attractive prices). Because the attempt to convert occurs after the merchant has already paid for the leads and the pay is nonrefundable, the referral fees are a sunk cost.[1] Merchants pay YesMail a fixed amount per thousand leads, regardless of how many leads it converts into customers. Therefore, in terms of the pricing decision by the merchant, the referral fee is a sunk cost.

Under pay-per-conversion, the merchant pays the affiliate only if a sale is made. From the merchant's point of view, the referral fee is an avoidable cost for the pricing decision because it is not paid if the lead is not converted into a customer. Therefore, the referral fee is a variable cost that varies with the amount of sales.

"I'd Rather Get Paid for My Performance, Without Being Hurt by Someone Else's Nonperformance"

Both merchant and affiliate have concerns about nonperformance by the other participant in the affiliation arrangement. From the perspective of the affiliate, pay-per-conversion is risky because the outcome depends on the merchant's successfully converting referred customers into buyers. Because the pay-per-conversion fee is a variable cost for the merchant, the higher the fee, the higher the price. However, a higher price means lower conversion rates. Thus, the merchant pricing decision may be suboptimal from the affiliate perspective. The affiliate, therefore, might prefer a referral fee arrangement that does not depend on the merchant performance. Indeed, affiliates such as YesMail and BizRate do not want to take the risk of a merchant not performing well and prefer to be paid based on the number of leads they refer to the merchant.

From the perspective of a merchant, on the other hand, there is a risk that affiliates will not perform (i.e., refer customers who are hard to convert). Therefore, the merchant might prefer a referral fee arrangement that is contingent on the affiliate performance, such as a pay-per-conversion arrangement. This may be particularly true in one-to-many programs because of the prospects for opportunistic behavior (i.e., "cheating") that arise due to the cost of monitoring and screening affiliates. This makes other control mechanisms (such as litigation, reputation effects, etc.) less effective in the one-to-many model than in the one-to-one model and therefore increases the value of opting for a pay-per-conversion fee.

Thus, the merchant and the affiliate might have conflicting incentives in choosing the type of referral fees. In the following sections, we model the two types of affiliate programs and analyze them to determine what type of a referral fee is more profitable for the merchant and the affiliates and under what circumstances each one is more profitable to the affiliation channel as a whole.

A ONE-TO-ONE AFFILIATION MODEL

In this section, we consider the case in which a merchant and an affiliate enter into a unique affiliation arrangement whose terms cover their relationship. Usually in such cases, the affiliate has some power that can be leveraged in determining the terms of the affiliation arrangement.

The merchant and the affiliate negotiate an affiliation agreement under which the affiliate will refer customers to the merchant for a fee, R_i, where the subscript i denotes the type of referral fee used. We consider two types of referral fee arrangements:

Pay-per-lead: The affiliate receives a fixed amount R_1 for each lead referred to the merchant.
Pay-per-conversion: The affiliate receives an amount R_2 only if the lead converts to an actual customer.

There are two stages in the model: First, an affiliation agreement is negotiated, and then the merchant decides on the price to charge customers. For simplicity, we assume that the merchant's behavior in the second stage is fully known. Thus, the affiliate has rational expectations regarding the merchant's price during the negotiation phase.

A lead becomes a customer only if his or her willingness to pay is higher than the price level set by the mer-

1. Note that pay-per-lead fees are sunk when the merchant makes the pricing decision but are an avoidable (variable) cost when the merchant makes a decision whether to enter into an affiliation arrangement.

FIGURE 1
Affiliation Marketing Models

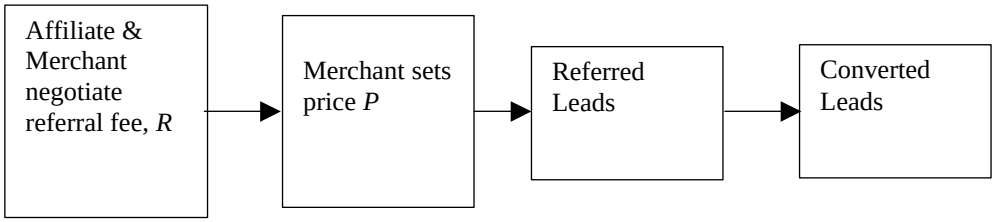
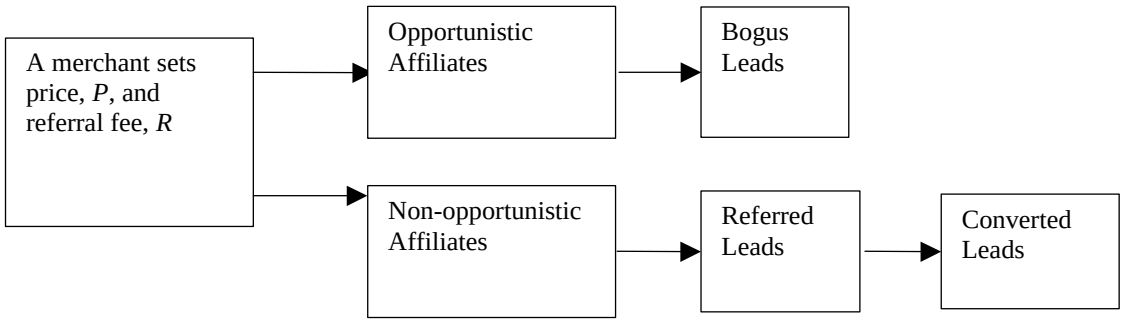


