Why Do Sales People Spend So Much Time Lobbying for Low Prices?

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In many companies there is persistent tension between the sales force and the managers responsible for pricing decisions. The sales force regularly proposes lowering prices, while the pricing managers focus on maintaining profit margins. What makes this surprising is that the firm controls the incentives of the sales force; it could use margin-based compensation to dissuade the sales force from lobbying for low prices. However, we show that the sales force's lobbying activities serve an important role. The firm may prefer to increase the cost of lobbying even though these costs represent a deadweight loss. The firm may also restrict how frequently a sales rep can lobby for low prices or penalize sales reps who lobby too frequently.

Key words: lobbying, influence activities, sales force management, pricing, incentives.

> "In many companies, sales forces and marketers feud like Capulets and Montagues. Salespeople accuse marketers of being out of touch with what customers really want or setting prices too high. Marketers insist that salespeople focus too myopically on individual customers and short-term sales at the expense of longer-term profits."
>
> Kotler, Rackham and Krishnaswamy (2006)

1. Introduction

Pricing managers frequently complain that their sales force is too focused on closing deals rather than increasing profits. The sales force argues for lower prices, while managers are concerned about maintaining margins. What makes this complaint surprising is that firms control the incentives of the sales force; if the incentives rewarded sales people sufficiently for charging higher prices the sales force would also focus instead on maintaining margins. In this paper we offer an explanation for why lobbying for lower prices is an equilibrium outcome.

The explanation recognizes that the sales force often has private information about the strength of demand. However, if the firm lowers prices when the sales force reports demand is low this may create an incentive for the sales force to understate demand, as it takes less effort to convince customers to buy when prices are low . As a result, the firm must pay the sales force information rents to admit when demand is high. Lobbying is a mechanism that the firm uses to help mitigate these rents. We model the requirement to lobby for low prices as a requirement to present evidence that demand is really low. If it is easier for the sales force to produce evidence that demand is low when it truly is low, then making this evidence a condition of approving a discount can be profitable for the firm. This is true even if the lobbying costs incurred to produce this evidence represent a deadweight loss. Intuitively, lobbying allows the firm to use the private information of the sales force in the low demand condition to reduce the information rents it has to pay when demand is high.

We motivate our investigation using examples acquired through a series of interviews with pricing managers and sales managers. The examples illustrate the different ways that sales people engage in lobbying for low prices, and the mechanisms that firms use to manage this process. We heard many examples of sales people spending as much time negotiating internally as they spend interacting with external customers. Much of this time is spent collecting evidence to justify requests to lower prices. This includes collecting information

about competitors' prices, or reviewing historical sales data to highlight examples in which lower prices led to past success.

Notably, firms do not simply banish lobbying as doing so may mean forgoing access to the sales force's private information about demand. In almost every interview product managers acknowledged that their sales force is in a better position to evaluate customers' willingness to pay. However, they also recognized the need to manage this lobbying activity. Many firms report that they do compensate their sales force at least partially on the basis of margins. It is also common for firms to shift the power to make pricing decisions away from the sales force, and pass it to a committee or manager who must approve any discount. Most firms allow "exceptions," in which the sales force can lobby for price discounts. However, the firm imposes requirements on the sales force when using this exception process, and may also include an implicit capacity constraint to prevent overuse of exceptions. We will illustrate why simply paying the sales force margin-based commissions may not fully resolve the incentive problem, and will show how imposing requirements and/or a capacity constraint on the exception process can contribute to higher profits.

Previous studies have recognized the tension between the sales force and pricing managers. As vividly depicted in Kotler, Rackham and Krishnaswamy (2006), the marketing unit often blames the sales force for its poor execution, whereas the sales team claims that the marketing managers set prices too high. Homburg and Jensen (2007) find that the tension between marketing and sales can hinder cooperation and hurt market performances. Ernst, Hoyer, and Rübsaamen (2010) also call for better cross-functional cooperation among sales, marketing, and R&D in product development. Our paper takes an agency theory approach to understanding the tension between the sales force and pricing managers, and describes ways that companies can manage this tension.

The paper is also closely related to the economics literature on "influence activities." Members in organizations often spend significant efforts trying to influence organizational decisions such as capital allocation among competing projects. The literature has largely focused on the inefficiencies caused by influence activities. For example, Milgrom (1988) studies how employees waste time trying to influence managers, and how organization redesign mitigates this inefficiency. Meyer, Milgrom and Roberts (1992) argue that the prospect of layoffs creates influence costs as threatened managers strive to defend their jobs. Scharfstein and Stein (2000) find that division managers' rent-seeking influence activities distort the internal capital markets as the CEO, an agent to outside investors herself, responds by granting the division managers favorable capital allocations. Wulf (2009) shows that division managers' influence activities (in the form of information distortion) jeopardizes investment efficiency because the

headquarters reacts by putting too little weight on the division managers' valuable yet distortable private information.

One notable exception to this influence activities literature is Laux (2008), who argues that influence activities can benefit the firm's capital budgeting process. The act of lobbying reveals to the firm which projects are worth defending, and the fear of fighting for the wrong project motivates the manager to gather more information in the first place. Similar to Laux (2008), we find that companies can improve profits by allowing the sales force to lobby for lower prices, which explains why lobbying is ubiquitous despite its seemingly wasteful nature. In this sense, our paper is also related to Hauser, Simester and Wernerfelt (1997), who discover that side payments need not reduce firm profits, and to Simester and Zhang (2010), who find that allowing bad products to continue can help companies motivate product managers.

The paper proceeds in Section 2 with four examples that help to illustrate the context and motivate the modeling assumptions. We then introduce the formal model and in our initial analysis describe the incentive conflict between the sales force and the firm. In Section 4 we show that allowing lobbying can mitigate this conflict and improve expected profits beyond margin-based compensation. In Section 5 we develop a search model of the lobbying process and ask how the firm could design this process to maximize the effectiveness of lobbying. In Section 6 we show that restricting the frequency of lobbying may provide another mechanism to improve upon margin-based compensation.

2. Examples

To motivate our model, we begin with several examples that arose during background interviews for this research.

