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PERSUASION AND EMPATHY IN SALESPERSON-CUSTOMER INTERACTIONS

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ABSTRACT

In a search model, prospects encounter salespeople who can try to persuade them. Persuasive messages can increase the utility of buying or increase the cost of not buying. The latter reduces welfare. Equilibria where only some salespeople make a persuasive effort often exist. Salespeople vary in their empathy, and choose their jobs accordingly. When all prospects are persuadable, a negative correlation between empathy and sales suggests that persuasion increases the cost of not buying. When only some are, messages that increase the utility of purchasing can reduce welfare. They can also lead to a negative correlation between empathy and sales.

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Books giving advice to would-be salespeople offer a number of recommendations that do not involve the transmission of information about the product or service being sold. Insofar as these techniques are successful, they presumably affect the value that potential customers ascribe to either buying or not buying. This paper studies the extent to which such persuasive techniques are used in a model where potential customers come into contact with a relatively small number of salespeople, so that price competition is muted.

I distinguish between sales techniques that increase the value of products to their purchasers and techniques that increase the cost of not buying the good. The former tend to increase welfare while the latter tend to reduce it. I show that, nonetheless, the two are observationally indistinguishable using only data on quantities and prices.

A second focus of the paper is on the role of the empathy of salespeople in increasing the level of their sales. One reason to study this empathy is that the influential papers of Mayer and Greenberg (1964) and Morlan (1986) have suggested that empathy towards customers is crucial for being successful in sales.[1] At the same time, the empirical literature studying cross-sectional correlations between salesperson empathy and salesperson effectiveness has produced mixed results. The early study of Tobolski and Kerr (1952) found a positive relationship between a measure of dispositional empathy and the effectiveness of new car salesmen at two dealers. By contrast, negative correlations with various measures of effectiveness are reported by Lamont and Lundstrom (1977) for a sample of building supply salesmen. Lastly, Dawson *et al.* (1992) reports a very weak relationship between empathy and sales.[2]

Following the suggestion of Weitz (1981), the model I present implies that the connection

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[1]See Dawson *et al* (1992) for additional references.

[2]More recent regression studies seeking to explain the performance of salespeople have tended to focus on "customer orientation," (CO) measured as in Saxe and Weitz (1982) rather than on empathy per se. The two variables are strongly correlated with one another (see Widmier (2002) and Stock and Hoyer (2005)) and closely related conceptually. The CO scale gives considerable weight to agreement with the statements "I try to achieve my goals by satisfying customers," and "A good salesperson has to have the customer's best interest in mind." Both of these fit well with the way I model empathy, which is by supposing that the salesperson's objective includes the utility of his customers. The meta-analysis of Franke and Park (2006) shows that the correlation between salespeople's self-reported customer orientation and the level of performance as evaluated by their managers is quite weak.

between empathy and sales depends on the parameters governing the relationship between salespeople and their customers. The model is a modified version of Burdett and Judd (1983) so that some consumers receive only a single price quote from a salesperson while the rest receives two. As a result, the equilibrium features price dispersion and firms that charge lower prices sell more. Empathetic salespeople prefer jobs where they increase the happiness of their consumers, and thus prefer jobs with lower prices. This implies that, in the baseline model, empathetic salespeople will seek jobs with low prices and high sales; and this tends to create a positive correlation between empathy and sales.

When this model is modified so that salespeople can expend effort to persuade consumers, this correlation comes to depend both on the likelihood that a salesperson can persuade a consumer and on whether the salesperson increases the value of buying or increases the cost of not buying. In the case where this effort is always persuasive and where it reduces the value of not buying, it is possible to find parameters so that the correlation between empathy and sales is negative. The reason for this is that, in this case, sales are enhanced by techniques that are costly to consumers, and empathetic salespeople want to avoid hurting their customers.

While the methods for increasing sales that I consider are abstract, they fit with some of the suggestions from the qualitative literature on selling techniques. One widespread suggestion in how-to books is that salespeople should devote effort at being liked by their potential customers (prospects). Girad (1989, p. 17) says "The prospect must like you." Baber (1997, p. 40) says "Customers like to do business with people and companies they like." Baber (1997) goes on to suggest that customers will "like you" if "they feel comfortable with you (you are like them naturally, through mirroring, or otherwise)." The technique of "mirroring," which Baber (1997, p. 39) describes and recommends, involves imitating the speech cadence and the body posture of prospects. The ethnographic analysis of Bone (2006, p. 61) shows that imitation was common among the "accomplished sellers" of the company he studied.

Perceived similarity has been shown to have two related consequences in the social psy-

chology literature. First, Byrne (1961) shows that subjects who believe that a confederate shares more of their attitudes report more "liking" for the confederate, and several papers have shown this finding to be robust. Consistent with this increased liking, a second group of papers has shown that perceived similarity leads to more helping.[3] A simple interpretation of these findings is that that people feel more empathy towards (or more altruism) for people that they perceive as being more similar to themselves.[4] In a sales context, creating the impression that the salesperson is similar to the prospect may thus enhance the customer's altruism towards the salesperson.

This induced altruism can both raise the value that a consumer attaches to a purchase and increase his cost from not purchasing.[5] Consumers rationally expect salespeople to be more pleased when they complete a sale than when they do not. As a result, the act of purchasing can give consumers some vicarious pleasure. It can also lead consumers to suffer some vicarious losses when they fail to purchase. Arguably, these vicarious losses can be increased if the salesperson convinces the consumer that he already expected the sale to be completed, because this can lead the consumer to feel more guilt or vicarious disappointment if he does not buy.

This fits with the advice given by several books directed at potential salespeople that the salesperson act in ways that "assume the sale" before the customer acquiesces formally. Girard (1989, p. 44) gives a number of examples of sentences that salespeople use "before the prospect agrees to buy your product," including "I'm putting you down on the monthly pay plan." While these sentences do not unambiguously state that the sale has already been consented to, they are open to this interpretation. In recommending techniques for "closing" a sale (MDRT 1999, p 26) goes further and recommends the use of sentences presuming the

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[3]See, for example, Suedfeld *et al.* (1972) and Guéguen *et al* (2005). Substantively, these findings are closely related to those of studies based on the "lost letter technique" of Milgram *et al.* (1965). These studies show that people are more likely to fulfill the desires of people whose unmailed letters they find on the ground if they agree with the attitudes of the senders of these letters. See, particularly, Tucker *et al.* (1977).

[4]See Rotemberg (2009) for an application to the domain of voting.

[5]This is broadly consistent with Calvó-Armengol and Jackson (2010) who model peers as able to exert "positive pressure," where they lower a peer's cost of taking an action and "negative pressure," where they increase the cost of not taking the action in question.

sale such as "Let me see if I can arrange to get the machine here on Monday. I'll call my office now." As MDRT (1999) states, the idea behind this closing technique is to make it difficult for the prospect to avoid purchasing the good.

A rare, but nonetheless effective method to obtain a sale by evoking sympathy is reported in Bone (2006, p. 90). He depicts a salesperson who, when customers declared an intention not to buy, routinely "burst into tears" while saying that she was "in trouble with the boss." This sales method led at least some customers to buy. Bone (2006, p. 67) also provides examples of a more common "hard sell" strategy, which also aims to increase the cost of not buying. This involves the seller obtaining agreement from the customer about desirable aspects of the product before price is discussed and then subtly suggesting that the customer is being "disingenuous" or "irrational" when he later tries to wiggle out of buying by backtracking on some of his earlier statements.

Because empathy is rarely considered in theoretical models of economic interactions, it is worth noting that there exists neurological evidence both for its relevance and for the reliability of self-reported questionnaires regarding empathy. Hutchinson *et al.* (1999) and Singer *et al.* (2004) show that pain related neurons are activated not only in response to painful stimuli to the self but also in response to painful stimuli that are applied to others in the subject's presence. These observations are among many in which neurons of an individual are observed to "mirror" the behavior of another person's neurons. Perhaps the most remarkable finding in Singer *et al.* (2004) is that the size of the "mirror neuron" responses they record is larger in subjects who score higher on the Balanced Emotional Empathy Scale of Mehrabian and Epstein (1972). The same is true for subjects who score higher in the Empathic Concern Scale of Davis (1980). These scales are based on answers to self-administered questionnaires.

The paper proceeds as follows. Section 2 introduces the model of costly persuasive effort. As in most of the paper, this effort is assumed to affect the willingness to pay of all customers by the same amount. If this effort costs sufficiently little, all salespeople engage in it, while none do so if it is sufficiently costly. More interestingly, there is a range of costs for this

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effort so that some salespeople actively "sell" their products while others do not. The ones that do tend to charge higher prices to recover their additional selling costs. They also sell their product more frequently, so as to reduce the amount of "wasted" sales effort.

Section 2 also shows that, using only data on prices and quantities, selling activities that increase the attractiveness of the product to consumers are indistinguishable from selling activities that reduce the desirability of not buying from a particular salesperson. Section 3 then shows that the welfare effect of these two kinds of selling efforts are quite different. To prepare the ground for using data on employee empathy to distinguish between different selling methods, section 4 discusses employee preferences. In line with research showing that people differ in their dispositional empathy (see Davis (1983)), I consider a situation where some employees are selfish while others are empathetic towards their customers. Unlike the former, the letter are modeled as having higher utility when their customers have higher material payoffs.

Armed with these properties of potential employees, Section 5 studies how employees with different preferences sort themselves across available sales. It shows that, in the deterministic case, the correlation between empathy and sales can only be negative if the effort of salespeople increases the cost of not buying. Section 6 considers an extension where the effectiveness of the selling effort is stochastic because a fraction of customers is immune to the persuasive efforts of salespeople. This brings the model closer to Eliaz and Spiegler (2006), Gabaix and Laibson (2006) and Armstrong and Chen (2008), who consider models where consumers differ in their naivete. I show that the presence of consumers who are susceptible to persuasive efforts by salespeople tends to make those that are immune worse off, which is reminiscent of Armstrong and Chen's (2008) finding that the existence of naive consumers can reduce the welfare of sophisticated ones. The reason this occurs in the present model is that firms are unable to distinguish between susceptible and immune consumers *ex ante* and end up raising the prices faced by both.

Just as in the case where persuasion is deterministic, it is easy to obtain parameters in the stochastic case that induce a negative correlation between empathy and sales when the sales

effort makes it costlier not to buy. The stochastic setting delivers two new findings. First, sales efforts that raise the utility of buying now reduce the utility of immune customers, and this effect can be so large quantitatively that average consumer welfare falls as well. Second, the correlation between empathy and sales can now be negative even when the sales effort is directed at increasing the utility from purchasing the good. This can occur when salespeople are able to increase substantially the utility that a small group of consumers derives from purchasing. Empathetic salespeople may then concentrate on these extremely profitable consumers and obtain only modest sales. One difference with the negative correlations obtained in the deterministic case is that here the empathetic salespeople are exerting a great deal of effort. Section 7 contains some concluding remarks. Among the things it discusses are the similarities and differences between persuasive advertising, which has been dealt with more extensively in the literature, and persuasive sales.

1 A deterministic model of persuasive selling

A large number N of firms sell a good that they can procure at marginal cost m. Each one does so through a single salesperson.[6] Each salesperson, in turn, is visited by μ prospects whose initial valuation for a single unit of the good equals v, and who have no use for additional units. The μ potential customers each salesperson are drawn independently from the population of consumers. As in Burdett and Judd (1983), a fraction θ of all consumers visits just one salesperson, while the rest visit two.

Salespeople can expend extra effort and thereby increase their customers' willingness to pay. As discussed in the introduction, they can do so by either increasing the utility of purchasing or by reducing the utility from failing to purchase. I thus suppose that, after a prospect interacts with salesperson i, he assigns a value of $v + g_i$ to obtaining the good from i while he suffers a loss ℓ_i if he does not buy it from i. This implies that a consumer prefers

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[6]The assumption that each firm has a single salesperson is made for simplicity of exposition. The model can equally well be interpreted as one where each firm has many salespeople, each of which is assigned a pre-specified job.

buying from i than not buying at all if

$$v + g_i - p_i \geq -\ell_i \qquad \text{or} \qquad v + k_i \geq p_i \qquad \text{where } k_i \equiv g_i + \ell_i. \qquad (1)$$

If the prospect visits only i, this condition induces him to purchase the good. If he visits two sellers i and j, he buys from i if, in addition,

$$v + g_i - p_i - \ell_j > v + g_j - p_j - \ell_i \qquad \text{or} \qquad v + k_i - p_i > v + k_j - p_j. \qquad (2)$$

If (1) is true and (2) holds as an equality, the consumer is equally willing to buy from either salesperson and I suppose he chooses i with probability $1/2$. If the inequality in (2) is reversed and (1) holds for j, the consumer buys from j. It follows that, from the perspective of a consumer's purchase decision, g_i and ℓ_i matter only through their sum k_i. As I discuss below, consumer welfare also depends on the individual components g and ℓ. However, the derivation of an equilibrium is simplified by focusing solely on k_i. To simplify further, I suppose that there is exists only one strictly positive level of effort, and that this leads k_i to equals the constant k. If, instead, the salesperson makes no effort, $k_i = 0$.