FIGURE 2
One-to-Many Model



chant. Thus, the probability of a potential customer converting into an actual customer (the conversion probability) is $1 - F(p)$, where F is the distribution of customers' willingness to pay and p is the price set by the merchant. Each of the converted customers has an expected lifetime value, $LV(p)$, that is the expected discounted contribution stream over time from the customer, excluding initial acquisition costs. The lifetime value depends on the price level p. The higher the price level at which a potential customer is willing to become a customer, the higher the expected lifetime value. That is,

$$\frac{\partial LV(p)}{\partial p} > 0.$$

The merchant's expected profit from a lead equals the conversion probability times the lifetime value from a lead, $[1 - F(p)]LV(p)$, less the expected referral fee, $E\{R_i\}$:

$$\Pi_{merchant} = [1 - F(p)]LV(p) - E\{R_i\}. \quad (1)$$

The expected profit of the affiliate is equal to the expected referral fee,[2]

$$\Pi_{affiliate} = E\{R_i\}. \quad (2)$$

Note from (1) that the merchant faces a trade-off when setting price because the conversion probability, $1 - F(p)$, decreases when the price, p, increases, but the lifetime value $LV(p)$ is increasing with price. Therefore, when the merchant lowers the price, the probability that a lead will be converted increases, which has a positive effect on the expected profit (given that price exceeds the customer acquisition cost). However, at the same time, the expected lifetime value from the converted lead decreases, which has a negative effect on the expected profit.

2. We assume that the only costs for the affiliate are fixed and normalize them to zero.

Joint Profit of the Affiliation Alliance

An efficient affiliation program should maximize the profits of the affiliation alliance (alliance in short) that consists of the joint profits of the merchant and affiliate firms. Summing the expected profit functions (1) and (2) yields the following alliance profit function:

$$\Pi_{alliance} = [1 - F(p)]LV(p). \quad (3)$$

The optimal price that maximizes (3) satisfies the following first-order condition:

$$\frac{\partial \Pi_{alliance}}{\partial p} = [1 - F(p)]\frac{\partial LV(p)}{\partial p} - f(p)LV(p) = 0. \quad (4)$$

Pay-Per-Lead[3]

Under a pay-per-lead payment agreement, the affiliate receives a referral fee R_1 for each lead, regardless of whether the lead buys. As a result, the acquisition cost per lead R_1 becomes a fixed (sunk) cost when the merchant maximizes its expected profit function (1). The resulting first-order condition for the optimal price decision by the merchant is

$$\frac{\partial \Pi_{merchant}}{\partial p} = [1 - F(p)]\frac{\partial LV(p)}{\partial p} - f(p)LV(p) = 0. \quad (5)$$

Pay-Per-Conversion

Under pay-per-conversion arrangements, the affiliate receives a referral fee only if the lead is converted into an actual customer. Thus, the expected referral fee is $E\{R_2\} = [1 - F(p)]\ R_2$. The merchant-expected profit function in this case is

$$\Pi_{merchant} = [1 - F(p)]LV(p) - [1 - F(p)]R_2. \quad (6)$$

The first-order condition for the optimal price decision by the merchant is

$$\frac{\partial \Pi_{merchant}}{\partial p} = [1 - F(p)]\frac{\partial LV(p)}{\partial p} - f(p)LV(p) + f(p)R_2 = 0. \quad (7)$$

3. Affiliates may try to free ride by referring bogus leads under pay-per-lead arrangements. We assume here that the affiliate is a reputable supplier concerned about providing quality leads. This assumption does not mean that there will never be free riding in a one-to-one program. Rather, it reflects the existence of control mechanisms, other than the fee arrangements, in the one-to-one program that make free riding less likely (as opposed to one-to-many programs).

Results

Comparing the first-order condition for the optimal price of the affiliation alliance (Condition (4)), to the corresponding conditions for pay-per-lead (Condition (5)) and pay-per-conversion (Condition (7)), we see that (a) the condition for the pay-per-lead case is the same as the affiliate alliance condition, and (b) the condition for the pay-per-conversion is different from the affiliate alliance condition. From observation (a), we conclude the following:

Result 1: The optimal price set by the merchant under pay-per-lead is the same as the price that maximizes the joint profit of the affiliation alliance.