The manager of a beverage company in Africa described the mechanisms that the firm used to facilitate the flow of information from the sales force to the firm. Sales managers have daily meetings with their sales representatives. These daily meetings are augmented by larger weekly and monthly meetings. The first agenda items in all of these meetings are the competitors' product and pricing activities, together with the strength of retailer and distributor demand. To prepare for these meetings the sales force invests time in collecting evidence to substantiate claims of competitive activity or low demand. These include collecting competitors' "dealer communications" from the field, or bringing competitors' products to highlight new product features or price promotions. The manager cited several examples of the sales force distorting demand to justify claims that prices were low. These include inflating

dealer sales targets to qualify for volume discounts; or coordinating dealers by asking them to temporarily order less inventory to support claims that demand is weak.

The owner of a Latin American heavy equipment manufacturer described how he allows his sales force to reduce prices by up to 5% without asking for permission. If a discount exceeds this level the commission is reduced by 25%. In addition the firm tells the sales force that frequent requests for discounts will damage the sales person's reputation and credibility. The owner claimed that the firm had a general understanding of how many customers need a discount and how many would pay a higher price, but it did not know which of the customers fell into each category.

A US military contractor sells through a closed bid system with one primary competitor. Contracts are few but large, and contact with customers is infrequent. The firm is generally uncertain about its competitors prices, with the primary source of information coming from Freedom of Information Act requests after the bid process, or informal interactions between the company's and the competitor's sales people. Most of the sales people for the two companies are retired military personnel, with many of them coming from the same units. The sales forces interact at trade shows and "over beer" and this informal information exchange is used by the sales force to justify lower prices. Because interactions with customers are infrequent, the sales force commonly spend more time negotiating internal price reductions than they do interacting with the customers. The firm's history includes a well-known example in which a senior employee sold equipment at a price below the manufacturing cost. This occurred before the firm had rigorous cost information and resulted in an embarrassing situation in which it had to re-negotiate an already finalized contract. This event had its own term within the firm "pulling a Smith" (not the real name) to describe the tendency of the sales force to always argue for lower prices.

Since this event, the firm introduced a formal exception process for discounts. This began with the sales force asking the product manager for a discount. Typically, the sales person would come to the product manager saying "this is what I am hearing" about the competitor's bid. The product manager then attempts to ascertain the credibility of the information. For large discounts the price has to enter an exception process, which is intentionally difficult to navigate. Success depends upon the sales force presenting sufficient "evidence" to justify the discount. In addition to informal information about the competitor's prices, the sales force will develop forecasting models using past examples to substantiate claims that the current transaction will lead to future transactions with either this client or another client. Our interview subject cited an example in which the firm sold a research tool at a deep discount to a prominent academic by claiming that the purchase would influence other purchasers. To

discourage overuse of the exception process the firm relies not just on requiring an effort to navigate the process, they also restrict the number of exceptions. This is intended to ensure that "sales people only ask for lower prices when they need it to close the deal, rather than just when it would be easier to close the deal."

Our final example is from the telecommunications industry, where we interviewed a sales manager who worked for a large handset manufacturer. The sales manager described an inherent asymmetry in beliefs between the product managers and the sales force. The success of the iPhone had convinced the product managers that it was possible to design a product that would "shift the demand curve." In contrast, the sales force was skeptical that any of the firm's products would shift the demand curve, and focused instead on "where to locate on the demand curve." Like the military contractor, the sales process went through a formal but infrequent bid process. The sales force spent approximately 75% of their time lobbying internally for lower prices. To support their lobbying they present data on competitors' prices, and use historical sales data to illustrate the relationship between sales and price (the demand curve).

These four examples share the following common features that form the basis of our analytical model. First, the sales force has asymmetric information about demand. Second, lowering prices makes it easier for the sales force to close transactions. Third, the sales force can exert effort on lobbying internally, and in equilibrium many sales people spend considerable time on this activity. Finally, the firm can influence these lobbying activities by changing the sales force commissions, establishing an exception process to approve discounts, requiring evidence before approving discounts, and by imposing a constraint on the frequency with which the sales force can pursue exceptions.

In the next section we present our formal model together with the initial analysis.

3. Baseline Model

Model Setup

We consider a firm who hires a sales rep to sell its product to a customer. The customer's willingness-to-pay has three possible outcomes: $V_H > V_L > 0$. The sales rep can choose to incur a personal cost e in selling efforts and the customer's willingness-to-pay depends on this selling effort and the customer's intrinsic state of demand.

There are two demand states, high and low, where demand is high with probability x, and low with probability 1 – x. If demand is high then with selling effort of at least e_H the customer will pay V_H, and with any less selling effort the customer will only pay V_L. If demand is low the firm cannot achieve V_H. Instead the customer will pay V_L if there is selling effort of at least e_L and zero otherwise. We summarize these outcomes below:

- If demand is high and selling effort $e \geq e_H$, the customer will pay V_H;
- If demand is high and selling effort $e < e_H$, the customer will pay V_L;
- If demand is low and selling effort $e \geq e_L$, the customer will pay V_L;
- If demand is low and selling effort $e < e_L$, the customer will pay 0.

The ordering $V_H > V_L > 0$ ensure that both high demand and diligent selling contribute to higher willingness-to-pay. We assume that the cost thresholds e_H and e_L are positive, but do not require that either threshold is higher than the other (they could be equal).

To focus on the mechanism of interest, we assume that demand shocks are i.i.d. across time and so the firm does not learn demand over time. Demand shocks are also i.i.d. across customers and only one sales rep can work with each customer, so that there is no competition between sales people.

Both the firm and the sales rep are risk-neutral. We normalize the sales rep's outside options to zero without loss of generality. The sales rep holds limited liability to the firm, which means that sales force wages cannot be negative. We also normalize the firm's marginal cost of producing the good to zero.