Each firm sets a single price and effort level, and these apply to every interaction of its salesperson.[7] Firms set prices and salesperson effort to maximize profits. If firm i wishes its salesperson to set $k_i = k$, it has to compensate him an extra w^e for each customer contact. For the moment, the level of this extra compensation, as well as the base wage w are taken as fixed.

While the number of firms is finite, they are treated as sufficiently numerous that the distribution of prices across firms can be well approximated by a continuous density. An equilibrium is then a distribution of prices such that no firm has an incentive to deviate because they earn the same profits at all the prices that are charged by a positive density of firms and would earn lower profits if they charged any other price. Under the assumption, which I maintain throughout, that $\mu\theta(v - m) > w$ the equilibrium satisfies the following

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[7]This assumption is inessential at this point. Since a range of prices gives the same profits in equilibrium, nothing would be lost by letting salespeople use different prices (and possibly different effort levels) in different sales encounters. This is no longer true below when I let salespeople differ in their attitudes towards customers.

Proposition 1. *a)(Burdett and Judd 1983) If $k < w^e$, all firms set $k_i = 0$ and the equilibrium price has support $\{\theta v + (1 - \theta)m, v\}$ with cumulative density function*

$$F_n(p) = 1 - \frac{\theta(v - p)}{(1 - \theta)(p - m)}.$$ (3)

b) If $w^e < \theta k$, all firms set $k_i = k$ and each firm earns expected profits of $\mu[\theta(v + k - m) - w^e] - w$. The equilibrium price distribution across firms has support $\{\theta(v + k) + (1 - \theta)m, (v + k)\}$ with cdf

$$F_a(p) = 1 - \frac{\theta(v + k - p)}{(1 - \theta)(p - m)}.$$ (4)

c) If $\theta k \leq w^e \leq k$, a fraction $\gamma = (1 - w^e/k)/(1 - \theta)$ of firms require their employees to set $k_i = k$ for each customer contact while the rest require $k_i = 0$. All firms have expected profits of $\mu\theta(v - m) - w$. The firms with $k_i = 0$ have a distribution of prices with support $\{p^*, v\}$ where

$$p^* = m + (v - m)\theta k/w^e,$$

and a cdf of prices given by

$$F_0(p) = 1 - \frac{\theta(v - p)}{(w^e/k - \theta)(p - m)}.$$ (5)

The firms with $k_i = k$ have a distribution of prices with support $\{p^-, p^* + k\}$ where

$$p^- = w^e + \theta v + (1 - \theta)m.$$

The cdf of their prices given by

$$F_k(p) = \frac{p - p^-}{(1 - w^e/k)(p - m)}.$$ (6)

For a given k_i, the main qualitative conclusion of this proposition is the same as that of Burdett and Judd (1983). This is that prices are dispersed in equilibrium with all firms making the same expected profits because those that post higher prices sell with lower frequency. While this correlation between price and quantity is important for what follows, the main novelty in the proposition lies in its conclusions regarding the extent to which firms use salespeople to persuade customers to buy.

The case where $k < w^e$ is the one covered by Burdett and Judd (1983) and can be interpreted as one where firms do not have access to any method for persuading customers. Thus, going from a situations with $k < w^e$ to one where $w^e < k$ can be thought of as involving the discovery of a sales method, an increase in the susceptibility of customers to a sales method or the elimination of a law that bans a particular method. Keeping these interpretations in mind, I now discuss how the nature of equilibria change as w^e varies relative to k.

The relatively radical change from the case where $w^e > k$ to the case where $w^e < \theta k$ leads every firm to adopt the persuasion method in question. This is the easiest change to analyze because the distribution of prices that applies in the former case (3) is the same as the one that applies in the latter case (4) if v is substituted by $v + k$. Thus, (4) can be used to analyze the effect on price of an innovation that is always implemented and raises the customer's willingness to pay by k. Rewriting this equation slightly, we have

$$p = \frac{\theta(v + k - m) + m}{1 - (1 - \theta)F_a(p)}.$$

This says that a one dollar increase in k raises the highest price (the one for which $F_a(p) = 1$) by one dollar. However, the prices such that $F_a(p) = x < 1$ rise by only $\theta/(1 - (1 - \theta)x)$ dollars, which is less than one dollar. This suggests that consumers' whose valuation rises by k are better off as a result of this innovation, while consumers whose valuation for the good does not rise are worse off. A formal proof of this is provided below.

The intermediate case where $\theta k < w^e < k$ is perhaps the most interesting one, because it leads to heterogeneity both in prices and in the tactics used by salespeople. It also leads to two different distributions of prices depending on the value of k_i. The highest price charged by a firm with $k_i = k$ exceeds (by k) the lowest price charged by firms with $k = 0$. If the lowest price charged by firms with $k_i = k$ (which equals $[m + w^e + \theta(v - m)]$) exceeds v, the two distributions do not overlap. This requires that $w^e > (1 - \theta)(v - m)$, which is satisfied if either few customers have access to two offers or if the cost of raising the valuation by k is substantial relative to the gap between consumer value and marginal cost. As a result,

outcomes without overlap in the two price distributions may be relatively rare. Still, this case is conceptually interesting because it shows that this extension of Burdett and Judd (1983) makes it possible for the overall price distribution to have a hole, something that is not possible in the standard case where there is no effort by salespeople.

I now turn to an analysis of the expected quantities sold by different salespeople. Let q_i denote the probability that the salesperson working for firm i makes a sale to a customer, so that this salesperson's expected sales equal μq_i. An important corollary of Proposition 1 is that salespeople who work for firms that set $k_i = k$ have larger expected sales than those that work for firms that set $k_i = 0$. In particular

Proposition 2. *If, for two firms i and j, $k_i = k$ and $k_j = 0$, $q_i \geq q_j$ with the inequality being strict unless the price of firm j equals p^* and that of firm i equals $p^* + k$.*

The intuitive logic of this proposition is that firms are more willing to incur the cost w^e if they are relatively likely to recover this cost through additional sales. Put differently, a firm that would have charged a low price and sold relatively frequently if the technology for raising k was unavailable has more to gain by setting $k_i = k$ and raising its price by k than a firm that was expecting to charge a high price and sell infrequently. The result is that all the firms that sell relatively frequently set $k_i = k$. In spite of this strong effect of the choice of k_i on the likelihood of selling, the availability of a technology to raise k by spending w^e has no effect on the overall distribution of sales. In particular,

Proposition 3. *Regardless of w^e and k, the distribution of the probability of selling q across salespeople is uniform between θ and one.*

The reason expected sales are uniform is that they depend linearly on the cumulative density function for prices, which is by necessity uniformly distributed.

2 The effects of employee effort on consumer welfare

This brief section discusses the implications for welfare as well as for empirical measures of GDP of giving firms access to a persuasion technology that raises willingness to pay by k.

As already suggested, it shows that this persuasion is good for consumers if it raises the utility of purchasing g while it is bad for them if it raises the disutility ℓ of not purchasing. I consider only two extreme cases. In the first, only g_i can be increased (so that $g_i = k_i$ and $\ell_i = 0$) while, in the second, $\ell_i = k_i$ and $g_i = 0$. As a shorthand, I refer to the former as the case where $k_i = g_i$ and the latter as the case where $k_i = \ell_i$.

Proposition 4. *Lowering w^e below k so that some firms set $k_i = k$ reduces the expected utility of consumers if $k_i = \ell_i$ while it raises their expected utility if $k_i = g_i$.*

The intuition behind this proposition is the following. When $k_i = g_i$, salespeople who make an effort actually improve the product for consumers. While it is true that price must be higher to induce salespeople to make this effort, it is not surprising that some of the resulting gains accrue to consumers in the form of increased utility. By contrast, in the case where $k_i = \ell_i$, the effort of employees increases prices but there is no corresponding consumer benefit, and this alone is sufficient to make consumers worse off. In addition, a consumer experiences a direct loss of ℓ if he meets two salespeople who both raise his cost of not buying. This would occur, for example, if he empathizes with the disappointment suffered by the salesperson he does not buy from.

One reason to be interested in the effects of these persuasion techniques on GDP is that a substantial number of workers are engaged in selling activities. According to the U.S. Bureau of Labor Statistics there were 135 million total employees in May 2008, of which it classified 14 million as working in "sales and related" occupations. While many of these employees do not spend enough time with customers to persuade them in the way I have been describing, the overall magnitude of these persuasion efforts is likely to be nontrivial.

As demonstrated in Proposition (3), the volume of sales is unaffected by these efforts. These effort do change the "perceived quality" of goods, particularly when they change g_i. However, statistical agencies charged with computing the national income accounts do not currently attempt to capture changes in this quality, so they would record the change in price attending a change in sales effort as inflation. If the effort of salespeople is unobservable,

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they might not measure the change in the labor input either. However, if the extra employee effort that is needed to boost k_i also involves longer hours of work, the elimination of this effort would be recorded as a decline in the labor input. In this case, the elimination of the sort of sales techniques I have been concerned with might well be counted as an increase in labor productivity. This is remarkable because, from the perspective of their employers, these techniques raise the productivity of salespeople.

Using only price and output data, increases in g and ℓ are observationally equivalent even though they have very different consequences for consumer welfare. I now show that, under certain circumstances, one can distinguish between these two scenarios, by studying the correlation between the empathy of salespeople and their sales volume. This topic should probably also be of independent interest since the role of empathy has been repeatedly discussed in the sales literature.

3   The Preferences of Salespeople

There are two types of salespeople, σ and λ, who differ in their empathy for their customers. Salespeople of type σ are selfish and care only about their effort and the financial compensation paid to them by their employer. In each period that they work in this industry, their utility is

$$\omega^\sigma = w + \mu e(w^e - c) \tag{7}$$

where w is their base wage, c is their cost of raising k_i from 0 to k for a single customer and e is an indicator variable which takes the value of one if they are asked to make this effort. Otherwise $e = 0$.

The salespeople of type λ are somewhat empathetic towards their customers so that their utility ω^λ is given by

$$\omega^\lambda = w + \mu e(w^e - c) + \tilde{\lambda}(u - \bar{u}) \tag{8}$$

where $\tilde{\lambda}$ is a parameter governing this type's empathy (or altruism), u measures the expected utility obtained by each of the individual salesperson's customers and $\bar{u}$ is a baseline level of

utility. The baseline level of utility $\bar{u}$ is unimportant for the analysis below. For concreteness, it can be thought of as being the utility this salesperson expects these customers to obtain if he absents himself from his job. Salespeople of this type could then be seen as comparing the *ex post* utility that their customers receive from what they would have received if the salesperson disappeared and did not treat the customer in the way he was instructed to do. Regardless of the benchmark utility $\bar{u}$, (8) captures the idea that salespeople with an empathetic disposition act as if they valued the pleasing of customers.[8]

Both when $w^e > k$ and when $w^e < \theta k$, salespeople only lose sales when their prospects meet another salesperson who charges a lower price. In the latter case, the expected utility of a prospect who meets a salesperson with a price of p therefore equals

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\begin{aligned}
u_c(p) &= \theta(v + g - p) + (1 - \theta) \left[\int_{\theta v}^{p} (v + g - \ell - y) dF_n(y) + \int_{p}^{v} (v + g - \ell - p) dF_n(y) \right] \\
&= v + g - (1 - \theta)\ell - \left[\theta + (1 - \theta)(1 - F_n(p)) \right] p - (1 - \theta) \int_{\theta v}^{p} y dF_n(y).
\end{aligned}
\tag{9}
$$

where either g or ℓ equal k depending on whether $k_i = g$ or $k_i = \ell$ and where both equal zero when $w^e > k$. The expression in (9) is declining in price. As one might expect, altruistic salespeople experience larger vicarious benefits when they sell at lower prices because this leads to larger utility levels for customers.