Consequently, the combined profits of the merchant and the affiliate under pay-per-lead are the same as the profit obtained when maximizing the alliance profit (3). The optimal joint profit is also the maximum total profit achievable. Thus, we have the following corollary:

Corollary 1: A potential arrangement of dividing the profits under pay-per-lead between the merchant and the affiliate exists such that each firm is not worse off, and each is potentially better off than under other referral fee structures.

From observation (b), on the other hand, we see the following:

Result 2: The optimal price set by the merchant under pay-per-conversion differs from the price that maximizes the joint profit of the affiliation alliance.

Result 2 shows that pay-per-conversion causes suboptimal pricing from the perspective of the affiliation channel. It follows that

Corollary 2: Under pay-per-conversion, at least one and possibly both of the firms do not earn as much as they potentially could by using pay-per-lead.

Pay-per-lead, not pay-per-conversion, is the arrangement that maximizes the joint profit of the affiliation alliance. Under pay-per-lead, it is possible to make both the merchant and the affiliate better off compared to a pay-per-conversion arrangement (presuming that such a sharing of profits is agreed upon, as we will discuss later). These results show that the concerns of some affiliates regarding the effects of merchants' decisions on conversions (as documented in the introduction) may be valid and that the use of pay-per-conversion does indeed hurt profits.

Result 3: The optimal price under pay-per-conversion is higher than the optimal price under pay-per-lead.

To prove Result 3, let p^*_{lead} be the optimal price under pay-per-lead. Consider the marginal potential customer who is just indifferent between becoming a buyer or not at this price. The contribution to the merchant from this marginal customer if he or she becomes a buyer is just sufficient to cover the loss from lowering the price to existing customers. Under pay-per-conversion, the loss from lowering the price is larger because, in addition to the lost revenue from existing customers, the merchant would have to pay the referral fee (an avoidable cost under pay-per-conversion, a sunk cost under pay-per-lead). Thus, the marginal customer under pay-per-lead is no longer profitable under pay-per-conversion. The merchant, therefore, will not want to attract these customers and will raise its price.

Because the price under pay-per-conversion is higher, fewer customers are served, and those served pay a higher price. Thus, we have the following:

Result 4: Consumer welfare is higher under pay-per-lead than under pay-per-conversion.

From Result 4 and Corollary 1, we see that using pay-per-lead is potentially a win-win-win approach. If a mutually beneficial agreement can be negotiated between the merchant and the affiliate on how to eventually divide profits under the pay-per-lead arrangement, such an arrangement will increase the profit of the merchant and the affiliate—and contribute to consumer welfare.

To find whether the merchant and the affiliate will both try to achieve a pay-per-lead arrangement, we need to understand their incentives during the negotiation phase. To address this issue, we look at the outcomes if each party tries to maximize its own profit in the negotiation phase, taking the choice of referral fee structure (i.e., pay-per-lead or pay-per-conversion) as given. Assume first that the merchant has a stronger negotiating position. In the extreme case, the merchant will be able to dictate terms to the affiliate. Those terms will be such that the affiliate will just be willing to refer customers (i.e., the affiliate will receive its reservation value). The merchant's profit is then the difference between the total profit and the affiliate reservation value. Because the affiliate reservation value does not depend on the referral fee structure, the merchant's profit will be highest when the total profit is highest. From Results 1 and 2, we know that total profits are highest under pay-per-lead. Therefore, when the merchant has a strong negotiating position, he or she should prefer pay-per-lead over pay-per-conversion, and the affiliate will be indifferent between them.

Now, assume that the affiliate has the more powerful negotiating position and, in an extreme case, can dictate terms to the merchant. This case is a bit more complicated because although the merchant is weak in the negotiation, he or she still holds the power to determine the price after the negotiations are completed. The affiliate will attempt to seize all the available profit except for the reservation value needed to convince the merchant to participate. Under pay-per-lead, the referral fee does not affect the optimal price of the merchant because the referral fee is a sunk cost to the merchant. Therefore, the affiliate can raise the referral fee without affecting sales, until the merchant is just indifferent between participating and not participating, and capture all the remaining profit. If the reservation value of the merchant is zero, the affiliate receives all the profit.

In contrast, under pay-for-conversion, the affiliate cannot raise the referral fee freely because the fee has a direct impact on the price set by the merchant and, consequently, on the quantity sold. Suppose that, given a certain referral fee, the merchant sets the price at p'. Clearly, the merchant must have a positive contribution from all customers, with willingness to pay greater than p'. If the affiliate tries to appropriate that positive contribution by raising the referral fee, the merchant will raise the price in response and have fewer customers but still positive contribution. Thus, under pay-per-conversion, the affiliate cannot appropriate all the profits even if the reservation value of the merchant is zero, and the merchant is guaranteed some minimal positive profit. Therefore, a weak merchant will prefer pay-per-conversion to pay-per-lead if the reservation value is below the level of profit the affiliate is not able to appropriate under pay-per-conversion and will be indifferent otherwise. The powerful affiliate always prefers pay-per-lead because it maximizes the alliance profits and does not prevent the affiliate from appropriating profits from the merchant.