First Best

Suppose the firm and the sales rep are integrated and observe the demand state before they choose whether to incur selling effort. We focus on the case in which selling effort is worthwhile in both demand states:

(1) $e_H < V_H - V_L$
(2) $e_L < V_L$

It follows that the integrated entity will charge an efficient price of V_H and incur an efficient effort of e_H if demand is high; it will efficiently charge V_L and incur effort e_L if demand is low. The first-best expected profit is

$$E\Pi^* = x(V_H - e_H) + (1-x)(V_L - e_L)$$

Margin-Based Compensation

If the firm and the sales rep are not integrated, the firm must design an incentive scheme to influence the sales rep's decisions. Specifically, the firm does not observe the sales rep's selling effort. Neither does the firm observe the demand state because the sales rep has more localized information about each customer's strength of demand. To motivate effort, the firm needs a performance-based compensation scheme; it must pay the sales rep a bonus if he is able to sell. In addition, charging a low price makes selling easier. Therefore, the firm may further condition its performance-based compensation on the sales margin to reward the sales rep for selling at a higher price. However, we will show that this "margin-based compensation" is insufficient to restore the first-best profit. We consider a game with the following sequence of moves.

Timing

1. The firm and the sales rep share the common prior belief that demand is high with probability x and low with probability 1 – x.
2. The firm offers a compensation scheme. If the sales rep rejects the offer, the game ends. If the sales rep accepts the offer the game proceeds.
3. The sales rep privately observes the realized demand state.
4. The sales rep reports to the firm whether demand is high or low.
5. The firm sets the price.
6. The sales rep decides whether to engage in selling effort.
7. The customer decides whether to buy and this decision is commonly observed. The firm receives its profit and the sales rep receives his compensation.

Equilibrium Analysis

The firm must decide whether to base its pricing decision on the sales rep's report of demand. If the firm decides to ignore the sales rep's report it has three options:[1]

1. Always charge a price V_H and offer a bonus $W = e_H$. The customer will buy only if demand is high and if the sales rep has made selling effort. If demand is high, the sales rep is just willing to work. (In practice, the firm can offer a bonus infinitesimally larger than e_H to make sure that the sales rep strictly prefers to work.) If demand is low, the

[1] Notice that the only price levels that we need to consider are V_H and V_L.

sales rep will shirk, knowing it is impossible to earn the bonus. The firm makes an expected profit of

$$E\Pi_1 = x(V_H - e_H)$$

2. Always charge a price V_L and offer a bonus $W = e_L$. If demand is low, the bonus is just sufficient to motivate selling effort. If demand is high, the sales rep can sell at price V_L at no effort, and is thus overcompensated. The firm earns an expected profit of

$$E\Pi_2 = V_L - e_L$$

3. Always charge a price V_L and offer a bonus $W = 0$. The sales rep will shirk in both demand states. The customer will buy only if demand is high. The firm earns an expected profit of

$$E\Pi_3 = xV_L$$

Not surprisingly, expected profits in all three options are lower than the first-best profit because the firm ignores demand information when setting prices. Alternatively, the firm could use margin-based compensation and base prices on the sale rep's demand report, which leads to the fourth option:

4. Charge V_H and offer W_H if the sales rep claims that demand is high; charge V_L and offer W_L if the sales rep claims that demand is low.[2] For the sales rep in the low demand state to be willing to work and honestly report the demand condition, it suffices to offer $W_L = e_L$. However, for the sales rep to work and truthfully report high demand, the firm must offer $W_H = e_H + e_L$, otherwise the sales rep will understate demand, sell at price V_L and receive the bonus $W_L = e_L$ without making any selling effort. It follows that the firm earns an expected profit of

$$E\Pi_M = x(V_H - e_H - e_L) + (1-x)(V_L - e_L)$$

[2] The firm could also charge V_H and offer W_H if demand is claimed to be low, and charge V_L and offer W_L if demand is claimed to be high. However, the sales rep will then claim that demand is high when it is low, and vice versa. The firm achieves the same outcomes as in option 4.

It can be easily shown that $E\Pi_1 > E\Pi_3$ and $E\Pi_M > E\Pi_2$ by Condition (1). We will focus on the more interesting case in which $E\Pi_M > E\Pi_1$ such that the firm prefers margin-based compensation among all four options. This comparison holds when the following condition is satisfied:

(3) $e_L < (1-x)V_L$

This is an important condition. In the remaining sections of the paper we will show how the firm can used different mechanisms to improve on the expected profits under margin-based compensation. For this reason we will assume that Condition (3) holds for the remainder of the paper (and will refer back to this condition in future sections).

Notice that margin-based compensation cannot on its own restore first-best profits. Although the firm is able to condition prices on demand information, to elicit demand information it pays the sales rep in high demand an information rent of e_L. We formally state this result with the following proposition.

> **Proposition 1**: Margin-based sales rep compensation is insufficient to restore first-best profit. The firm pays the sales rep an information rent when demand is high.
>
> **Proof**: By construction.

This result helps explain why companies often find margin-based compensation inadequate. In the following section, we investigate if the firm can do better by allowing the sales rep to lobby for lower prices.

4. Lobbying

We introduce our study of lobbying in this section by exogenously limiting when lobbying is feasible and fixing the costs that the sales rep incurs when engaging in lobbying. This allows us to clearly illustrate how lobbying activities can help mitigate the information rents that the firm must pay to persuade the sales rep to admit when demand is high. In Section 5 we will relax these exogenous assumptions by explicitly modeling lobbying activities as the search for evidence that demand is low.

We modify the timing of the game as follows.

Timing

1. The firm and the sales rep share the common prior belief that demand is high with probability x and low with probability 1 – x.
2. The firm offers a compensation scheme. If the sales rep rejects the offer, the game ends. If the sales rep accepts the offer the game proceeds.
3. The sales rep privately observes the realized demand state.
4. **The sales rep decides whether to lobby for a lower price. When lobbying the sales rep incurs cost c_H if demand is high and c_L if demand is low.**
5. **Observing lobbying or and lack thereof, the firm sets the price.**
6. The sales rep decides whether to engage in selling effort.
7. The customer decides whether to buy and this decision is commonly observed. The firm receives its profit and the sales rep receives his compensation.

It is illustrative to first consider settings in which lobbying is only possible when demand is low (this is equivalent to assuming that the cost of lobbying in the high demand condition c_H is prohibitively high).