I now turn to the effect of e in the case where some salespeople set $e = 0$ while others do not. Those that do, lose sales both when their customers meet another salesperson with a lower price and when they meet one that has set e equal to one. Thus, the expected utility

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[8]As discussed in footnote 2, the more recent empirical literature on sales performance has focused on "customer orientation" rather than empathy. While the Saxe and Weitz (1982) customer orientation scale involves answering 24 questions, several of them ask directly whether the salesperson cares about satisfying customers.

of a customer that meets a salesperson with $e = 0$ and a price of p is

$$u_0(p) = \theta(v - p) + (1 - \theta)\left\{(1 - \gamma)\left(\int_{p^*}^{p}(v - y)dF_0(y) + \int_{p}^{v}(v - p)dF_0(y)\right)\right.$$
$$\left. + \gamma\left[\int_{p^-}^{p^*+k}(v + g - y)dF_k(y)\right]\right\}$$
$$= v + (1 - \theta)\gamma g - \left[\theta + (1 - \theta)(1 - \gamma)(1 - F_0(p))\right]p$$
$$- (1 - \theta)\left[(1 - \gamma)\int_{p^*}^{p}ydF_0(y) + \gamma\int_{p^-}^{p^*+k}ydF_k(y)\right]. \tag{10}$$

where $g = k$ if this is the effect of setting $k_i = k$.

By the same token, an employee who sets $e = 1$ sells to all those prospects whose other salesperson sets $e = 0$. Therefore, a salesperson who charges p with $e = 1$ expects his prospects to have a utility of

$$u_1(p) = \theta(v + g - p) + (1 - \theta)\left\{(1 - \gamma)\int_{p^*}^{v}(v + g - p)dF_0(y)\right.$$
$$\left. + \gamma\left[\int_{p^-}^{p}(v - y + g - \ell)dF_k(y) + \int_{p}^{p^*+k}(v - p + g - \ell)dF_k(y)\right]\right\}$$
$$= v + g - (1 - \theta)\ell - \left[1 - (1 - \theta)\gamma F_k(p)\right]p - (1 - \theta)\gamma\int_{p^-}^{p}ydF_k(y), \tag{11}$$

where, again, either g or ℓ equal k and the other is zero. The effect of e on the seller's vicarious benefits depend on whether it is g_i or ℓ_i that is equal to k_i. In the former case, $\ell = 0$ and $g = k$ in equations (10) and (11). Therefore

$$u_0(p^*) = \theta(v - p^*) + (1 - \theta)\left\{(1 - \gamma)\int_{p^*}^{v}\left(v - \frac{\theta v k}{c}\right)dF_0(y)\right.$$
$$\left. + \gamma\int_{p^-}^{p^*+k}(v + g - y)dF_k(y)\right\} = u_1(p^* + k). \tag{12}$$

Thus, when $k_i = g_i$, the lowest price with $e = 0$ gives the same utility to employees of type λ as the highest price with $e = 1$. It follows that

Proposition 5. *Suppose that $k_i = g_i$ and let ω_i^λ denote the utility of salesperson i, where this individual is of type λ. Then, if there exist i and j such that $\omega_i^\lambda > \omega_j^\lambda$, it must be the case that $q_i > q_j$.*

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This proposition follows directly from the earlier analysis. For a given level of k_i, the two variables are positively related because $u_i(p)$ is decreasing in price while Proposition 1 implies that lower prices lead to more sales. Moreover, Proposition 2 implies that firms with $k_i = k$ provide higher output than firms with $k_i = 0$, with the two providing the same output only when the latter charge p^* while the former charge $p^* + k$. Equation (12) implies that, as long as $k_i = g_i$, consumer utility also stays constant, since the increase in price is matched exactly by an increase in the perceived value of the good. Thus, utility only rises when output is increased and the proposition follows.

If, however, $k_i = \ell_i$ so that $\ell = k$ in (10) and (11), consumers are no longer indifferent between the combination of a price p^* with $k_i = 0$ and a price $p^* + k$ with $k_i = k$. In particular, (10) and (11) now imply that

$$u_1(p^* + k) = u_0(p^*) - k.$$

The effect of the increase in effort and price is to lead consumers to lose an additional k either because they pay this as a higher price (when they just meet one firm with $k_i = k$) or because they incur the psychological cost k (when they meet two firms with $k_i = k$). Thus, the lowest possible value of u_1 is lower than the highest possible value of u_0 in this case. In the case where $k_i = \ell_i$, there are two additional relationships between utility levels that prove to be important below. These are the relationships between the highest value of u_1 (namely that which accrues from a price of p^-) and both the highest and lowest utility levels obtained by consumers who meets a salesperson that sets $e = 0$. If $u_1(p^-) > u_0(p^*)$, the highest level of utility is obtained by a consumer who meets (and buys from) the lowest-priced salesperson who sets $e = 1$. By contrast, when $u_0(v) > u_1(p^-)$ (which obviously implies that $u_1(p^-) > u_0(p^*)$ is violated), salespeople of type λ that set $e = 1$ are all worse off than any employee of type λ that sets $e = 0$. I study these conditions under the assumption that $m = 0$. The condition on parameters that lead $u_1(p^-)$ to be smaller than $u_0(v)$ is given in the following proposition.

Proposition 6. *Suppose $k_i = \ell_i$ and consider the case where $\theta k \leq w^e \leq k$ so that some*

salespeople set $e = 0$ while others set $e = 1$. Suppose also that $m = 0$. Then,

$$u_0(p) = v(1 - \theta) - \theta v \log(p/\theta v) - w^e \log(k/w^e) \tag{13}$$

$$u_1(p) = (v - k)(1 - \theta) - w^e - (w^e + \theta v)\big[\log(p) - \log(w^e - \theta v)\big], \tag{14}$$

so that

$$u_0(v) > u_1(p^-) \qquad \Leftrightarrow \qquad 1 + (1 - \theta)\frac{k}{w^e} - \log\left(\frac{k}{w^e}\right) > -\frac{v}{w^e}\theta \log(\theta) \tag{15}$$

$$u_1(p^-) > u_0(p^*) \qquad \Leftrightarrow \qquad (\theta v + w^e)\log(k/w^e) > k(1 - \theta) + w^e. \tag{16}$$

Condition (15) is very strong, since it ensures that every salesperson that sets $e = 1$ gives lower expected utility to his prospects than any salesperson that sets $e = 0$. One of its implications is that the average utility of prospects who meet a salesperson with $e = 1$, $E(u_1(p))$, is smaller than that of prospects who meet a salesperson with $e = 0$, $E(u_0(p))$. To obtain some insight into the economic forces that lead (15) to hold, note first that the left hand side of (15) is positive since $k/w^e > \log(k/w^e)$. Moreover, $\theta \log(\theta)$ is negative because $\theta < 1$. For given θ and k/w^e, $u_0(v)$ thus exceeds $u_1(p^-)$ as long as w^e/v is large enough. Rises in w^e/v raise p^- relative to v since firms that set $e = 1$ have to recoup the cost w^e. They thus raise the utility of consumers that receive an offer of v with $e = 0$ relative to that of consumers who receive an offer of p^- with $e = 1$. Notice that, since k/w^e is bounded between 1 and $1/\theta$, the relatively high value of w^e/v that is needed implies that k/v must be substantial as well.

The parameters k/w^e and θ have more complex effects on condition (15). Raising k/w^e above 1 increases the potential price a customer with an offer of v might have to pay if his second offer comes from a high-priced salesperson with $e = 1$ and this raises $u_1(p^-)$ relative to $u_0(v)$. On the other hand, an increase in k/w^e also raises the psychological cost that a customer with an offer of p^- faces if he gets a second offer with $e = 1$ and this lowers $u_1(p^-)$ relative to $u_0(v)$. In the case of θ, intermediate values lead to a maximum for $|\theta \log(\theta)|$, which favor $u_1(p^-)$ because they raise the expected price that a consumer who receives an offer of v will have to pay if he receives a second offer from a salesperson with $e = 0$.

Too little is known to calibrate the parameters of (15) on the basis of empirical observations. Still, one would not expect the actual cost of effort w^e to be substantial relative to the subjective value of the product v. It is thus worth knowing that a value of w^e/v of about .23 is sufficient to make (15) hold for any θ in the case where $k = w^e$.[9] The derivative of the left hand side of (15) with respect to k/w^e is negative for $1 \leq k/w^e \leq 1/(1-\theta)$ so that increases in k/w^e above the value of 1 initially imply that higher values of w^e/v are needed for $u_0(v)$ to exceed $u_1(p^-)$. However, smaller values of w^e/v are again compatible with (15) if k/w^e is sufficiently larger than $1/(1-\theta)$, though this requires that θ be relatively small since the conditions of Proposition 6 require that k/w^e be smaller than $1/\theta$. If, in particular, k/w^e is equal to 10, so that θ is less than or equal to .1, (15) is true as long as w^e/v is less than or equal to .12.

This analysis demonstrates that there are robust conditions under which (15) is true, and there are equally robust conditions under which it is violated. I demonstrate below that the validity of this condition has implications for the correlation of the empathy of salespeople with the volume of their sales. The same is true for the condition (16) that makes $u_1(p^-)$ larger than $u_0(p^*)$.

To satisfy this latter condition, k must be sufficiently small. To understand the reason, note that the effort of salespeople is irrelevant and consumers care only about price when k is zero. More generally, the lowest price with $e = 1$ remains the lowest price overall when k is small and, in this case, the loss of k has a limited impact on consumer welfare. As a result, the lowest-priced firm with $e = 1$ remains the consumers' favorite supplier and $u_1(p^-) > u_0(p^*)$.

One possible outcome from having an employee absent himself from his job is that the $\mu\theta$ customers who would have visited only him are unable to buy the good and get zero utility from this transaction. The $\mu(1-\theta)$ customers that have access to another offer, meanwhile, would obtain the expected utility from a single offer. The baseline utility $\bar{u}$ that enters into

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[9]When $k = w^e$, (15) holds as long as w^e/k exceeds $-\theta \log(\theta)/(2 - \theta)$ and this expression reaches a maximum of about .23 for θ equal to about .46.

(8) would then be given by

$$\bar{u} = (1-\theta)\left\{(1-\gamma)\int_{\frac{\theta vk}{c}}^{v}(v-y)dF_0(y) + \gamma\int_{\theta v+c}^{\frac{\theta vk}{c}+k}(v+g-y)dF_k(y)\right\}, \qquad (17)$$

where $g = k$ when the effort raises g whereas $g = 0$ if it raises ℓ. Notice that, since the lowest value of u_0 is $u_0(v)$, (17) and (10) imply that $u_0(v) = \bar{u}$. Since the salesperson that charges v is providing consumers no surplus, it is reasonable to think of consumers as getting as much utility from such a salesperson as from one that is absent. While I included this definition of $\bar{u}$ for concreteness, the behavior of the employees of type λ once they are in the industry is independent of this variable. This variable would play a role if, instead of treating their total supply as exogenous, the decision of individuals of type λ to enter this industry were modeled explicitly.

4 The correlation between empathy and sales

The purpose of this section is to derive the correlation between the empathy of employees and their individual sales in the context of the deterministic model presented so far. Since the employee's type is binary, this correlation can be studied by treating the type as a dummy variable which equals 1 for employees of type λ and zero for employees of type σ. Then, as is well known from the difference-in-differences literature, the regression coefficient of individual sales on the dummy variable representing the salesperson's type equals the difference between the average sales of individuals of type λ minus the average sales of employees of type σ. If $\eta^\lambda(q)$ represents the proportion of salespeople who sell quantity q who are of type λ, then the average sales of people of this type are

$$q_\lambda = \frac{1}{a}\int_\theta^1 \frac{\eta^\lambda(q)qdq}{1-\theta},$$

where I have made use of the fact that the total proportion of altruistic salespeople equals a and that q is uniformly distributed between θ and 1. The average sales of salespeople of type λ exceed those of type σ if q_λ exceeds the overall average of sales across firms $(1+\theta)/2$.

The connection between empathy and sales thus depends on the way that salespeople of the two types sort themselves into jobs with different prices and effort levels. It might be thought that the simplest approach to this problem would be to consider the full-information setup of Rosen (1986) where workers know all the prices charged and the effort required by employers before choosing their jobs. Unfortunately, it is then impossible for the wage paid by firms to be independent of the price they charge unless only type σ workers are employed in equilibrium. The reason is that, if the wage is independent of price and some type λ workers are employed, these workers strictly prefer to be employed by firms that charge a low price. Such firms are thus able to raise their profits by decreasing their wage slightly.

If the wage that firms are required to pay depends on the price that they charge, the earlier analysis based on Burdett and Judd (1983) is invalid. Moreover, computing equilibrium prices in the case where a firm's wage cost depends both on the price the firm charges and the price charged by others is likely to be complicated. I thus opt for a simpler solution, namely to suppose that the pricing decisions of firms are not known to workers when they decide which job to accept. It is worth stressing, however, that the conclusion of the analysis, namely that altruistic workers are concentrated in the jobs whose prices and effort levels they find more attractive, is likely to remain valid in a more complex model.