Finally, note that in all the intermediate cases when one of the sides cannot dictate terms unilaterally, the weaker side is more powerful than assumed above. As a result, in these cases, pay-per-lead will be preferred to pay-per-conversion. This is because both the merchant and the affiliate, as they become more powerful, prefer more and more pay-per-lead arrangements to pay-per-conversion, as argued above. We can sum all this up in the following result:

Result 5: The affiliate (weakly) prefers pay-per-lead over pay-per-conversion. The merchant (weakly) prefers pay-per-lead over pay-per-conversion, except when it has a weak negotiating position and its reservation value is very low.

Result 5 may provide an explanation for why pay-per-lead arrangements exist. Moreover, the results of the one-to-one model suggest that firms should, in most cases, use a pay-per-lead arrangement in one-to-one affiliate programs because it will lead to higher profits and be more ef-

ficient. The most surprising aspect of Result 5 is that the merchant, in most cases, would prefer to use pay-per-lead. To drive this point home, we next state a stronger (albeit more restricted) result regarding the merchant's profits.

Corollary 3: The merchant's optimal profit under pay-per-lead is higher than the optimal profit under pay-per-conversion if the negotiation position of the merchant is sufficiently strong.

Let Π_L and Π_C be the optimal total channel profits under pay-per-lead and pay-per-conversion, respectively. Consider a merchant with a very strong negotiation position that can dictate terms to the affiliate. The optimal profits of that merchant are $\Pi_L - A_R$ under pay-per-lead (where A_R is the affiliate reservation value) and $\Pi_C - A_R$ under pay-per-conversion. From Results 1 and 2, we know that $\Pi_L > \Pi_C$, and because the affiliate reservation value does not depend on the type of affiliation fee arrangement, it follows that for a very strong merchant, the optimal profit is higher under pay-per-lead than under pay-per-conversion. By continuity, this holds for a range of the merchant negotiation power until some possible threshold value.

Thus, we show that in some cases, the merchant's optimal profit will be higher under pay-per-lead than under pay-per-conversion. It is important to note that Corollary 3 does not describe the full set of conditions under which the merchant profits are higher under pay-per-lead. A full characterization of these conditions depends on assumptions regarding the negotiation process, which we do not provide in this article.

ONE-TO-MANY AFFILIATION MODEL

In the one-to-many model, a merchant enters into an affiliation arrangement that covers many affiliates. In this case, a powerful merchant (such as Amazon) sets the price and the referral fee and invites any interested party to join and refer customers. Such arrangements can attract many affiliates, all under the same terms and without the need to negotiate separately with each affiliate. This greatly simplifies the task of managing so many affiliate relationships. The downside is that such arrangements may allow free riding because affiliates may devise methods to collect additional referral fees by referring bogus leads that cannot be converted into buyers.

We consider the decisions of a merchant that can acquire customers through many affiliates. Each acquired customer has an expected lifetime value of $LV(p)$, and the probability of converting a lead into an actual customer is $1 - F(p)$. The one-to-many model differs from the one-to-one model in the following ways (see Figure 2):

1. The merchant sets the referral fee R_i, instead of negotiating it with the affiliates. The affiliates decide whether to refer customers based on the expected referral fees, given the terms offered by the merchant.
2. Because the merchant is more powerful than the affiliates, when making decisions, it optimizes over both the referral fee and the price. This is in contrast to the sequential decision making in the one-to-one model, in which the referral fee is negotiated, and only then does the merchant choose the optimal price.
3. Because of the large number of possible affiliates, the merchant knows little about the quality of referred leads. As a result, under pay-per-lead, affiliates may free ride by referring bogus leads that will never become buyers to obtain the referral fee. Such free-riding behavior is a concern to companies that consider using multiple affiliation programs (Helmstetter and Metivier 2000).

Given the referral fee set by the merchant, the number of affiliates that join the program is given by $N[E\{R_i\}]$, with the function N increasing monotonically with the expected referral fee.[4] Some of these affiliates may engage in free-riding behavior. We model this by assuming that only a portion α of the affiliates refers prospects that might become actual customers (i.e., the probability of converting the other leads is 0). We assume that the merchant knows α but cannot identify the specific affiliates that will free ride before the fact.

The merchant determines the price and referral fee that will maximize the expected profit. Under a pay-per-lead, the expected profit is

$$\Pi_{lead}(p, R_1) = \alpha[1 - F(p)]N(R_1)LV(p) - N(R_1)R_1. \quad (8)$$

Under pay-per-conversion, the expected profit is

$$\Pi_{conversion}(p, R_2) = \alpha[1 - F(p)]N[E\{R_2\}]LV(p) - \alpha[1 - F(p)]N[E\{R_2\}]R_2, \quad (9)$$

where $E\{R_2\} = [1 - F(p)]R_2$ as before.

Results

We now show that pay-per-conversion is preferred to pay-per-lead under a one-to-many affiliate structure as long as free riding exists.