Lobbying Possible Only When Demand is Low

If the firm does not condition prices on the sales rep's lobbying decision the sales rep will not engage in (costly) lobbying in either demand condition.[3] The only relevant case is where the firm responds to lobbying by charging the lower price V_L. When lobbying in the low demand condition the sales rep earns a surplus of $W_L – e_L – c_L$ if he makes selling efforts, and $– c_L$ otherwise. By not lobbying, the price will be V_H which makes it impossible to sell in the low demand condition regardless of selling efforts. The sales rep will thus shirk and earn a surplus of zero. Therefore, when demand is low the sales rep will only lobby and make selling efforts if the bonus from selling at V_L is at least

$$W_L = e_L + c_L$$

In the high demand condition the sales rep cannot lobby (by assumption) and so the firm charges V_H and pays the same bonus as in the full information case

$$W_H = e_H$$

[3] Recall that we began by recognizing that the firm could use margin-based incentives to dissuade the sales force from lobbying for low prices. Simply ignoring the lobbying activities is another response that the firm could use to dissuade lobbying.

This yields the following expected profit for the firm

$$E\Pi = x(V_H - e_H) + (1-x)(V_L - e_L - c_L)$$

We are interested in whether the lobbying mechanism can improve the firm's expected profit beyond margin-based compensation. Therefore, we can compare this expected profit with the expected profit without lobbying ($E\Pi_M$) and see that the firm will allow lobbying whenever

$$x(V_H - e_H) + (1-x)(V_L - e_L - c_L) \geq x(V_H - e_H - e_L) + (1-x)(V_L - e_L)$$

This inequality simplifies to:

$$xe_L \geq (1-x)c_L$$

Intuitively, by allowing lobbying the firm harnesses the sales rep's private information in the low demand condition to avoiding paying information rents in the high demand condition. The cost of doing so is compensating the sales rep for the cost of lobbying. The firm only incurs this cost when demand is low and so lobbying is profitable as long as this expected cost, $(1-x)c_L$, is less than what it expects to save by mitigating the rents paid when demand is high, xe_L.

Notice that lobbying is more profitable when the cost of lobbying (c_L) is small. We will next allow the possibility that the sales rep can lobby in either demand condition and will see that this result is reversed in the high demand condition.

Lobbying Possible in Both Demand States

To elicit truthful reporting of demand information, the firm will want the sales rep to lobby for a low price only when demand is low. We develop the optimal contract to achieve this goal.

Suppose the firm offers a bonus W_H if the sales rep fulfills a sale without lobbying, and a bonus W_L if he sells after lobbying. We first consider the case of low demand. As in the previous subsection, by lobbying the sales rep earns a surplus of $W_L - e_L - c_L$ if he incurs selling effort, and $-c_L$ otherwise. By not lobbying the sales rep earns zero surplus. Therefore, for the sales rep in low demand to lobby and incur selling efforts the firm needs to offer a bonus equal to

$$W_L = e_L + c_L$$

Next we consider the case of high demand. By lobbying, the sales rep can make a sale without selling efforts. As a result, he earns a surplus of $W_L - c_H$. By not lobbying, the sales rep earns a

surplus of $W_H - e_H$ if he incurs selling effort, and 0 otherwise. Therefore, the bonus required to persuade the sales rep not to lobby and incur effort when demand is high must satisfy the following two conditions:

$$W_H - e_H \geq e_L + c_L - c_H$$

$$W_H - e_H \geq 0$$

It follows that by enforcing a lobbying process the firm earns an expected profit of

$$E\Pi_L = x[V_H - e_H - \max(0,\ e_L + c_L - c_H)] + (1-x)(V_L - e_L - c_L)$$

We are again interested in whether the lobbying mechanism can improve the firm's expected profit beyond margin-based compensation. Comparing the expected profits we see that with the lobbying mechanism the firm subsidizes the sales rep's lobbying cost c_L when demand is low, but pays the sales rep a rent of $\max(0,\ e_L + c_L - c_H)$ rather than e_L when demand is high. This amounts to a saving of $\min(e_L, c_H - c_L)$ in information rent. Hence, lobbying improves expected profits ($E\Pi_L > E\Pi_M$) iff

$$(4)\quad x \min(e_L, c_H - c_L) > (1-x)\, c_L$$

The benefit of the lobbying mechanism compared with margin-based compensation is that it helps the firm reduce the rent paid to the sales rep in the high demand state. This benefit is greater when demand is more likely to be high (larger x), and when the information rents are larger under margin-based compensation (larger e_L).

More importantly, Condition (4) is more likely to hold with larger values of c_H and smaller values of c_L. The more costly lobbying is for the high-demand sales rep, the smaller the information rent the firm has to pay to prevent him from lobbying. The more costly lobbying is for the low-demand sales rep, the lower the firm's expected profit because it is the firm that eventually bears the lobbying cost.

For Condition (4) to hold, we need $c_H > c_L$. If lobbying is just as easy (or easier) in the high demand condition as in the low demand condition then it no longer provides an effective screening mechanism. The sales rep in the high demand condition can always mimic the actions in the low demand condition. As a result, lobbying does not allow the firm to exploit the private information in the low demand condition to avoid paying information rents when demand is high. However, if lobbying is more costly when demand is high then it is no longer as

easy for the high-demand sales rep to mimic (by lobbying that demand is low). We formally state this result with the following proposition.

> **Proposition 2**: The lobbying mechanism improves the firm's expected profit beyond margin-based compensation only if lobbying is more costly to the sales rep when demand is high than when demand is low.
>
> **Proof**: By construction.

If the firm can influence the values of c_H and c_L, from the expression of $E\Pi_L$ we know that the firm would want to increase c_H and decrease c_L. In the extreme, if the sales rep finds it costless to lobby when demand is low and prohibitive to lobby when demand is high, then we are back to the first-best scenario. To directly manipulate c_H and c_L, however, the firm must observe demand, which the firm does not. In the next section, we investigate the micro-foundations of the lobbying process to explore how the firm can manage the cost and effectiveness of this mechanism.

5. Requiring Evidence that Demand is Low

A frequent observation from our interviews is that firms require the sales rep to "acquire convincing evidence of low demand" in order to lobby for a lower price. In the African beverage company the sales reps visit distributors and dealers either to collect evidence that demand is low and/or document the actions of competitors. In the telecommunications and military contractor examples, the sales force searches through historical transactions to find evidence that past discounts contributed to future sales from the same customer or other customers.