I consider both a one-period model and a dynamic extension. In each period there are μ new consumers per firm in each period, which have the properties assumed earlier (so that, for example, a fraction θ visits one salesperson while the rest visit two). At the beginning of each period there is also a queue of potential employees who decide, in sequence, whether to accept a job posted by a firm in the industry under study. Potential employees are assumed to accept one of the available jobs for the period if they are indifferent between doing so and not working in the industry. If they choose to work in other industries, potential employees of type σ obtain a reservation utility of $\bar{w}$ per period.

Consider first a model with a single period. At the beginning of this period, potential firms publicly post their compensation terms, which consist of a base wage w_i and a compensation for effort w_i^e. After firms post these offers, a series of potential salespeople are placed

in a queue. These employees decide, in sequence, which job offer to accept, if any. At the moment that a job is accepted, it ceases to be available to potential employees occupying later positions in the queue.

There is a finite number A of potential employees of type λ at the head of this queue, and there is an unlimited number of potential employees of type σ after this. The assumption that potential employees of type λ are at the head of the queue is a simplification which is meant to capture that they are in sufficiently finite supply that they are inframarginal from the point of view of wage setting. I suppose, in particular that the fraction of empathetic employees $a = A/N$ is smaller than $\gamma(1 - \gamma)$ where γ is the fraction of firms that set $k_i = k$. Notice that my assumption of a fixed finite supply obviates the need to explicitly discuss the reservation wage of employees of type λ, although, implicitly, this wage must be low enough that these employees gain utility from accepting the compensation in this industry.

I now show that, if potential employees do not know the price that individual firms intend to charge, there is an equilibrium where all firms offer a base wage w equal to $\bar{w}$ and set their effort compensation w^e equal to c. Since firms can attract an unlimited supply of workers of type σ on these terms, any firm that offers a higher w or w^e is strictly worse off. Now consider a firm planning to set $e = 0$. If it deviates and offers a lower base wage, it cannot attract either employees of type λ, who have better options at the same effort level, or employees of type σ, who find the offer insufficient. The same logic applies to a firm planning to set $e = 1$ which offers either a lower base wage or a lower compensation for effort.

These wages apply in all three cases considered in Proposition 1. Since $w^e = c$, Proposition (1) implies that all firms ask their employees to make the same effort when $c < \theta k$ or $c > \theta$. Altruistic employees are then indifferent with respect to all the offers that are made in equilibrium. They pick employers at random, and there is no connection between employee altruism and the level of sales.

The more interesting case is where $\theta k < c < k$ so that only some firms ask their employees to set $e = 1$. Propositions 2 and 4 then imply immediately

Proposition 7. *Suppose that there is a single period, that $\theta k < c < k$ and that firms credibly*

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communicate to potential employees whether they will set $e = 0$ or $e = 1$. Then $\eta^\lambda(q)$ is larger for $q > c/k$ than for $q < c/k$ when salesperson effort is good for consumers. When this effort makes consumers worse off and $E(u_1(p)) < E(u_0(p))$, $\eta^\lambda(q)$ is larger for $q < c/k$ than for $q > c/k$.

The correlation of altruism with sales is thus positive when the effort e benefits consumers while it can be negative when it is bad for them. I now show that the result that negative correlation between empathy and sales is indicative of a situation where the selling effort reduces welfare extends to a setting that is somewhat more realistic along two dimensions. The first assumption of the previous analysis that can be questioned is that workers know the effort level required by firms. Competition for workers forces all firms to offer the same compensation, so that firms are left with no reason to convey this information themselves. Bone's (2006) description of how he was hired suggests that, in fact, some sales-oriented firms make little effort in this regard. Instead of describing the job in detail, his employer simply expected those that did not "fit in" to move elsewhere. This brings up the second weakness of the analysis to this point, which is that its focus on a single period precludes labor mobility.

I therefore consider a multi-period model that starts in period 1 and where a worker of type i has a utility of

$$E \sum_{t=1}^{\infty} \hat{\rho}^{(t-1)} \omega_t^i \qquad\qquad i = \lambda, \sigma, \tag{18}$$

where $\hat{\rho}$ is a discount factor and ω_t^i represents the period utility at t. The period utility is given by (7) or (8) if the individual works in the industry. Individuals of type σ receive a per-period utility of $\bar{w}$ outside the industry. In each period, each firm faces a new μ customers with the same properties as the customers we have analyzed so far (so that a fraction θ visits only one salesperson, for example). The labor market in period 1 is identical to the one in the single-period model considered so far. It starts with firms posting compensation levels. I suppose that firms are not allowed to change these compensation offers in subsequent periods. After these offers are posted, a queue of potential employees chooses which, if any,

firm to work for. The queue continues to be headed by A workers of type λ, though workers are now assumed not to know the effort level required by potential employers when they are choosing whether to accept one of these offers.

Workers who accept a job at the beginning of period t are required to complete the job's requirements for that period, and thereby learn the required level of effort. At the end of each period, a fraction ψ of workers leaves the industry for exogenous reasons. These workers are replaced by workers from the queue that forms at the beginning of the next period. To keep the total number of employees of type λ constant, the queue of potential new recruits that forms every period is headed by $\psi a N$ workers of type λ with all subsequent potential employees being of type σ.

The $(1 - \psi)N$ workers who are not forced to leave the industry at the end of the period can seek to change their employer. If they do so, they take positions at the front of the queue of potential employees. In other words, if X employees quit their current job and are willing to remain in the industry, these X individuals get to pick first which of the $\psi N + X$ open jobs they wish to join in the next period. When they make this choice, they again do not know the effort level required by potential employers.

Before analyzing the mobility of workers, it is worth noting that an equilibrium continues to exist in which the base wage is equal to $\bar{w}$ while w^e equals c. Firms have no problem attracting employees at these wages, so raising wages only raises their costs. Similarly, a firm that lowers either of these forms of compensation is unable to attract workers in the initial period. At this equilibrium, workers of type σ are indifferent among all jobs and I thus suppose they stay at their existing job until they are forced to leave the industry.

Workers of type λ, on the other hand, obtain more vicarious utility at those firms that have a higher u, where this represents the expected utility of customers that meet these firms. Let $z_t(\tau, u)$ denote the joint density at t (across jobs or firms) of u and the type τ of employees. The cdf of the marginal distribution of expected customer utility u is denoted by $G(u)$. This is constant over time because the distribution of prices and effort levels is constant over time and u depends on only these variables. The overall probability that

employees are of type λ is constant as well, and equal to a. As long as the assignment of employee types to jobs varies over time, the joint distribution z_t varies over time as well. My focus, however, is on its steady state $z(\tau, u)$.

When working at a job that gives customers an expected utility of u, a worker of type λ obtains a vicarious utility $\mu\tilde{\lambda}u$. Maximizing the expected present discounted value of this vicarious utility is thus equivalent to maximizing the the present value of the expected utilities u earned by the salesperson's customers. Let $V(u)$ represent, in steady state, this present value for a salesperson who provided a utility u to his customers in his previous job and who thus has the option of providing this utility once again by remaining in this job. By moving, this individual gets a random draw from the distribution of consumer utility levels offered by those firms that need to fill a job. Let $H(u)$ denote the cdf of this steady state distribution. Then $V(u)$ satisfies

$$V(u) = \max\left(u + \rho V(u), \left[\int (y + \rho V(y))dH(y)\right]\right) \tag{19}$$
$$\text{where} \quad \rho = \hat{\rho}(1 - \psi),$$

where this equation takes into account that the salesperson has a probability ψ of exiting the industry in the next period. Since the term in square brackets in this equation is independent of u, V is increasing in u. There thus exists a critical value of u, which I label by $\hat{u}$ such that $u + \rho V(u)$ is smaller than the term in square brackets for $u < \hat{u}$ and is larger for $u > \hat{u}$. For $u = \hat{u}$ the two expressions are equal.

This implies that employees of type λ stay in jobs that provide customers an expected utility greater than or equal to $\hat{u}$ while they leave all jobs that provide smaller utility. Thus,

$$V(u) = \begin{cases} u + \rho V(u) = u/(1 - \rho) & \text{if} \quad u \geq \hat{u} \\ \int (y + \rho V(y))dH(y) = V(\hat{u}) & \text{if} \quad u < \hat{u}, \end{cases} \tag{20}$$

where the last equality follows from the fact that individuals are indifferent between staying and leaving at $\hat{u}$. Combining these equations, we have

$$V(\hat{u}) = \frac{\hat{u}}{1 - \rho} = \int_{-\infty}^{\hat{u}} ydH(y) + \rho H(\hat{u})V(\hat{u}) + \int_{\hat{u}}^{\infty} \frac{y}{1 - \rho}dH(y),$$

so that

$$\hat{u}(1 - \rho H(\hat{u})) = \int_{-\infty}^{\hat{u}} (1 - \rho)ydH(y) + \int_{\hat{u}}^{\infty} ydH(y),$$

or

$$\rho = \frac{\hat{u} - \int_{-\infty}^{\infty} ydH(y)}{\hat{u}H(\hat{u}) - \int_{-\infty}^{\hat{u}} ydH(y)}. \tag{21}$$

It follows from equation (21) that, when ρ equals zero, $\hat{u}$ equals the mean of u (according to the distribution H) while it equals the maximum value in the support of H when ρ equals one. Moreover, it is easily verified that the right hand side of (21) is monotonically increasing in $\hat{u}$. This implies that, for any $\hat{u}$ above the mean of H, one can use this equation to find a ρ such that this $\hat{u}$ is the minimal level of utility that is required for an employees of type λ to stay at his current job. I take advantage of this in the analysis that follows by treating $\hat{u}$ as given, with the understanding that one still needs to check that a ρ can be found to rationalize this $\hat{u}$. For this given value of $\hat{u}$, I now study H and steady state distribution of employees of type λ across jobs.

To do this, one must first clarify the properties of $G(u)$, the probability that a job chosen at random offers a utility less than or equal to u to its individual customers. If all jobs had the same k_i, this probability would equal the probability that the price exceeds that which gives an expected utility of u. Thus, when $c < \theta k$ or $c > \theta$, we have

$$G(u) = 1 - F_i\left(u_i^{-1}(u)\right) \qquad i = a, c$$

When $\theta k < c < k$, encounters with either salespeople who set $e = 0$ or encounters with salespeople that set $e = 1$ can lead expected utility to be lower than u. We thus have in this case

$$G(u) = (1 - \gamma)\left[1 - F_0\left(u_0^{-1}(u)\right)\right] + \gamma\left[1 - F_k\left(u_1^{-1}(u)\right)\right].$$

As we saw, all salespeople of type λ whose job gives customers an expected utility level u below $\hat{u}$ quit their jobs, while those whose jobs give higher utility stay. Job changers give an expected utility level drawn from H. Therefore, if either both u^1 and u^2 are no smaller

than $\hat{u}$ or if they are both strictly smaller

$$\frac{z(\lambda, u^1)}{z(\lambda, u^2)} = \frac{g(u^1)}{g(u^2)},$$

where $g(u)$ is the density of u implied by G. It follows that all jobs with consumer utility $u \geq \hat{u}$ have the same fraction η of employees of type λ while all those jobs with utility $u < \hat{u}$ have a fraction $\hat{\eta}$ of employees of type λ where

$$\eta = \frac{z(\lambda, u)}{g(u)} \qquad\qquad \forall u \geq \hat{u}$$

$$\hat{\eta} = \frac{z(\lambda, u)}{g(u)} \qquad\qquad \forall u < \hat{u}$$

$$a = (1 - G(\hat{u}))\eta + G(\hat{u})\hat{\eta}. \tag{22}$$

The last equality follows from the fact that the overall fraction of employees of type λ equals a. Knowledge of η is sufficient to obtain $H(u)$ from $G(u)$. To see this, note first that, if $\tilde{u} \leq \hat{u}$, the total number of posted jobs with an $u \leq \tilde{u}$ is the sum of $\psi G(\tilde{u})N$ (the number of dissolved jobs with $u \leq \tilde{u}$) and $(1 - \psi)\hat{\eta}G(\tilde{u})N$ (the number of non-dissolved jobs with $u \leq \tilde{u}$ held by employees of type λ). If, instead, $\tilde{u} > \hat{u}$ the total number of posted jobs with $u \leq \tilde{u}$ equals the dissolved jobs $\psi G(\tilde{u})N$ plus the total number of jobs abandoned by employees of type λ, $(1 - \psi)\hat{\eta}G(\hat{u})N$. Therefore

$$H(u) = \begin{cases} \left[\psi + \hat{\eta}(1 - \psi)\right]G(u) \Big/ \left[\psi + \hat{\eta}(1 - \psi)G(\hat{u})\right] & \text{for } u \leq \hat{u} \\ \left[\psi G(u) + \hat{\eta}(1 - \psi)G(\hat{u})\right] \Big/ \left[\psi + \hat{\eta}(1 - \psi)G(\hat{u})\right] & \text{for } u > \hat{u}. \end{cases} \tag{23}$$

To characterize the equilibrium, one now needs the value of either η or $\hat{\eta}$. This is given in the following proposition.