Assume that p^* and R_1^* solve the merchant decision problem under pay-per-lead (i.e., they maximize the profit

4. Alternatively, the function can be thought of as the probability that a single Web site will decide to refer customers.

function (8)). The maximum profit expected under pay-per-lead is then

$$\Pi^*_{lead} = \alpha[1 - F(p^*)]N(R_1^*)LV(p^*) - N(R_1^*)R_1^*. \quad (10)$$

Now consider the following choices under pay-per-conversion:

$$p = p^* \qquad R_2(p^*) = \frac{R_1^*}{1 - F(p^*)}. \quad (11)$$

Substituting into the profit function (9), we find that the expected profit in this case is

$$\Pi_{conversion} = \alpha[1 - F(p^*)]N(R_1^*)LV(p^*) - \alpha N(R_1^*)R_1^*. \quad (12)$$

Case 1: No free riding. Here, $\alpha = 1$, and the expected profits in (10) and (12) are the same. Thus, we have the following:

Result 6: Pay-per-conversion is at least as profitable as pay-per-lead for the merchant in one-to-many affiliation arrangements.

Result 6 shows that pay-per-lead is not superior to pay-per-conversion in a one-to-many model in which a powerful merchant can set both the price and referral fee.

Case 2: Free riding. Here, $\alpha < 1$, and comparing Equation (10) with Equation (12), we see that the expected profit under pay-per-conversion in (12) is greater than the expected profit under pay-per-lead in (10) (the first [positive] terms in the equations are identical, and the second [negative] terms differ by a factor of α). Thus, we have found one choice of pay-for-conversion values that leads to greater profit than the maximum under pay-per-lead if there is free riding.

Result 7: Pay-per-conversion is more profitable than pay-per-lead for the merchant in one-to-many affiliation arrangements when there is free riding.

Taken together, Results 6 and 7 suggest that pay-per-conversion will be preferred to pay-per-lead in one-to-many affiliation arrangements. In contrast, in the one-to-one model, pay-per-lead is better than pay-per-conversion. There are two reasons why pay-per-conversion becomes more attractive in the one-to-many model. First, in this model, the merchants can control the price as well as referral fee. This enables the merchant to avoid the distorting effects of pay-per-conversion in the one-to-one model. Second, potential free-riding behavior by affiliates makes pay-per-conversion more desirable because the firm does not have to pay for customers who do not buy.

Furthermore, note that the one-to-many and one-to-one results differ even when the merchant in the one-to-one model is able to dictate terms to the affiliate (see Corollary 3). The reason is that in the one-to-one case, even a very powerful merchant has to contend with the possibility that if pushed too far, the affiliate may just walk out on the deal, leaving the merchant with nothing. In the one-to-many case, on the other hand, even if some affiliates decide not to join the program, there are still other affiliates that will. Put in other words, even a very powerful merchant in a one-to-one relationship is not as powerful as a merchant in a one-to-many program.

REFERRAL FEES AND THE NUMBER OF LEADS

So far, we have assumed that the number of leads provided by an affiliate does not depend on the referral fees. This assumption describes well situations when leads are by-products of the affiliate operations and do not require any special effort on their part (except of setting up a link on the Web site). For example, consumers who search for information about computers on CNET can be directed to retailer and vendor sites without any additional cost to CNET. On the other hand, there are cases when an affiliate expands effort and resources specifically to generate leads, as is the case for referral sites such as YesMail. In these cases, it is reasonable to assume that the number of leads generated will depend on the referral fees because the higher the fees, the more effort the affiliate is likely to make to generate leads. In this section, we consider this possibility and investigate how it affects our previous results.

One-to-One Model

We assume that generating leads is a function of the affiliate effort and that effort is costly, with $c(q)$ being the cost of generating q leads

$$\left(\frac{\partial c(q)}{\partial q} > 0;\ \frac{\partial^2 c(q)}{\partial q^2} > 0\right).$$

As before, we consider a one-to-one affiliation arrangement in which the two sides negotiate a referral fee in the first stage, the merchant then sets the price, and the affiliate

decides how many leads to generate, given the price and the referral fee.

Given this setup, the expected profits of the merchant and the affiliate are as follows:

$$\Pi_{merchant} = q[1 - F(p)]LV(p) - qE\{R_i\}, \quad (13)$$

$$\Pi_{affiliate} = qE\{R_i\} - c(q). \quad (14)$$

Joint Profit of the Affiliation Alliance

The joint profit function is

$$\Pi_{alliance} = q[1 - F(p)]LV(p) - c(q). \quad (15)$$

The optimal price and number of leads that maximize (15) satisfy the following first-order conditions:

$$\frac{\partial \Pi_{alliance}}{\partial p} = q\left([1 - F(p)]\frac{\partial LV(p)}{\partial p} - f(p)LV(p)\right) = 0, \quad (17)$$

$$\frac{\partial \Pi_{alliance}}{\partial q} = [1 - F(p)]LV(p) - \frac{\partial c(q)}{\partial q} = 0. \quad (18)$$

As can be observed from Condition (16), the price that maximizes the joint profit does not depend on the number of leads.