In modeling terms, we can think of this information acquisition process as the sales rep searching for "signals" to support claims that demand is low (and justify the recommendation to lower prices). In this section we will model the information gathering process as a search process. The sales rep incurs effort to draw signals of demand without knowing whether any individual signal will indicate that demand is high or low. He can continue to search for evidence that demand is low by making additional draws.

The firm can decide whether to require evidence that demand is low before agreeing to lower prices. We interpret this as a decision about whether to require lobbying. We will show that it may be profitable to require lobbying, even where the cost of lobbying represents a

deadweight loss. The firm may also vary *how much evidence* is required before it will lower prices, and in some situations it may also be able to influence the cost of searching for that evidence. We investigate how the firm will make these decisions, and how the outcome will be influenced by the accuracy of the demand signals.

We begin by considering whether the firm will require a *single* signal that demand is low. Assume that each demand signal drawn by a sales rep could indicate whether demand is high or low and that the signals are i.i.d. conditional on the true state of demand. In particular, the signal generating process is characterized by the following conditional probabilities:

$$\Pr(\text{high signal} \mid \text{high demand}) = \Pr(\text{low signal} \mid \text{low demand}) = r$$

where $\frac{1}{2} < r < 1$. That is, demand signals are noisy yet diagnostic of demand.[4]

The sales rep incurs a (search) cost c for each draw of a demand signal. This could represent the cost of researching historical transactions or visiting customers in the field. He can continue making draws until he uncovers a signal of low demand. The number of draws needed until the encounter of a low signal follows the negative binomial distribution. If demand is high, the expected total number of draws is

$$N_H = 1 + r/(1-r) = 1/(1-r).$$

If demand is low, the expected total number of draws is

$$N_L = 1 + (1-r)/r = 1/r.$$

Naturally, in expectation fewer draws are needed if demand is low. In addition, the more precise the demand signals are (the closer r approaches 1), the fewer draws are needed if demand is low, and the more draws are needed if demand is high. That is, more precise demand signals polarize the lobbying costs between the two demand states.

We now rewrite the firm's contract offer as a function of c and r. To induce the low-demand sales rep to lobby and to make selling efforts, the firm must offer a bonus of

$$W_L = e_L + c\, N_L = e_L + c/r$$

[4] This assumption is consistent with the premise of demand measurement, that market data are noisy yet reflective of the true state of demand.

To induce the high-demand sales rep to not lobby and to make selling efforts, the firm must offer a bonus of

$$W_H = e_H + \max[0,\ e_L + c(N_L - N_H)] = e_H + \max[0,\ e_L - c(2r-1)/r(1-r)]$$

It follows that the firm earns an expected profit of

$$E\Pi_L = E\Pi^* - x \max[0,\ e_L - c(2r-1)/r(1-r)] - (1-x)c/r$$

We can easily verify that the term $(2r-1)/r(1-r)$ increases with r over (1/2, 1). Therefore, $E\Pi_L$ increases with r. When demand signals are more precise, lobbying is less costly for the low-demand sales rep and more costly for the high-demand sales rep, which makes the lobbying process more effective at eliciting truthful demand information. When r approaches 1, the low-demand sales rep is almost guaranteed to obtain a low signal at the first draw, whereas the high-demand sales rep can almost never find a low demand signal. The firm's expected profit in this case thus approaches the first-best profit $E\Pi^*$. We interpret r as a measure of the accuracy of the search process and summarize this result with the following proposition.

> **Proposition 3**: If the firm requires the sales rep to provide evidence of low demand before lowering prices, the firm's expected profit increases when the search for evidence is more accurate.
>
> **Proof**: By construction.

Intuitively the precision of the demand signals determine the effectiveness of lobbying as a screening mechanism. The more precise the signals the more difficult it is for sales reps in the high demand condition to mimic the actions in the low demand condition (by producing evidence that demand is low). This makes it easier for the firm to exploit the information in the low demand condition to mitigate the information rents when demand is high.

We are also interested in how the profitability of the lobbying mechanism varies with the search cost c. We obtain the following result.

> **Proposition 4**: If the firm requires the sales rep to provide evidence of low demand before lowering prices, then as long as the search process is sufficiently accurate ($r > 1/(1+x)$) the firm's expected profit can increase with the cost of search.
>
> **Proof**: If $c \geq c^* = e_L\, r(1-r)/(2r-1)$, then $E\Pi_L = E\Pi^* - (1-x)c/r$, so that $d\, E\Pi_L / d\, c < 0$.

If $c < c^*$, then $E\Pi_L = E\Pi^* - x\,[e_L - c(2r-1)/r(1-r)] - (1-x)c/r$, so that $d\,E\Pi_L / d\,c = [r(1+x)-1]/r(1-r)$, which is positive if $r>1/(1+x)$ and negative otherwise. Therefore, if $r < 1/(1+x)$, then $E\Pi_L$ decreases with c; if $r > 1/(1+x)$, then $E\Pi_L$ increases with c over $[0, c^*]$ and decreases with c over (c^*, ∞).

This result reflects a trade-off between two tensions. On the negative side, the cost of acquiring information increases the lobbying cost when demand is low, which the firm has to subsidize. On the positive side, it discourages lobbying when demand is high, which reduces the information rents. When the search process is more accurate the negative side is less important because it takes fewer draws to satisfy the evidence requirement when demand is truly low. Moreover, the positive side is amplified because evidence of low demand is harder to acquire if demand is actually high. Therefore, if the search process is sufficiently accurate the positive effects of a higher search cost outweigh the negative effects and the firm's expected profit increases with the search cost. This result continues to hold until the search cost reaches the threshold c^*, where searching for evidence is so costly that the high-demand sales rep no longer wants to make claims of low demand. As we have shown at the beginning of Section 4, when lobbying is possible only when demand is low, the firm's expected profit decreases with the cost of lobbying.

Proposition 4 leads to the following question - what should the optimal search cost be if the firm is able to choose it? In the context of our examples, the African beverage company could provide infrastructural support for its sales reps to visit distributors and dealers, and the telecommunications military contractor could make historical transaction data more accessible to its sales force. Since the resulting profit from lobbying varies, we also ask how the firm should choose between lobbying and margin-based compensation. We establish the following result.