Proposition 8. *The steady state proportion η satisfies*

$$(1 - \psi)(1 - G(\hat{u}))\eta^2 - [a + \psi(1 - a) + (1 - \psi)(1 - G(\hat{u}))]\eta + a = 0. \tag{24}$$

For $0 < \psi < 1$, this equation has a root strictly between a and one so that $\eta > \hat{\eta}$.

In the case where ψ equals one so that every job terminates after one period, employees of type λ spread themselves evenly across all available jobs so that $\eta = a$. For lower values of ψ, the departure of employees of type λ from jobs with $u < \hat{u}$ leads them to be more concentrated in jobs that give them higher utility so that $\eta > a$. Employees of type σ end up correspondingly concentrated in jobs whose u is below $\hat{u}$. The mean value of u, which is a measure of the utility that employees of type λ would obtain in a particular job, is thus larger for employees of type λ than for employees of type σ.

In the case where $k_i = g_i$, Proposition 5 implies that higher values of u are associated with higher expected sales. Thus, the over-representation of altruistic employees in jobs with high values of u implies that their mean sales are higher as well, so that empathy and sales are positively correlated.

The following two propositions show that, when $k_i = \ell_i$, the correlation between empathy and sales is ambiguous.

Proposition 9. *Suppose $k_i = \ell_i$ and (15) is satisfied. There then exists a range of values for ψ and ρ such that employees of type λ quit all jobs with $e = 1$ and stay at those jobs with $e = 0$. As a result, the proportion $\eta^\lambda(q)$ is equal to η for values of q below c/k while it equals $\hat{\eta} < \eta$ for $q > c/k$. The correlation between empathy and sales is therefore negative.*

For these parameters, employees of type λ abandon jobs with $e = 1$ to look for new jobs. They thus end up being concentrated in jobs with $e = 0$ even though they only learn about the effort that jobs require after joining these jobs. The reason there is more than a single combination of ψ and ρ that fulfills the requirements of Proposition 9 is that, when (15) holds, altruistic salespeople obtain strictly less utility at the "best" job with $e = 1$ than at the "worst" job with $e = 0$. As a result, several discount rates lead the expected present discounted value of staying at any job with $e = 1$ to be lower than that of leaving while the opposite is true for the best job with $e = 0$.

Choosing a $\hat{u}$ so that the range of jobs that altruists accept coincides with the range where $e = 0$ facilitates construction of an equilibrium with a negative correlation between

altruism and sales. With (15) satisfied, the correlation stays negative even if $\hat{u}$ is slightly above $u_1(p^* + k)$ (so that salespeople of type λ quit some jobs with $e = 1$) or slightly below $u_0(v)$ (so that they keep some jobs with $e = 0$).

When (15) is violated, and particularly when (16) holds, the correlation between empathy and sales can become positive. We have, in particular,

Proposition 10. *Suppose $k_i = \ell_i$ and (16) is satisfied. There then exist values of ψ and ρ such that $\hat{u} = u_0(p^*)$. As a result, the proportion $\eta^\lambda(q)$ is equal to η for all levels of q greater than or equal to q^* and equals $\hat{\eta} < \eta$ for all levels of q smaller than q^*. The correlation between altruism and output is therefore positive.*

Since (16) is satisfied, the cost k is relatively small so that consumers receive their highest possible utility when they encounter a salesperson with $e = 1$ that sets a price of p^-. Empathetic salespeople are then willing to have their customers incur the cost ℓ as long as they do so at firms that charge low enough prices. The result is that the sales of empathetic salespeople are relatively high.

The combination of Propositions 9 and 10 and the more general result for the case where $k_i = g_i$ implies that, in the deterministic case I have considered so far, a negative correlation between empathy and sales is indicative of a situation where $k_i = \ell_i$ while a positive correlation is not enough to rule out the possibility that the sales effort is socially deleterious. I now turn to the case where the persuasiveness of salespeople is stochastic.

5   A generalization with skeptical consumers

Suppose that a fraction α of customers is "susceptible" to persuasion by salespeople while the rest are "immune." When a salesperson incurs the cost e, the former change their attitude towards purchasing in the manner discussed above. By contrast, the latter do not suffer any loss when they do not buy and continue to gain v from purchasing regardless of whether the salesperson incurs the cost e or not. Salespeople do not know in advance who is susceptible and who is immune, so the choice of effort cannot be made dependent on the customer's

type.

I start by giving conditions on parameters under which there is no equilibrium in which all firms set $e = 0$ because some firms would benefit by deviating and setting $e = 1$. To do this, recall from Proposition 1 that expected sales for a firm that sets $e = 0$ and a price of p, $q_0(p)$ in an equilibrium where all firms set $e = 0$ satisfy

$$q_0(p) = \begin{cases} 1 & \text{if } p < m + \theta(v - m) \\ \theta(v - m)/(p - m) & \text{if } p_0^- \equiv m + \theta(v - m) \leq p \leq v \\ 0 & \text{if } v < p. \end{cases} \qquad (25)$$

At this equilibrium, all firms earn expected profits per customer (net of the base wage) equal to $\theta(v - m)$. A firm that deviates and sets $e = 1$ while charging p sells with probability $q_0(p - k)$ to susceptible customers while it sells with probability $q_0(p)$ to immune ones. Such deviations are thus profitable if a price exists such that the expected profits per customer (net of base wages)

$$\big[\alpha q_0(p - k) + (1 - \alpha)q_0(p)\big](p - m) - w^e \qquad (26)$$

exceed $\theta(v - m)$. An equilibrium where all firms set $e = 0$ exists if and only if (26) is smaller than $\theta(v - m)$ for all p. To obtain more specific conditions one must distinguish between the cases where

$$(1 - \theta)(v - m) < k \qquad (27)$$

holds and the case where it is violated. In the latter case, k is small enough for a range of prices p to exist such that $k + p_0^- \leq p \leq v$ where p_o^- is defined in (25). For these prices, (25) implies that both $q_0(p - k)(p - k - m)$ and $q_0(p)(p - m)$ are equal to $\theta(v - m)$. Using this in (26), the profits per customer resulting from such a deviation equal

$$\theta(v - m) + \alpha q_0(p - k)k - w^e. \qquad (28)$$

The profits from this deviation are maximized by setting p equal to $p_0^- + k$, which leads $q_0(p - k)$ to equal one. Profits from deviating then equal $[\theta(v - m) + \alpha k - w^e]$ so that, when (27) is violated, equilibria where all firms set $e = 0$ fail to exist if

$$\alpha k - w^e > 0.$$

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Notice that lowering p below p_o^- reduces profits from deviating because the probability of selling to susceptible consumers does not rise above one while the price they pay falls. Deviating by setting a price above v is equally unattractive since it eliminates sales to the skeptical consumers while lowering the profits from the susceptible ones. Thus, when (27) does not hold, equilibria where all firms set $e = 0$ do exist if the above condition is violated as well.

Now turn to the case where (27) is satisfied. Two sorts of deviations are now worth considering. In the first, a deviating firm sets a price above v and turns away all immune customers while, in the second, it sets a price smaller than or equal to v and sells to some of them. The expected profits per customer from the first kind of deviation are given by the left hand side of (28) with the term in square brackets set to zero (because there are no sales to immune customers). These profits increase when $q_0(p - k)$ rises, so that the most profitable price is $p_0^- + k$. For this deviation to be profitable, it must be the case that

$$\alpha k - (1 - \alpha)\theta(v - m)) - w^e > 0. \tag{29}$$

In the second type of deviation, the deviating firm's price p is no larger than v so that $p - k$ is strictly smaller than p_0^-. Equation (25) then implies that its profits per customer are given by the left hand side of (28) with the term in curly brackets set equal to $\alpha(p - m)$ (because it sells to all its susceptible customers). This is maximized by setting the highest possible price, which here involves setting $p = v$. This deviation is thus profitable when

$$\alpha(v - m) + (1 - \alpha)\theta(v - m) - w^e > \theta(v - m) \qquad \text{or} \qquad \alpha(1 - \theta)(v - m) - w^e > 0. \tag{30}$$

When (27) holds, an equilibrium where all firms set $e = 0$ exists only if both (29) and (30) are violated.

I now turn to the study of equilibria in two situations where no equilibrium exists with all firms setting $e = 0$. In both of these situations, (27) holds. In the first, (29) holds as well, while (30) does not. This can be thought of as a situation where both w^e and k are "large." Given the high cost of setting $e = 1$ and the substantial impact this has on

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susceptible customers, all the firms that set $e = 1$ charge a price above v so that immune customers do not buy from them. In the second case I consider, (30) holds so w^e is more modest. Together with the other conditions I impose, this leads to equilibria where firms that set $e = 1$ charge prices below v and, indeed, charge prices that are also charged by firms that set $e = 0$. The result is that, at these equilibria, firms that set $e = 1$ have larger sales. As a result, it becomes possible once again for altruistic salespeople to sell less than selfish ones because the former prefer not to set $e = 1$.

When, instead, firms that set $e = 1$ charge prices above v, their sales tend to be lower. I start by studying parameters that give rise to outcomes of this sort.

Proposition 11. *Suppose that (30) is violated. Then, for any fraction of susceptible customers $\alpha > 0$ there exists an equilibrium where a fraction $\gamma > 0$ of firms set $e = 1$ while the rest set $e = 0$. This equilibrium requires that the parameters k and w^e satisfy*

$$\alpha(1 - \gamma(1 - \theta))k - w^e = \left[\frac{1 - \alpha}{1 - (1 - \theta)\alpha\gamma}\right](\theta + (1 - \theta)(1 - \alpha)\gamma)(v - m) \qquad (31)$$

which implies (27) and (29).

Let

$$p^* = m + \frac{\theta + (1 - \theta)(1 - \alpha)\gamma}{1 - (1 - \theta)\alpha\gamma}(v - m) \qquad (32)$$

$$p_1^- = m + \frac{w^e}{\alpha} + \frac{\theta + (1 - \theta)(1 - \alpha)\gamma}{\alpha}(v - m). \qquad (33)$$

The prices of firms that set $e = 0$ lie between p^* and v and have cdf

$$F_0(p) = 1 - \frac{[\theta + (1 - \theta)(1 - \alpha)\gamma](v - p)}{(1 - \theta)(1 - \gamma)(p - m)}. \qquad (34)$$

The prices of the firms that set $e = 1$ lie between p_1^- and $p^* + k$ and have a cdf

$$F_1(p) = \frac{p - p_1^-}{(1 - \theta)\gamma(p - m)} \qquad (35)$$

When $\gamma = 0$, (34) reduces to (3) so that the equilibrium is the standard Burdett-Judd (1983) outcome displayed in part a) of Proposition 1. As γ is increased, prices rise for two

reasons. First, note that the violation of (30) implies that p_1^- in (33) exceeds v. Thus, the fraction γ of firms that sets $e = 1$ charges more than v, which was originally the highest price. This not only raises prices directly but also implies that firms that set $e = 0$ find themselves with a larger group of customers whose purchases are insensitive to price, namely the immune customers whose other salesperson set $e = 1$. As a result, profits of firms that set $e = 0$ must be higher, and this requires higher prices. Formally, $F_0(p)$ in (34) falls when γ increases so that the distribution of prices conditional on finding a firm with $e = 0$ for a particular γ stochastically dominates the corresponding distribution for a lower value of γ.

This increase in prices makes immune consumers worse off. If one interprets a simultaneous increase in α and γ as an increase in the number of credulous consumers coupled with an increase in the number of firms willing to devote themselves exclusively to serve them, then this increase in credulity is costly to "sophisticated" customers. This can be compared with Eliaz and Spiegler (2006), Gabaix and Laibson (2006), and Armstrong and Chen (2008), who also consider firms with customers with varying levels of sophistication. As in Armstrong and Chen (2008) but unlike in the other two papers, credulity is costly to immune customers. The reason is similar in both models, namely that firms switch their product in the direction of those purchased bi the susceptible agents. Here they do so by increasing their selling effort, which reduces the competition for immune consumers, while in Armstrong and Chen (2008) they do so by producing a low quality good that only naive customers are willing to buy.[10]

When $k_i = \ell_i$, the effort e of salespeople also makes them worse off (since they pay more than the valuation v and sometimes lose an additional k). Thus, overall welfare is reduced by the availability of the persuasion technology in this case. Matters are more complex when $k_i = g_i$ so that the utility of naive consumers is increased by the effort e. Even if the result is a net gain in the welfare of susceptible consumers, average consumer welfare can still fall if

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[10]While ignored in the current analysis, there is an even more direct way in which immune consumers pay for the resources involved in the selling effort. They do so by spending time listening to arguments by salespeople. As discussed extensively by Bone (2006), these often purposefully delay giving a price quote until after they have presented these arguments.

the decline in the utility of immune consumers is large enough. I now construct a numerical example where this does indeed occur.