Pay-Per-Lead

After negotiating a referral fee R_1 for each lead, the merchant sets its price. Let $q^*(R_1)$ be the best response function of the affiliate. This best response function does not depend on the price set by the merchant because under pay-per-lead, the affiliate is paid, whether or not the lead is converted. Intuitively, if the price decision does not affect the number of leads generated, the optimal price should not depend on q and be the same as the price that maximizes the joint profit. This intuition is confirmed by the first-order condition for the optimal price decision by the merchant:

$$\frac{\partial \Pi_{merchant}}{\partial p} \quad (18)$$
$$= q^*(R_1)\left([1 - F(p)]\frac{\partial LV(p)}{\partial p} - f(p)LV(p)\right).$$
$$= 0$$

The affiliate provides the number of leads that maximizes its profit. The corresponding first-order condition is

$$\frac{\partial \Pi_{affiliate}}{\partial q} = R_1 - \frac{\partial c(q)}{\partial q} = 0. \quad (19)$$

Comparing Condition (19) for the number of leads under pay-per-lead to Condition (17) for the number of leads under joint profit maximization, we see that the two are the same iff $R_1 = [1 - F(p)]LV(p)$. However, this level of referral fees means that the profit of the merchant is zero. In general, the merchant will insist on positive profits, and therefore the referral fee will be lower. Thus, the number of leads generated under pay-per-lead arrangements will be lower than the number of leads generated under joint profit maximization.

To summarize,

Result 8: Under pay-per-lead, when the number of leads depends on the referral fee, the price is the same as the joint profit-maximizing price, but the number of leads is lower than the number generated under joint profit maximization.

Pay-Per-Conversion

After negotiating a referral fee R_2 for each conversion, the merchant sets the price. Let $q^*(p, R_2)$ be the affiliate's best response function. In contrast to the pay-per-lead case, the affiliate response in the pay-per-conversion case depends on the price set by the merchant. This is because the affiliate is paid only if conversion occurs, and conversion depends on the merchant's price. The first-order condition for the optimal price decision by the merchant is

$$\frac{\partial \Pi_{merchant}}{\partial p} = q^*\left([1 - F(p)]\frac{\partial LV(p)}{\partial p} - f(p)LV(p)\right) \quad (20)$$
$$+ \frac{\partial q^*}{\partial p}[1 - F(p)][LV(p) - R_2] + q^* f(p)R_2 = 0$$

The affiliate provides the number of leads that maximizes its profit. The corresponding first-order condition is

$$\frac{\partial \Pi_{affiliate}}{\partial q} = [1 - F(p)]R_2 - \frac{\partial c(q)}{\partial q} = 0. \quad (21)$$

Comparing the first-order conditions under pay-per-conversion to those under joint profit maximization, we find the following:

Result 9: Under pay-per-conversion, when the number of referrals depends on the referral fee, both the price and the number of leads generated are distorted compared to the joint profit optimal levels—the number of leads is lower, and the price is different from the joint profit-maximizing price.
Proof: See appendix.

Because pay-per-conversion leads to distortions in both the price and the number of leads generated compared to the joint profit maximization, whereas pay-per-lead only causes distortion in the number of leads generated, it seems reasonable to expect that there are pay-per-lead arrangements that will make both the merchant and the affiliate better off compared to pay-per-conversion arrangements. Indeed, we show in the appendix the following:

Result 10: There is always a potential pay-per-lead arrangement that will increase the expected profits of both the merchant and the affiliate compared to any pay-per-conversion arrangement.
Proof: See appendix.

This result is analogous to Corollary 1 for the case when the number of referrals does not depend on the level of the referral fees. As before, we see that using pay-per-lead is a win-win approach for both the merchant and the affiliate, provided that they can negotiate a mutually beneficial agreement. Whether both the merchant and the affiliate will try to achieve a pay-per-lead arrangement depends on their incentives during the negotiation phase. It is easily verifiable that given that Result 10 holds, all the arguments proving Result 5 hold in this case as well, and therefore Result 5 applies also when the number of referrals depends on the level of referral fees.

Thus, we find that even if the number of leads depends on the level of the referral fee, pay-per-lead arrangements can lead to higher profits for both the merchant and the affiliate. Furthermore, the economic incentives are such that both the merchant and the affiliate would like to reach an agreement on a pay-per-lead arrangement, except for cases when the merchant is in a weak negotiating position, and have a very low reservation value. These results are similar to the case in which the number of leads does not depend on the referral fee. However, in contrast to that case, when the number of leads depends on the referral fee, pay-per-lead arrangements do not fully coordinate the merchant and affiliate actions, leading to a lower number of leads than the number under joint profit maximization. Thus, although pay-per-lead is superior to pay-per-conversion, other referral fee arrangements may perform better than pay-per-lead.