Proposition 5: If the search process is sufficiently accurate ($r > 1/(1+x)$) then the firm should require evidence of low demand before lowering prices, and choose margin-based compensation otherwise. If the firm has control over the sales rep's search cost, it should impose a positive search cost: $c^* = e_L\, r(1-r)/(2r-1) > 0$.

Proof: Since $E\Pi_L$ decreases with c over (c^*, ∞) for all values of r, the optimal c must fall within $[0, c^*]$. Given Condition (4), the firm will prefer lobbying over margin-based compensation iff

$$x\, e_L \min(1, c/c^*) > (1-x)\, c/r$$

Since $c \le c^*$ in equilibrium, Condition (4) becomes

$$x\, e_L/c^* > (1-x)/r$$

Rearranging terms, the above condition is equivalent to

$r > 1/(1+x)$

However, from the proof of Proposition 4 we know that $E\Pi_L$ increases with c over [0, c*] when $r > 1/(1+x)$. Therefore, the optimal c equals c*.

When it is optimal to require evidence of low demand then it is important that acquiring this evidence is costly. This result echoes observations that companies often allow lobbying but make the lobbying process "difficult" for the sales people. If lobbying is too frustrating, sales people who truly face low demand cannot easily communicate this information; if lobbying is reduced to a rubber stamp, sales people in favorable markets will argue for a low price as well.

Notice that the sales rep's search cost is effectively a deadweight loss in this system, yet the firm is willing to introduce this loss in order to reclaim the rents it would otherwise pay when demand is high. When c equals its optimal value c*, the firm's expected profit from using the lobbying mechanism becomes

$$E\Pi_L = E\Pi^* - (1-x)c^*/r = E\Pi^* - (1-x)\, e_L\, (1-r)/(2r-1)$$

The lobbying mechanism introduces a dead-weight loss of $(1-x)c^*/r$, which equals the subsidy the firm pays the low-demand sales rep to cover his lobbying cost. This result reflects the different implications of the costly lobbying process: from the social efficiency perspective, lobbying is wasteful; from the firm perspective, however, the costly nature of lobbying helps it better regulate the incentives of the sales force. This deadweight loss increases with the prior probability that demand is low (1–x) and with the information rent that the firm would otherwise pay to the high-demand sales rep (e_L), but decreases with the accuracy of the search process (r).

In some situations, it is difficult for the firm to directly control the sales rep's search cost. An alternative lever that the firm can use to manage the lobbying process is to vary the amount of evidence required before agreeing to lower prices. In terms of our model, the firm can decide how many signals of low demand are required before it is willing to approve a discount. We analyze this decision next.

Suppose the firm requires the sales rep to provide n signals of low demand. If demand is high, the expected total number of draws the sales rep needs to meet this requirement is

$$N_H = n + n\, r/(1-r) = n/(1-r).$$

If demand is low, the expected total number of draws needed is

$N_L = n + n\,(1–r)/r = n/r$.

Both numbers increase with n. Moreover, the difference between them, $N_H–N_L = n\,(2r–1)/r(1–r)$, increases with n as well. This result drives the firm's tradeoff in deciding how much evidence to require before approving a discount. A higher bar (larger n) raises the lobbying costs in both demand states, which in turn increases the firm's payroll costs. However, a higher bar also amplifies the difference in lobbying costs between the two demand states because it is disproportionately difficult to collect many low signals when demand is actually high. To manage this tradeoff the firm will want to choose an "intermediate" value of n. We obtain the following result.

Proposition 6: When the firm requires the sales rep to provide evidence of low demand before lowering prices, it should set the number of low demand signals required at $n^* = e_L\, r(1–r)/c\,(2r–1)$.

Proof: The firm's expected profit from using the lobbying mechanism is:

$$E\Pi_L = E\Pi^* – x \max[0,\ e_L – c\, n\,(2r–1)/r(1–r)] – (1–x)\, c\, n/r$$

Solving $e_L = c\, n\,(2r–1)/r(1–r)$ we obtain[5]

$$n = n^* = e_L\, r(1–r)/c\,(2r–1)$$

If $n \geq n^*$, then $E\Pi_L = E\Pi^* – (1–x)c\, n/r$, which decreases with n. Therefore, the optimal n must fall within $[0, n^*]$.

If $n \leq n^*$, then $E\Pi_L = E\Pi^* – x\,[e_L – c\, n\,(2r–1)/r(1–r)] – (1–x)\, c\, n/r$, so that

$$d\,E\Pi_L/\,d\,n = xc(2r\text{-}1)/r(1\text{-}r) – (1\text{-}x)c/r$$

which is positive iff $r > 1/(1+x)$.

Given Condition (4), the firm will prefer lobbying over margin-based compensation iff

$$x\, e_L \min(1, n/n^*) > (1–x)\, cn/r$$

Since $n \leq n^*$ in equilibrium, Condition (4) becomes

$$x\, e_L/n^* > (1–x)c/r$$

Rearranging terms, the firm will choose the lobbying mechanism over margin-based compensation iff:

$$r > 1/(1+x)$$

But $d\,E\Pi_L/\,d\,n > 0$ over $[0, n^*]$ iff $r > 1/(1+x)$. Therefore, the optimal choice of n equals n^* when the firm adopts the lobbying mechanism.

[5] To facilitate exposition, we ignore the discrete nature of n. The solution to the discrete case follows the same logic.

The optimal number n* increases with e_L, and decreases with c and r. These comparative statics have intuitive interpretations. First, recall that e_L is the sales rep's information rent in the high demand state under margin-based compensation. The larger this rent, the more the firm wants to extract it with an onerous evidence requirement. Second, the sales rep's search cost (c) has a similar effect on profit as the required number of low-demand signals (n); both make the lobbying system more costly yet more discerning as a screening mechanism. Therefore, when acquiring evidence is costly, the firm will reduce the evidentiary requirement (requiring fewer low-demand signals). Finally, the more precise demand signals are, the more difficult it is to gather low signals when demand is actually high. As a result, fewer low-demand signals are needed to prevent the sales rep from understating demand.