For all the simulations carried out in this paper, $v = 1$ and $m = 0$, where these choices are inessential. In the current simulation, θ is equal to .2 while α takes values on a grid between 0.001 and .999. For each value of α I consider, I set $\gamma = \alpha$ and set w^e so that it equals .01 plus the value that makes (30) hold as an equality. The first panel of Figure 1 displays the resulting values of w^e and k, which is given by (31), as a function of my choice of α. The second panel displays, for the case where $k_i = g - i$, the resulting values of expected utility. The expected utility of immune consumers is simply equal to the expectation of $v - p$, where p is the price that they pay, while that of susceptible ones is the expected value of $v + k - p$. The Figure also displays the average expected utility of consumers, which gives a weight of $(1 - \alpha)$ to the former and a weight of α to the latter.

This Figure shows that, for low values of α average expected utility is declining in the proportion of susceptible consumers. The main reason for this is that, as just discussed, the utility of immune consumers declines as α and γ increase. The effect of changes in α on the utility of susceptible consumers depends to an important degree on the assumed changes in k, so the figure does not clarify the effect of α, by itself, on this utility. Rather, the Figure is only intended to demonstrate that one can change parameters so that susceptible consumers are better off, as when α increases beyond the value of about .13, while average utility falls because the losses of immune consumers outweigh the gains of susceptible ones.

This possibility that an effort that makes susceptible consumers better off is nonetheless bad for consumers as a whole raises the question of whether it is now possible for the correlation between empathy and sales to be negative even though the effort e enhances the utility of certain consumers. The third panel of Figure 1 demonstrates that this is indeed possible. For α above about .37, the expected utility of consumers that meet a salesperson with $e = 1$ and a price of p^- exceeds the expected utility of consumers that meet a salesperson with $e = 0$ and a price of p^*.

As discussed earlier, this implies that the job that gives the highest level of utility to

altruistic salespeople is the ones with $e = 1$ and a price of p^-. It thus becomes possible to find values of ψ and ρ so salespeople of type λ are mostly found in jobs with $e = 1$ and prices near p^-. The Figure shows that, for values of α between about .35 and .5, expected sales of these employees, $q_1(p^-)$ are lower than average sales $E(q)$. The parameters associated with α between .37 and .5 thus lead to a negative correlation between altruism and sales. One difference with the negative correlation in $k_i = \ell_i$ case is that now the salespeople of type λ are setting $e = 1$. The parameters that accomplish this seem fairly special. Nonetheless, this demonstrates that empirical instances of negative correlations between empathy and sales need to be studied further before it is determined that the salespeople involved are causing harm to their consumers. This is particularly so because, as the Figure demonstrates, these negative correlations can be found for parameters where the persuasive efforts of salespeople also increase the average expected utility of consumers.

I now briefly discuss some implications of these parameters for the case where $k_i = \ell_i$. These are depicted in the bottom panel of Figure 1. This panel shows that, for all these parameters, the expected utility of consumers who encounter a salesperson with $e = 0$ and a price of v exceeds the expected utility of consumers who meet a salesperson with $e = 1$ and a price of p^-. Both of these salespeople give the same utility to immune consumers since these do not buy from the former and obtain no surplus from the latter. The difference is that susceptible consumers are at risk of losing k as soon as one of their salespeople sets $e = 1$. Moreover, k has to be larger than in the deterministic context because firms that set $e = 1$ now sell less frequently. For this reason, these salespeople give consumers quite low utility when $k_i = \ell$.

For low values of α, salespeople who set $e = 1$ also have low sales. As α increases, the expected sales of firms that set $e = 1$ ($E(q_1)$) rise above those $E(q_0)$, the expected sales of those that set $e = 0$. In the numerical exercises this starts occurring when α reaches .7. From that point on, it is straightforward to choose values of ψ and ρ such that altruistic salespeople stay at jobs with $e = 0$ (which give utility of $u_0(p^*)$ or more) while they leave jobs with $e = 1$ (which give utility of $u_1(p^-)$ or less). There is then a negative correlation

between empathy and sales. This demonstrates that, just as in the deterministic case, it is relatively straightforward to obtain parameters where the correlation between empathy and sales is negative if the effort of salespeople increases consumers' cost of not buying from them. The reason is that such salespeople make consumers worse off while their sales tend to be high, at least if susceptible consumers are sufficiently numerous.

I now turn to a set of parameters that lead firms that set $e = 1$ to charge less than v. This leads such firms to have relatively high sales, since they also sell to immune consumers. Since these firms still impose costs on susceptible consumers when $k_i = \ell_i$, it becomes easy once again to find parameters such that the correlation between sales and altruism is negative.

Proposition 12. *An equilibrium with a proportion $\gamma > 0$ of firms setting $e = 1$ exists if*

$$w^e = \alpha(1 - \gamma)(1 - \theta)(v - m), \tag{36}$$

$$\theta \geq \frac{(1 - \alpha)(1 - \gamma)}{1 + (1 - \alpha)(1 - \gamma)}, \tag{37}$$

$$(1 - \theta)^2 \alpha \gamma^2 - ((1 - \theta)\alpha) + 1 + \theta)\gamma + 1 > 0, \tag{38}$$

and

$$v - m < k + p^* - m < \left[\frac{\alpha(1 - \gamma)(1 - \theta) + \theta}{\alpha(1 - \gamma)(1 - \theta) + \alpha\theta} \right] (v - m), \tag{39}$$

where

$$p^* - m = \frac{\theta(v - m)}{1 - \alpha\gamma(1 - \theta)}. \tag{40}$$

These conditions also ensure that there is no equilibrium where all firms set $e = 0$. Let $F_i(p)$ denotes the cumulative distribution function of the prices charged by firms with $e = i$. At the equilibrium where a fraction γ of firms sets $e = 1$, these cdf's satisfy

$$F_1(p) = \frac{1 + (1 - \alpha)(1 - \theta)\gamma}{\gamma(2 - \alpha)(1 - \theta)^2} - \frac{w^e + \alpha\theta(v - m)}{\alpha\gamma(2 - \alpha)(1 - \theta)(p - m)} \qquad \text{for } p^- \leq p \leq v \quad (41)$$

$$F_0(p) = \frac{1 - \alpha\gamma(1 - \theta)}{(1 - \gamma)(1 - \theta)} - \frac{\theta(v - m)}{(1 - \gamma)(1 - \theta)(p - m)} \qquad \text{for } p^* \leq p \leq p^- \quad (42)$$

$$= \frac{\theta}{(2 - \alpha)(1 - \gamma)(1 - \theta)^2} - \frac{\alpha\theta(v - m) - (1 - \alpha)w^e}{\alpha(2 - \alpha)(1 - \gamma)(1 - \theta)(p - m)} \qquad \text{for } p^- \leq p \leq v \quad (43)$$

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where

$$p^- - m = \frac{1 - \gamma(1 - \theta)}{1 + (1 - \alpha)(1 - \theta)\gamma}(v - m). \tag{44}$$

This proposition involves several restrictions, and an obvious question is whether there are any parameters that satisfy all of its requirements. One way of showing that such parameters do indeed exist is to present numerical simulations of parameters that do fulfill all its requirements, and I do so below. Direct inspection of its conditions also suggests that the range of parameters where it applies is nontrivial. Note first that term in square brackets in (39) is greater than one so that one can find a range of k's that fulfill this condition for any values of the other parameters. Note further that (37) is satisfied for θ larger than one half when α and γ both zero and that it becomes less restrictive as either of these parameters becomes larger.

Finally, the quadratic equation on the left hand side of (38) has two positive roots, only one of which is smaller than one. Thus (38) is satisfied for values of γ below a critical value that is between zero and one. Analysis of this equation reveals that this critical is greater than or equal to $1/2$ for any values of θ and α. It equals $1/2$ in the limit when θ goes to one, and is larger for smaller values of θ.

Figure 2 presents some outcomes from a set of parameters satisfying the requirements of Proposition 12. The Figure is drawn under the assumption that γ is equal to .3. It allows α to vary between .01 and .99. Whenever possible, the value of θ is set equal to .2. For values of α below .66, this would violate (37) and the value of θ is thus set just above the value that makes (37) hold. The Figure plots the resulting value of θ as well as $E(q_1) - E(q_0)$, the difference between the expected sales per customer for firms that set $e = 1$ and the expected sales per customer for firms that set $e = 0$. Not surprisingly, this is strictly increasing in the fraction of susceptible customers α. A larger fraction of such customers ensures higher sales for the fixed fraction of salespeople that set $e = 1$.

Lastly, the Figure plots the difference $(u_1(p^-) - u_0(v))$ between the average utility of customers who visit a salesperson with $e = 1$ and a price of p^- and the average utility of customers who visit one salesperson with $e = 0$ and a price of v. This difference in utility,

is drawn under the supposition that $k_i = \ell_i$ so that the effort of salespeople reduces utility. This difference in utility depends on k, with higher values of k implying larger losses to susceptible customers who do not buy from a salesperson that set $e = 1$. The constraint (39) limits the allowable range of k, however. For $\alpha = .8$ and the other parameters of the Figure, for example, k has to be between .75 and .82 (where v has been normalized to equal 1 and m has been set to equal zero). This differences has only a very mild effect on the results, so the Figure is drawn for k set at the midpoint of the two extremes allowed by (39).

The effect of an increase in α is to reduce $(u_1(p^-) - u_0(v))$. The reason is not that increases in α endogenously increase k. In fact both limits of (39) decline slightly when α rises. A factor that contributes to the effect of α is the induced decline in θ, since this lowers p^* and thus the average prices charged by firms that set $e = 0$. However, $(u_1(p^-) - u_0(v))$ also declines with α in the part of the Figure where θ is constant. This occurs because an increase in α raises the number of susceptible customers who lose ℓ when they meet two salespeople who set $e = 1$ and this reduces $u_1(p^-)$.

The result is that, for α large enough, one can again construct equilibria with a negative correlation between sales and empathy. When α exceeds .5, $(u_1(p^-) - u_0(v))$ is negative while there are sufficient susceptible consumers that $E(q_1) - E(q_0)$ is positive. The former implies that any job with $e = 1$ gives lower utility to altruistic salespeople than any job with $e = 0$. There thus exist values of ψ and ρ such that altruistic salespeople stay in the latter but quit the former. The fact that $E(q_1) > E(q_0)$ then implies that altruistic salespeople have lower sales on average.

I have not been able to determine whether it is possible, when $k_i = g_i$, to have a negative correlation between empathy and sales for the parameter configurations that satisfy Proposition 12. It is worth noting, however, that all the prices charged by firms with $e = 1$ are also charged by firms that set $e = 0$. For a given price, the sales of the former are clearly larger, since they sell to more susceptible customers. Moreover, if they must charge a particular price, salespeople of type λ prefer to set $e = 1$ rather than $e = 0$ since this gives more utility when $k_i = g_i$. While they do not prove it, these observations suggest that the

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sales of employees of type λ are likely to greater than average.

6 Conclusions

The aim of this paper has been to evaluate an equilibrium where salespeople can effectively persuade customers to purchase. As in some models of advertising, persuasion involves a change in the utility of making a purchase. This change can be interpreted along the lines of Becker and Murphy (1993) as being the result of consuming the message itself. There are, however, two important differences between persuasion in the two contexts. The first is that, when messages are delivered by salespeople, consumers can be charged a price that depends on whether they receive a message or not. This matters because equilibria exist where some consumers meet persuasive salespeople while others do not. The result is that price dispersion is amplified by the ability of salespeople to persuade their prospects.

The second difference is that salespeople have the capacity to make customers care about their interaction with them in a way that advertisements do not. As a result, salespeople can raise the costs that customers experience from not buying a product. Doing so with an advertisement seems more difficult and, probably for this reason, this case does not appear to have been dealt with in the advertising literature. The "hard sales" tactics that accomplish this cannot be distinguished from more benign persuasion methods if one uses only data on prices and quantities. Under some circumstances, however, the two types of sales messages can be distinguished using data on the empathy of salespeople carrying out different jobs. I have shown that, if the correlation of a salesperson's empathy and their sales performance is negative and if all customers are equally persuadable by salespeople, the sales messages are of the kind that increase the cost of not buying.