One-to-Many Model

Given that the number of leads is a function of the expected referral fee by the affiliate, the merchant-expected profits are given by

$$\Pi_{lead}(p, R_1) = \alpha[1 - F(p)]q(R_1)N(R_1)LV(p) - q(R_1)N(R_1)R_1, \quad (22)$$

$$\Pi_{conv}(p, R_2) = \alpha[1 - F(p)]q[E\{R_2\}]N[E\{R_2\}]LV(p) - \alpha[1 - F(p)]q[E\{R_2\}]N[\{R_2\}]R_2. \quad (23)$$

It is immediate that with a change of variables $\hat{N}(\cdot) = q(\cdot)N(\cdot)$, the expected profit functions (22) and (23) are the same as the expected profit functions (8) and (9) when the number of leads does not depend on the referral fee. Therefore, all the results of the one-to-many model hold also when the number of leads depends on the referral fee.

DISCUSSION

Our analysis provides an explanation for why both pay-per-lead and pay-per-conversion arrangements exist in affiliation marketing. To understand why pay-per-conversion is not always preferred, it is important to note that both the merchant and the affiliate have concerns about each other's performance. A merchant that receives referrals from an affiliate would like to avoid the risk of paying for referrals that are not converted into buyers. An affiliate, on the other hand, would like to avoid the risk that a "greedy" merchant will fail to convert potentially good leads into customers (e.g., because of prices that are too high). We have shown that because of these concerns, pay-per-lead may sometimes be preferred. More specifically, the results suggest the following guidelines for a merchant that considers using affiliation programs:

- Use pay-per-lead in one-to-one affiliate programs, unless you are in a very weak negotiating position.
- Use pay-per-conversion in one-to-many affiliate programs and, if you have a weak negotiation position, in one-to-one programs as well.
- Use pay-per-conversion if free riding by affiliates is significant.

We have shown that pay-per-lead arrangements work better than pay-per-conversion for an affiliation alliance in situations when two firms negotiate a referral agreement one-on-one. In a one-to-one setting, pay-per-conversion

results in a retail price that is too high from the point of view of the alliance. As a result, customers who can be profitably converted into buyers are left out, leading to inefficiencies. Pay-per-lead, on the other hand, leads to higher joint profits and is more efficient. Therefore, moving from a pay-per-conversion to a pay-per-lead can improve the profit of each firm and service more customers. That is, the move will be win-win-win.

Pay-per-lead, however, does not improve on pay-per-conversion when the merchant recruits many small affiliates all under the same terms as set by the merchant itself. Moreover, pay-per-lead may open the door to opportunistic behavior by affiliates that refer bogus leads to receive the referral fee. We have shown that in this case, a pay-per-conversion arrangement is preferred.

In the one-to-one affiliation model, the merchant views the pay-per-conversion referral fee as a variable cost when setting price. As a result, the profit-maximizing price under pay-per-conversion is higher than the one that maximizes the joint profit. In contrast, under pay-per-lead, a distortion of price to a level higher than the joint profit one does not occur because the referral fee the merchant pays is a fixed cost that does not affect the optimal price. Therefore, the price is the same as the one that maximizes the joint profit of the alliance.

An interesting analogy can be made when comparing the coordination problem that exists in the one-to-one affiliate-merchant with the one encountered in vertical product channels (Spengler 1950; Jeuland and Shugan 1983; Moorthy 1987; Gerstner and Hess 1995). When a manufacturer sells a product through a retailer that can set price independently, sales will be lower compared to a vertically integrated product channel, and price will be higher than the one that maximizes the joint profit. The reason is that the independent channel takes into account the wholesale price set by the manufacturer as a variable cost when setting its retail margin (this coordination problem is known as *double marginalization*). The affiliation alliance can be viewed as a "customer channel" in which the customer, not the product, is moved by the merchant. In this analogy, the referral fee under pay-per-conversion is equivalent to the wholesale price, and when the merchant sets the retail price, a coordination problem exists between the affiliate and the merchant. We have shown that pay-per-lead helps the affiliation alliance overcome this problem because under pay-per-lead, the referral fee does not affect the price, and therefore price is not distorted.

In the one-to-many affiliation model, however, the distorting effect of pay-per-conversion is eliminated. The merchant controls both the price and the referral fee, thus eliminating the double marginalization effect. In addition, one-to-many affiliation arrangements can suffer from free-riding behavior in the form of bogus leads. Such behavior can be prevented by the use of pay-per-conversion. Because of this, as well as the lack of distortion of the pricing decision, pay-per-conversion is preferred in a one-to-many arrangement.

Thinking of referral affiliation arrangements in terms of a customer channel (i.e., viewing the customer rather than the product as the unit of analysis) (see Rust, Zeithaml, and Lemon 2000) is insightful. Without any analysis, it is tempting to conclude, just as the popular business press often does, that pay-per-conversion is superior to pay-per-lead. We show, however, that pay-per-lead arrangements could be more profitable for both the affiliate and the merchant, lead to more customers being served, and be more efficient. Managers need to be mindful of these results, as well as the effect of the context in which affiliation deals are struck and the effect of payment structure on profits.