The firm's optimal choice of n again creates a deadweight loss. When n = n*, the firm's expected profit is

$$E\Pi_L = E\Pi^* - (1-x)\, c\, n^*/r = E\,\Pi^* - (1-x)\, e_L\, (1-r)/\,(2r-1)$$

which is lower than the first-best profit EΠ* because of the lobbying cost incurred in the low-demand state. Although this lobbying cost is socially wasteful, it makes it easier for the firm to learn demand and charge efficient prices.

Our background interviews revealed another internal process that firms use to manage the sales force's tendency to understate demand. Instead of requiring evidence of low demand, some firms impose a quota on how often the sales rep can ask for price discounts. Recall the example of the military contractor, who restricts the number of "exceptions" a sales rep can obtain. This is designed to ensure that sales reps only ask for discounts when lower prices are needed to close the deal, rather than when they just make selling easier. We investigate these restrictions in the next section.

6. Restricting Lobbying through Quotas

To understand how quota systems can improve profits beyond margin-based compensation, we focus on the simple case in which the sales rep serves two customer accounts at the same time. In this case, imposing a quota means that the sales rep can lobby for a low price at most once. To identify the separate effect of quota systems, we assume that the sales rep incurs no lobbying cost in either demand state. This assumption is consistent with real-world scenarios whereby firms grant their sales force "free exceptions" – a sales rep can obtain lower prices

"with no questions being asked" but is only able to do so up to a certain frequency. We maintain the assumption that demand is i.i.d. across customers.

A Thought Experiment

We begin with the following thought experiment to gain more intuition about quota systems. Suppose the firm knows that one of the two customers has low demand, but does not know *which* customer it is. Let us consider the following quota scheme. Suppose the firm's objective is for the sales rep to lobby for a lower price if and only if he is serving a low-demand customer. This would mean that the decision to lobby reveals the sales rep's demand information. To motivate selling efforts, the firm will then want to pay the sales rep e_H if the customer buys at V_H, and pay e_L if the customer buys at V_L, which leaves the sales rep zero surplus. However, the sales rep will then want to deviate and lobby for a low price when serving the high-demand customer. In doing so, he loses business from the low-demand customer, but earns the bonus e_L effortlessly by serving the high-demand customer. It follows that the firm must pay the sales rep a rent of e_L in order to elicit truthful demand information. Recall that e_L is the information rent the high-demand sales rep earns under margin-based compensation. Therefore, this quota scheme cannot improve the firm's profits beyond margin-based compensation.

What explains the inadequacy of this scheme? In theory, imposing a quota reduces the sales rep's degrees of freedom; by understating one customer's demand, he must overstate the other. However, with this quote scheme, the sales rep enjoys rents when understating demand but is not punished when overstating demand – he earns zero surplus from the low-demand customer whether he tells the truth or not. As a result, this scheme is no better than margin-based compensation in regulating the sales rep's incentives.

Can the firm design a better quota scheme? The firm needs to devise a way to punish the sales rep from overstating demand, which in turn reduces his payoff from understating demand on the other customer. The following quota scheme serves this purpose:

> The sales rep can lobby only once. The firm pays the sales rep a total bonus of $W=e_H+e_L$ if both customers buy, and 0 otherwise.

The sales force only earns a commission if it achieves its aggregate sales target. By lobbying iff a customer has low demand, the sales rep earns zero surplus. By deviating and lobbying for the high-demand customer, the sales rep must charge a high price to the low-demand customer. In doing so, the sales rep loses not only the low-demand customer, but also the information rent he earns from serving the high-demand customer, which makes deviation unattractive. The

firm as a result can restore the efficient outcomes – it charges the efficient prices without over-compensating the sales rep.

This thought experiment shows that the benefit of the quota scheme comes from its ability to "tie together" the sales outcomes across multiple customers, which helps regulate the sales rep's demand claims. Interestingly, the firm is able to restore the first best profit without perfect information. All it needs to know is the *combination* of demand states (one out of two customers has low demand), rather than the *permutation* (which customer has low demand). The quota system itself will induce the sales rep to charge the right price to the right customer. We formalize this result with the following proposition.

> **Proposition 7**: Suppose the sales rep serves K>1 customers at the same time. If the firm knows that k customers have low demand, it can restore the first best profit using the following quota system: the sales rep can lobby at most k times; the firm pays the sales rep a total bonus of $W=(K-k)e_H + ke_L$ if all customer buy, and 0 otherwise.
>
> **Proof**: By lobbying for the k low-demand customers, the sales rep earns a net surplus of zero. By deviating and not lobbying for any of these low-demand customers, the sales rep also earns zero profit. Hence the sales rep cannot profitably deviate.

In practice the firm may not even know the combination of demand states. If both customers turn out to have low demand, the sales rep will shirk, knowing that he cannot meet the sales goal with only one chance to lobby. The firm as a result loses the profit from the low-demand customers. If both customers are of high demand, lobbying would lead to inefficient prices. However, the sales rep will choose to use up the lobbying quota: he earns a net surplus of e_L if he lobbies, and $e_H+e_L-2e_H = e_L-e_H < e_L$ if he does not lobby. In other words, this quota scheme may induce sales reps to lobby even when they do not need a low price to close the deal. We next consider the optimal contract when the firm does not know how many customers have low demand.

When the Firm Does Not Know How Often to Lower Prices

For each customer, the firm holds the prior belief that demand is high with probability x and is low with probability 1 – x. Given the assumption that demand is i.i.d. across customers, the firm's prior knowledge of demand in the two-customer case is as follows:

- With probability x^2, both customers have high demand;
- With probability $2x(1-x)$, one customer has low demand;

- With probability $(1–x)^2$, both customers have low demand.

The firm may allow the sales rep to lobby never, once or twice. Never allowing lobbying is equivalent to mandating a high price (option 1 in Section 3). The firm saves on the information rent, but loses business whenever one or more customers have low demand. The firm earns an expected profit of $x^2 (2V_H–2e_H) = x\ 2\ E\Pi_1$. We know that $E\Pi_1 < E\Pi_M$ under Condition (3). Therefore, never allowing lobbying is less profitable than margin-based compensation in this two-customer case. Allowing the sales rep to lobby twice is equivalent to margin-based compensation, because the sales rep is free to make any claim about a customer's demand without affecting what he can say about the other customer. The firm earns an expected profit of $2E\Pi_M$. Therefore, the key question is whether allowing the sales rep to lobby only once can generate higher profits.