The paper raises the question of when it is more cost-effective to persuade consumers with messages that enhance their utility from buying rather than with messages that reduce the utility from not buying. An idea along these lines is that consumers may be less willing to buy an item sold through high pressure tactics when the memory of the purchase is an important component of the future utility delivered by the product. As a result, these tactics

may be less effective for souvenirs than for more utilitarians items. A related question that deserves further study is the role of empathy in repeated, as opposed to one-shot purchases. At first glance, it might seem that the "hard sell" tactics I have been describing have a smaller role in repeated interactions because customers would migrate away from salespeople who use them.[11] On the other hand, these tactics might be effective in those repeated sales situations where customers are satisfied by other aspects of the product or service that they are buying.

A second question raised by the paper is how the analysis would change if salespeople were given more independence to adapt their message and their price to the particular customer that they encounter. One reason for pursuing such an analysis is that there may be settings in which it is difficult to monitor the messages that salespeople use.[12] In addition, there exists a rich marketing literature (including Lal and Srinivasan (1993) and Joseph (2001)) studying the conditions under which it is optimal to delegate pricing to the salesforce because of its superior information about customers. These informational asymmetries might also lead firms to give salespeople some latitude regarding their persuasion methods and this could strengthen the conclusion that empathetic salespeople are less likely to use messages that raise the cost of not buying. In the current paper, salespeople can avoid doing so only by becoming employed in jobs that do not require these messages. The same logic would presumably lead empathetic salespeople to use these messages more sparingly in jobs that let employees choose their tactics.

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[11]Using questionnaires, Hawes and Winick (1996) show that the use of these techniques makes salespeople less trusted.

[12]Bone (2006) shows that, in his setting, managers question salespeople closely and this monitoring is quite effective.

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Proof of Proposition 1

Notice that firms can assure themselves of profits equal to $\mu\theta(v - m) - w$ by charging the reservation price v. Since this is positive, no firm i charges more than v if $k_i = 0$ and no firm charges more than $v + k$. Doing so would lead to zero sales and profits of $-w$.

As demonstrated by Burdett and Judd (1983), the fact that some but not all customers observe two prices implies that the distribution of prices is smooth and has no holes. To see this, suppose first that the distribution has an atom at p_1. Then, a firm charging slightly less than p_1 makes strictly more profits because it increases the probability of selling by a discrete amount (namely by half the probability that the other firm charges exactly p_1). Now suppose that there is a hole in the price distribution between p_1 and p_2 with $p_1 < p_2$. Then, a firm can make strictly more profits than the firm at p_1 by charging a price above p_1, since it sells just as frequently but at a higher price.

Consider case a) where $k < w^e$. If a firm were to set $k_i = k$ in this case and the probability of selling at p were equal to q, it expected profit per customer would equal $q(p - m) - w^e$. By setting $k_i = 0$ and setting the price at $p - k$, the firm would continue to sell with the same probability q, but its profit per customer would be higher. This implies that it is not desirable to set $k_i = k$.

The expected profit per customer is thus $\theta(v - m)$ for all firms so that the probability of selling at p, $q_0(p)$ must satisfy $q_0(p)(p - m) = \theta(v - m)$. Since $q_0(p)$ equals $(\theta + (1 - \theta)(1 - F_n(p)))$ where $F_n(p)$ is the cdf of prices charged by firms, (3) follows.

Since the price distribution has no mass points, any firm charging either the reservation price v with $k_i = 0$ or the reservation price $v + k$ with $k_i = k$, sells only to a fraction θ of its potential customers. Of these two reservation price strategies, charging $v + k$ with $k_i = k$ is more profitable if

$$\theta(v + k) - w^e > \theta v \qquad \text{or} \qquad \theta k > w^e. \qquad (45)$$

When this is satisfied, the highest price charged in equilibrium is $v + k$ (with $k_i = k$). The reason is that, if the highest price were lower, expected profits per customer (ignoring the

base wage, which acts as a fixed cost at this stage) at the highest price would be lower than $\theta(v+k) - w^e$, which is achievable by charging $v+k$. Since firms can assure themselves of this level of profits per customer, none has lower ones. Moreover, no firm has higher profits because, otherwise, a firm would prefer undercutting rather than charging $v+k$.

I now show that, given that (45) implies that profits per customer equal $\theta(v+k) - w^e$, no firm sets $k_i = 0$. For a firm to benefit from setting $k_i = 0$, there would have to exist a price p so that the probability of selling at this price q satisfies

$$q(p-m) \geq \theta(v+k-m) - w^e.$$

If such a combination of p and q existed, q would have to exceed θ because this inequality is false for $q = \theta$ even when $p = v$. Even then, such a firm would then have the option of setting $k_i = k$ and charging $p + k$. It would then sell with the same probability q and its expected profit per customer (ignoring the base wage) would be $q(p+k-m) - w^e$. This exceeds $q(p-m)$, contradicting the desirability of setting $k_i = 0$.

Since the expected profit per customer is $\theta(v+k-m) - w^e$ for all firms, the probability of selling at p for firms with $k_i = k$, $q_k(p)$, must satisfy $q_k(p)(p-m) = \theta(v+k-m)$. At the same time, the probability of selling $q_k(p)$ equals $(\theta + (1-\theta)(1-F_a(p)))$ where $F_a(p)$ is the cdf of prices charged by firms, and this implies (4).

Turn now to case b), where $\theta k \leq w^e \leq k$. Since (45) is violated, all firms have an expected profit per customer equal to $\theta(v-m)$. Denote by $q_0(p)$ the probability that a firm setting $k_i = 0$ sells if it charges p, while $q_k(p)$ is the probability that a firm setting $e_i = 1$ sells at p. The consumer consumer decision rule (2) implies that $q_0(p) = q_k(p+k)$.

Note that the equations

$$q_0(p^*)(p^* - m) = q_0(p^*)(p^* + k - m) - w^e = \theta(v-m). \tag{46}$$

have the unique solution $q^0(p^*) = w^e/k$ and $p^* = m + \theta k(v-m)/w^e$. This establishes that the price p^* is the only one which ensures that both the expected profit per customer of firms with $k_i = 0$ that charge p^* and that of firms with $k_i = k$ that charge the price $p^* + k$ equal

$\theta(v - m)$. Since $q^0(p)$ is monotone in p, firms with $k_i = 0$ make higher profits at p than do firms with $k_i = k$ at price $p + k$ if $p^* < p$ while they make lower profits for $p^* < p$. Thus, all firms with $k_i = k$ charge prices lower than or equal to $p^* + k$ while all firms with $k_i = 0$ charge prices greater than or equal to p^*. Thus, $q_0(p) = \theta + (1 - \theta)(1 - \gamma)(1 - F_0(p))$ for prices between p^* and v. Plugging this in (46) and using the fact that $F_0(p^*) = 0$ demonstrates that γ is indeed equal to $(1 - w^e/k)/(1 - \theta)$. Using this the resulting expression for $q_0(p)$ in (46), one obtains (5).

Similarly, for prices between $w^e + m + \theta(v - m)$ (the price such that a firm setting $k_i = k$ obtains an expected profit per customer of $\theta(v - m)$ if it sells with probability one) and $p^* + k$, $q_k(p) = \theta + (1 - \theta)(1 - \gamma + \gamma(1 - F_k(p)))$. Using this in (46), one obtains (6).

Proof of Proposition 2

Since some firms set $k_i = 0$ and others set $k_i = k$, we must be in case b) of proposition 1. Proposition 1 then implies that p^* is the lowest price charged by firms with $k_i = 0$ while $p^* + k$ is the highest price charged by firms with $k_i = k$. Thus firms with $k_i = 0$ that do not charge p^* expect smaller sales than those that do. Similarly, the expected sales of those firms with $k_i = k$ that do not charge $p^* + k$ are larger than those that do. Lastly, the expected sales of firms that set $k_i = 0$ and charge p^* are the same as those of firms that set $k_i = k$ and charge $p^* + k$.

Proof of Proposition 3

For $w^e < \theta k$ the probability of selling q equals $(\theta + (1 - \theta)(1 - F_a(p)))$ while it equals $(\theta + (1 - \theta)(1 - F_n(p)))$ when $w^e > k$. Since both $F_a(p)$ and $F_n(p)$ are distributed uniformly between 0 and 1, q is distributed uniformly between θ and 1.

Now let $\theta k \le w^e \le k$ and consider firms that set $k_i = 0$. Since their expected profits equal $\mu\theta(v - m) - w$, their sales have to satisfy $q(p)(p - m) = \theta(v - m)$. The probability that a random firm has a q less than or equal to $\bar{q}$ must thus be equal to the probability that its price exceeds $m + \theta(v - m)/\bar{q}$. Using (5), this conditional probability must thus equal

$$\text{Prob.}(q \le \bar{q}|k = 0) = 1 - \frac{(w^e/k)(\theta(v - m)/\bar{q}) - \theta(v - m)}{(w^e/k - \theta)(\theta(v - m)/\bar{q})} = \frac{\bar{q} - \theta}{w^e/k - \theta}$$

for $\bar{q}$ between θ and w^e/k. Since firms that set $k_i = k$ sell more, the overall probability that $q \le \bar{q}$ when $\bar{q} < w^e/k$ is thus $(1-\gamma)$ times this probability. With $\gamma = (1 - w^e/k)/(1-\theta)$, this overall probability equals $(\bar{q} - \theta)/(1-\theta)$.

Consider now the firms that that set $k_i = k$. Their expected profits per customer must also equal $\mu\theta(v-m) - w$ so $q(p)(p-m) - w^e = \theta(v-m)$. For these firms, the conditional probability that q is less than or equal to $\bar{q}$ is thus equal to the probability that p exceeds $m + (\theta(v-m) + w^e)/\bar{q}$ or, using (6),

$$\text{Prob.}(q \le \bar{q}|k_i = k) = 1 - \frac{(\theta(v-m) + w^e)/\bar{q} - (\theta(v-m) + w^e)}{(1 - w^e/k)(\theta(v-m) + w^e)/\bar{q}} = \frac{q - w^e/k}{1 - w^e/k}.$$

Since firms with $k = 0$ have a $q \le w^e/k$, the overall probability that q is below $\bar{q}$ when $\bar{q} > w^e/k$ is equal to the sum of γ times the conditional probability that $q < \bar{q}$ conditional on $q \ge w^e/k$ and $(1-\gamma)$. Using the value of γ above, this overall probability equals $(\bar{q}-\theta)/(1-\theta)$ once again. This is the cdf for the uniform distribution between θ and 1

Proof of Proposition 4

Let $Q(u)$ be equal to the cdf of drawing an *ex post* utility smaller than u from a visit to a single firm. When w^e is prohibitively high, this *ex post* utility is $v - p$ where p is the price paid. Thus, $Q(u)$ is the probability that p exceeds $v - u$ and this equals

$$Q(u) = 1 - F_n(v - u) = \frac{\theta u}{(1-\theta)(v - u - m)}, \tag{47}$$

where F_n is given by (3).

Turn now to case c) where w^e is low enough that all salespeople incur this cost. Suppose first that $k_i = g_i$. The cfd $Q_k(u)$ is now the probability that p exceeds $v + k - u$, or $1 - F_a(v + k - u)$ where F_a is given by (4). Using this equation, we have

$$Q_k(u) = \frac{\theta u}{(1-\theta)(v + k - u - m)}. \tag{48}$$

This expression is smaller than that in (47) when k is positive. This means that the distribution of utilities from a visit to a single salesperson first order stochastic dominates the distribution when w^e is prohibitive, so consumers are better off. It follows that, when

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salespeople raise utility by k, the maximum utility obtained from two different salespeople also dominates the maximum utility from visiting two salespeople when all firms set $k_i = 0$. Thus, all consumers can be expected to be better off when all firms set $g_i = k$.

Now suppose that $k_i = \ell_i$ and focus first on the case where w^e is low enough that all salespeople raise ℓ_i. The cdf $Q(u)$ is the probability that p is greater than $v - u$ with F still being given by (4). This now equals

$$Q_\ell(u) = \frac{\theta(u + k)}{(1 - \theta)(v - u - m)}. \tag{49}$$

This is larger than the expression in (47) so the case with infinite w^e leads to a u that first order stochastically dominates this one. This means that a customer that sees a single salesperson can expect to be worse off in the case where all firms set $\ell = k$. It also implies that customers that visit two salespeople are worse off. This is not only because such individuals get two draws from a less favorable u distribution but also because such individuals lose k for sure (since they suffer the loss from turning down one salesperson).