APPENDIX
Proof of Result 9

To see that the number of leads is lower under pay-per-conversion, compare Condition (21) to Condition (17). The two are the same iff $R_2 = LV(p^*)$. However, this is impossible because if the referral fee is set at some level $LV(p')$, the merchant's optimal decision is to set $p^* > p'$.[5] Thus, the number of leads generated under pay-per-conversion is lower than the one generated under joint profit maximization.

To prove that the optimal price under pay-per-conversion is different from the price under pay-per-lead and joint profit maximization, we first show that

$$[1 - F(p^*)][LV(p^*) - R_2] - 1 > 0. \qquad \text{(A1)}$$

Using the envelope theorem for $\frac{\partial p^*}{\partial R_2}$ and $\frac{\partial q^*}{\partial R_2}$,

$$\begin{aligned}\frac{\partial p^*}{\partial R_2} &= [1 - F(p^*)]\left[\frac{\partial q^*}{\partial R_2}(LV(p^*) - R_2) - q^*\right] \qquad \text{(A2)}\\ &= [1 - F(p^*)]q^*([1 - F(p^*)][LV(p^*) - R_2] - 1)\end{aligned}$$

Because the referral fee under pay-per-conversion is a marginal cost for the pricing decision by the merchant, it follows that

$$\frac{\partial p^*}{\partial R_2} > 0.$$

5. By the same argument as in the proof of Result 5.

Therefore, the last term in Equation (A2) must be positive, and Condition (A1) holds.

Using the envelope theorem, we can write the first-order condition for the pricing decision (Equation (20)) as

$$\frac{\partial \Pi_{merchant}}{\partial p} = q * \left([1 - F(p)] \frac{\partial LV(p)}{\partial p} - f(p) LV(p) \right) - q * f(p) R_2 ([1 - F(p)[LV(p) - R_2] - 1) . = 0 \quad \text{(A3)}$$

From Condition (A1), the last term in Equation (A3) is always negative. Therefore, the optimal price under pay-per-conversion, p^*_{conv}, satisfies the following condition:

$$[1 - F(p^*_{conv})] \frac{\partial LV(p^*_{conv})}{\partial p} - f(p^*_{conv}) LV(p^*_{conv}) = K, \quad \text{(A4)}$$

where K is always greater than zero. However, from the first-order condition for joint profit maximization (Equation (16)) and pay-per-lead (Equation (18)), we know that the optimal price under both joint profit maximization and pay-per-lead satisfies Condition (A4) with $K = 0$. Thus, the optimal price under pay-per-conversion is different from the optimal price under pay-per-lead and the price that maximizes the joint profit.

Proof of Result 10

Denote by p^*_{conv} and q^*_{conv} the optimal price and number of referrals given a pay-per-conversion referral fee of R_2. Consider a pay-per-lead arrangement with

$$R_1 = [1 - F(p^*_{conv})] R_2 .$$

The number of leads under this pay-per-lead arrangement is the same as the number of leads under the pay-per-conversion arrangement (see Equations (17) and (21)). Therefore, the affiliate profit and the expected total payment by the merchant to the affiliate are the same under both arrangements. It also follows that

$$\Pi^{lead}_{merchant} (p^*_{conv}, [1 - F(p^*_{conv}) R_2) = \Pi^{conv}_{merchant} (p^*_{conv}, R_2).$$

But, as we have shown above, $p^*_{lead} \neq p^*_{conv}$; therefore, from the optimality of p^*_{lead}, it follows that

$$\Pi^{lead}_{merchant} (p^*_{lead}, [1 - F(p^*_{conv}) R_2) > \Pi^{conv}_{merchant} (p^*_{conv}, R_2).$$

Thus, this choice of R_1 leads to a higher merchant profit and the same affiliate profit.

Denote by Δ the above difference in the merchant profit between pay-per-lead and pay-per-conversion. For Invalid EQN syntax: [1 ^-^ F (p sub conv sup *)] R sub 2 ^<^ R sub 1 ^<^ [1 ^-^ F (p sub conv sup *)] R sub 2 ^+^ { DELTA } over { q sub conv sup * ^+^ ([1 ^-^ F (p sub conv sup *)] R sub 2) sup 2, the affiliate profits under pay-per-lead are higher than under pay-per-conversion.[6] At the same time, the decrease in the merchant profit is lower than Δ; therefore, the merchant profit is still higher under pay-per-lead than under pay-per-conversion. Thus, we found a possible pay-per-lead arrangement that leads to increased profit compared to pay-per-conversion arrangements for both merchant and affiliate. Therefore, there is at least one pay-per-lead arrangement that will lead to higher profits for the merchant and affiliate than any pay-per-conversion arrangement.

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6. The upper bound is a conservative estimate because it ignores the increased revenue to the merchant from the higher number of leads.

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