Consider the following quota scheme:

- If the sales rep never lobbies, the firm pays the sales rep W_0 if both customers buy, and 0 otherwise;
- If the sales rep lobbies once, the firm pays the sales rep W_1 if both customers buy, and 0 otherwise.

We previously restricted $W_0=W_1$ (Proposition 7). However, if the firm is not sure how many customers have low demand we can show that conditioning the wages on the frequency of lobbying is more profitable.[6] We can also show that the firm has no incentive to offer an "interim" bonus when only one customer buys. The intuition is as follows. If the sales rep lobbies once, offering such an interim bonus only reduces his punishment from misreporting demand, as we have seen in the thought experiment. If the sales rep never lobbies, failing to sell at the high price means the sales rep has either shirked or overstated demand, both of which the firm wants to discourage. Therefore, bonuses are contingent on both customers buying. It remains to determine the optimal values of W_0 and W_1.

The firm would want the sales rep to only lobby when there is a low-demand customer. For the sales rep to not lobby and to work when both customers have high demand, the firm needs to ensure that

[6] This contract is also more profitable than requiring the sales rep to lobby *exactly* once, which is equivalent to setting W_0 to zero. Under the latter contract, the firm earns an expected profit of $[x^2 + 2x(1–x)]\ (V_H+V_L–e_H–e_L)$, which is lower than the profit when the firm allows the sales rep to lobby *at most* once ($E\Pi_Q$ which is derived later).

$$W_0 - 2\,e_H \geq \max(W_1 - e_H, 0)$$

The first term on the right-hand side is the deviation surplus the sales rep would earn if he lobbies once, which saves him the selling cost on one customer. The second term is what he would earn if he does not lobby but shirks selling efforts. Similarly, for the sales rep to lobby and to work when one customer has low demand, the firm needs to ensure that

$$W_1 - e_H - e_L \geq 0$$

The right-hand side is simpler because the sales rep earns zero surplus by not lobbying – he will not be able to persuade both customers at the high price.

The resulting contract is

$$W_1 = e_H + e_L$$
$$W_0 = 2\,e_H + e_L$$

Notice that the sales rep earns a greater bonus from selling the same amount if he lobbied less frequently to do so. Alternatively, we can consider the reduction in the wage when the sales rep lobbies as a cost that the firm imposes on the sales rep for engaging in too much lobbying.

This contract generates an expected profit of

$$E\Pi_Q = x^2\,(2V_H - 2e_H - e_L) + 2x(1-x)\,(V_H + V_L - e_H - e_L)$$

From the profit function, we can see the costs and benefits of the quota system. First, when only one customer has low demand, the quota scheme implements the efficient outcomes – the sales rep charges the efficient prices without being overcompensated. This is the effect we have seen in the thought experiment. Second, when both customers have high demand, the firm must pay the sales rep a *total* rent of e_L to prevent him from lobbying. However, this is still less costly than margin-based compensation, which pays the sales rep a rent of e_L for *each* high-demand customer. Finally, when both customers have low demand, the firm earns no profit from these customers. The first two effects favor the quota scheme whereas the last effect favors margin-based compensation. Trading off the pros and cons, the quota system is more profitable than margin-based compensation when the following condition holds:

(5) $e_L \geq 2\,(1-x)^2\,V_L / [1+(1-x)^2]$

This condition is more likely to hold for larger values of x, other things being equal.[7] Intuitively, when demand is more likely to be high, the rent savings under the quota system are more likely to outweigh the lost profit from low-demand customers. We summarize these findings with the following proposition.

> **Proposition 8**: Quota systems can improve firm profit beyond margin-based compensation, especially when demand is more likely to be high.
>
> **Proof**: By construction.

7. Conclusions

In many companies there is a persistent tension between the sales force and the managers responsible for making pricing decisions. The sales force regularly proposes lowering prices, while the pricing managers focus on maintaining profit margins. What makes this surprising is that the firm controls the incentives of the sales force. If it wanted to dissuade the sales force from lobbying for low prices, it could seemingly do so by using margin-based incentives.

We begin this paper by confirming that compensating the sales force based on the profit margin can help to increase firm profits. However, because the sales force always has the option in high demand conditions of deviating and claiming that demand is low, the firm can only induce accurate reporting of demand (and hence efficient pricing) if it pays the sales force information rents in the high demand state. The focus of the paper is on exploring what internal mechanisms the firm can use to reduce these rents.

The key finding in the paper is that lobbying is a mechanism that serves this role. By requiring that the sales force go through a costly process of lobbying before agreeing to lower prices, the firm uses lobbying as a screening mechanism. As long as it is less costly to lobby when demand is low, then lobbying allows the firm to use the private information of the sales force in the low-demand condition to reduce the rents that it pays in high demand conditions. We show that the firm will require that the sales force lobby for low prices even if lobbying costs represent a deadweight loss.

We model the requirement to lobby for low prices as a requirement to present evidence that demand is really low. The profitability of this mechanism depends upon how easily the sales force can acquire this evidence in the different demand states. If the evidence is a lot easier to produce in the low demand state than in the high demand state, then lobbying is a more

[7] Notice also that Condition (5) is compatible with Condition (3) for all values of x.

efficient screening mechanism. The firm will find it profitable to implement a positive search cost and set a high evidentiary threshold before approving any discounts.

Although we have explained why a firm would allow its sales people to lobby for low prices, it may want to restrict how often they can lobby. When the firm knows how many of the customers should get low prices (but it does not know which customers to offer them to), a quota is an effective mechanisms for identifying which customers should receive discounts without paying information rents to the sales force. In practice, the firm will often be uncertain not just about who should receive discounts, but also how many customers should receive discounts. We show that even when the firm is uncertain about how often it should discount it may be profitable to limit how frequently the sales force can engage in lobbying.

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