I now study case b), where there is a probability γ that firms set $k_i = k$. To compare the resulting consumer welfare with welfare when w^e is prohibitively high, it is useful to decompose the distribution of u from a single visit in the case of prohibitively high w^e. In particular, let $Q^-(u)$ be the cdf of u conditional on u being smaller than $v - p^*$ (the level of u when the price is p^*) while $Q^+(u)$ is the cdf of u conditional on u being larger than $v - p^*$. Using Bayes' rule

$$Q^-(u) = \frac{Q(u)}{Q(v - p^*)} \qquad \text{and} \qquad Q^+(u) = \frac{Q(u) - Q(v - p^*)}{1 - Q(v - p^*)}.$$

In the case where w^e is prohibitive, $Q(u) = 1 - F_n(v - u)$ with F_n given by (3). Therefore,

$$Q^-(u) = \frac{\theta u}{(w^e/k - \theta)(v - u - m)} \qquad \text{and} \qquad Q^+(u) = \frac{\theta(v - m) - (v - u - m)w^e/k}{(1 - w^e/k)(v - u - m)},$$

while

$$Q(v - p^*) = 1 - F_n(p^*) = \frac{w^e/k - \theta}{1 - \theta} = 1 - \gamma, \tag{50}$$

where the third equality follows from Proposition 1. When $\theta k \leq w^e \leq k$, there is a probability $(1 - \gamma)$ that employees set $e_i = 0$ so the resulting *ex post* utility also equals $v - p$. The cdf

of u conditional on encountering a salesperson who sets $e_i = 0$, $Q^0(u)$ is thus equal to $1 - F_0(v - u)$. Using (5), this implies that $Q^0(u) = Q^-(u)$.

Therefore, the distribution of utility in case b) conditional on finding a salesperson who has set $k_i = 0$ is the same as the distribution of utility when w^e is prohibitive and the price is above p^*. Moreover, (50) implies that the probability in case b) of finding a salesperson who has set $k_i = k$ is the same as that of finding a price above p^* when w^e is prohibitive. Thus, the question of whether the utility distribution in case b) dominates the distribution of utility when w^e is prohibitive reduces to the question of whether the distribution of utility conditional on finding a salesperson who sets $k_i = k$ dominates the distribution of utility conditional on finding a price below p^* in the case where w^e is prohibitive.

When $k_i = g_i$, a consumer's utility when purchasing from a salesperson who has set $k_i = k$ is $v + k - p$. Therefore, the conditional probability of obtaining a level of utility below u from a single encounter with a salesperson, $Q^1_g(u)$, equals $1 - F_k(v + k - u)$ or, using (6)

$$Q^1_g(u) = 1 - \frac{v + k - u - m - \theta(v - m) - w^e}{(1 - w^e/k)(v + k - u - m)} = \frac{\theta(v - m) - (v - u - m)w^e/k}{(1 - w^e/k)(v + k - u - m)}.$$

For $k > 0$, this is smaller than $Q^+(u)$. This implies that the distribution of utility when some salespeople set $g_i = k$ first order stochastically dominates the utility when w^e is prohibitive.

When $k_i = \ell_i$, the utility from finding a single salesperson who has set $k_i = k$ remains $v - p$ so that the conditional probability of obtaining a level of utility below u, $Q^1_\ell(u)$, equals $F_k(v - u)$ or, using (6)

$$Q^1_\ell(u) = 1 - \frac{v - u - m - \theta(v - m) - w^e}{(1 - w^e/k)(v - u - m)} = \frac{\theta(v - m) + w^e - (v - u - m)w^e/k}{(1 - w^e/k)(v - u - m)}.$$

For $w^e > 0$, this is larger than $Q^+(u)$. Thus the distribution of utility when some salespeople set $\ell_i = k$ is stochastically dominated by the distribution that obtains when w^e is prohibitive. Consumers are therefore made worse off by the higher prices that accrue when salespeople raise ℓ_i. In addition, when salespeople incur the requisite effort to raise ℓ, consumers who visit two salespeople who both have $\ell_i = k$ suffer the direct loss of k.

Proof of Proposition 6

Notice first that, when $m = 0$, Proposition 1 implies that revenue $[\theta + (1 - \theta)(1 - \gamma)(1 - F_0(p))]p$ must equal θv while revenue $[1 - (1 - \theta)\gamma F_k(p)]p$ must equal $w^e + \theta v$. It further follows from (5) that, when $m = 0$,

$$dF_0(p) = \frac{\theta v}{(w^e/k - \theta)p^2}$$

so that

$$\int_{p^*}^{p} y dF_0(y) = \int_{v\theta k/w^e}^{p} \frac{\theta v \, dy}{(w^e/k - \theta)y} = \frac{\theta v}{(w^e/k - \theta)} \log\left(\frac{pw^e}{v\theta k}\right)$$

Similarly (6) implies that

$$dF_k(p) = \frac{w^e + \theta v}{(1 - w^e/k)p^2}$$

so that

$$\int_{p^-}^{p} y dF_k(y) = \int_{w^e + \theta v}^{p} \frac{(w^e + \theta v)dy}{(1 - w^e/k)y} = \frac{w^e + \theta v}{(1 - w^e/k)} \log\left(\frac{p}{w^e + \theta v}\right).$$

Substituting these expressions in (10) and (11) and simplifying, (13) and (14) follow. By evaluating these equations for $u_0(p)$ and $u_1(p)$ at prices of v, p^* and p^-, one obtains the conditions (15) and (16).

Proof of Proposition 8

Suppose we are in a steady state. At any point in time t, the total number of salespeople of type λ whose jobs give customers utility greater than or equal to $\hat{u}$ equals $\eta(1 - G(\hat{u}))N$. Of these, a fraction $(1 - \psi)$ keep their period t jobs at $t+1$. In addition $[\psi a + (1 - \psi)\hat{\eta}G(\hat{u})]N$ individuals of type λ search for jobs at the beginning of $t + 1$, where $\psi a N$ are new recruits and the rest are individuals who are dissatisfied with their period t job. These searchers have a probability $1 - H(\hat{u})$ of finding a job at $t + 1$ that provides utility greater than or equal to $\hat{u}$. Thus, the total number of people of type λ that have such jobs at $t + 1$ is

$$\left\{(1 - \psi)(1 - G(\hat{u}))\eta + \left[\psi a + (1 - \psi)\hat{\eta}G(\hat{u})\right]\frac{\psi(1 - G(\hat{u}))}{\psi + (1 - \psi)\hat{\eta}G(\hat{u})}\right\} N$$

Equating this to $\eta(1 - G(\hat{u}))N$ and simplifying gives equation (24) as long as $\psi \neq 0$. For $0 < \psi < 1$, the left hand side of this equation equals plus infinity for $|\eta| = \infty$ while it equals $\psi(a - 1) < 0$ for $\eta = 1$. This implies that the equation has one real zero smaller than one

and another real zero that is greater than one. For values of η between these zeros, the left hand side of (24) must be negative. At $\eta = a$, this expression equals

$$a^2(1-\psi)(1-G(\hat{u})) - a[1 + (1-\psi)(a - G(\hat{u}))] + a = a(1-a)(1-\psi)G(\hat{u})$$

Since this is positive and $a < 1$, the smallest zero of (24) is larger than a. Equation (22) then implies that η exceeds $\hat{\eta}$.

Proof of Proposition 9

Since (15) is satisfied so that $u_1(p^-) < u_0(v)$, $G(u_1(p^-)) = G(u_0(v)) = \gamma$. Changes in $\hat{u}$ within the range $[u_1(p^-), u_0(v)]$ thus have no effect on η, implying that $H(u)$ is also constant in this range. Equation (23) implies that $\lim_{\psi \to 0} H(\hat{u}) = 1$. One can therefore find both a sufficiently small ψ such that the mean of H is below $\hat{u}$ for any $\hat{u}$ between $u_1(p^-)$ and $u_0(v)$ and a ρ less than 1 that satisfies (21). Since ψ is small, (19) implies that the discount rate $\hat{\rho}$ that accomplishes is less than one as well.

As $\hat{u}$ moves within the range $[u_1(p^-), u_0(v)]$, the set of values for ψ that ensure that $\hat{u}$ exceeds the mean of H varies as well. For a given ψ, varying $\hat{u}$ within this range also changes the value of ρ that leads $\hat{u}$ to be the cutoff level of utility. All values of $\hat{u}$ in the range $[u_1(p^-), u_0(v)]$ lead to the same behavior, namely the departure of employees of type λ from jobs with $e = 1$. It follows that there is a nontrivial set of values of ψ and ρ that rationalize these actions. Moreover, these actions ensure that a fraction η of the employees that set $e = 0$ (and thus have output levels below c/k) are of type λ. Among salespeople with higher output, the fraction is only $\hat{\eta}$, which is lower.

Proof of Proposition 10

Given that $u_1(p^-) > u_0(p^*)$, a $\hat{u}$ equal to $u_0(p^*)$ implies that salespeople of type λ leave all jobs with $e = 0$ and stay only at those jobs with $e = 1$ that provide utility greater than $u_0(p^*)$. Since this utility level exceeds $u_1(p^* + k)$, it involves a lower price than $p^* + k$ so that type λ employees only remain at jobs whose $q > q^*$ where $q^* > c/k$. As in the proof of Proposition 9, one can always find a low enough ψ so that this choice of $\hat{u}$ is above the mean of H. At a low ψ, the $\hat{\rho}$ that satisfies (19) and (21) is smaller than one, and this discount

rate ensures that salespeople do indeed set the $\hat{u} = u_0(p^*)$.

Proof of Proposition 11

Since (31) implies that $\alpha k > w^e$ and (30) implies that $w^e > \alpha(1 - \theta)(v - m)$, $\alpha k > \alpha(1 - \theta)(v - m)$, which implies (27). Moreover, since the term in square brackets in (31) exceeds one, the equation implies that $\alpha k - w^e$ exceeds $\theta(v - m)$, which obviously exceeds $\theta(1 - \alpha)(v - m)$ so that (29) holds.

Now notice that $F_0(p)$ in (34) is indeed a proper cdf. It is increasing in p, and takes the value of zero for $p = p^*$ and the value of one for $p = v$. I first show that, if this is the distribution of prices for firms that set $e = 0$, they all make the same profits.

From (33), we have

$$\alpha(p_1^- - m) = \left[\theta + (1 - \theta)(1 - \alpha)\gamma\right](v - m) + w^e > \alpha(v - m)$$

where the inequality uses the violation of (30), the fact that $\theta > \theta\alpha$ and the fact that $(1 - \theta)(1 - \alpha)\gamma > 0$. This implies that $p_1^- > v$ so that, at the proposed equilibrium, no immune consumer buys from a firm that sets $e = 1$. Firms whose price is no greater than v therefore face a fraction $\theta + (1 - \theta)(1 - \alpha)\gamma$ of consumers who are insensitive to price. Their expected sales per customer at a price p, $q_0(p)$, are

$$q_0(p) = \theta + (1 - \theta)\left[(1 - \gamma)(1 - F_0(p)) + \gamma(1 - \alpha F_1(p + k))\right] = 1 - (1 - \theta)\left[(1 - \gamma)F_0(p) + \gamma\alpha F_1(p + k)\right]$$

For prices between p^* and v, $F_1(p + k) = 1$ and, using (34), profits per customer equal

$$q_0(p)(p - m) = \left[\theta + (1 - \theta)(1 - \alpha)\gamma\right](v - m)$$

so that firms that set $e = 0$ are indifferent among all these prices.

I now turn to firms that set $e = 1$. Note first that $F_1(p)$ in (35) is increasing in p because $p_1^- > m$. It obviously equals 0 for $p = p_1^-$. Moreover (31) together with (32) and (33) implies that $F_1(p^* + k) = 1$. Thus, $F_1(p)$ is a proper cdf between p_1^- and $p^* + k$.

For any price $p > v$, firms that set $e = 1$ have expected sales per customer, $q_1(p)$ equal to

$$q_1(p) = \alpha\left\{\theta + (1 - \theta)\left[(1 - \gamma)(1 - F_0(p - k)) + \gamma(1 - F_1(p))\right]\right\} = \alpha\left\{1 - (1 - \theta)[(1 - \gamma)F_0(p - k) + \gamma F_1(p)]\right\}.$$

For prices below $p^* + k$, $F_0(p - k) = 0$ so that, using (35), expected profits per customer equal

$$q_1(p)(p - m) - w^e = \big[\theta + (1 - \theta)(1 - \alpha)\gamma\big](v - m).$$

Therefore, firms that set $e = 1$ are indifferent among these prices and also have nothing to gain or lose by switching to $e = 0$ with a price between p^* and v.

All that is left to prove is that charging other prices for either level of e is strictly less profitable. Consider first deviations involving $e = 1$. Charging prices strictly between v and p_1^- gives lower profits because it attracts no sales beyond those available at p_1^- while charging strictly less. Charging the price v gives profits per customer of

$$(1 - \alpha)\big[\theta + (1 - \theta)(1 - \alpha)\gamma\big](v - m) + \alpha(v - m) - w_e.$$

Condition (30) implies that this is less than the equilibrium level of profits. Now consider prices above $p^* + k$. A firm charging such a price makes no sales to susceptible individuals who encounter another firm with $e = 1$. Its probability of selling is

$$q_1(p) = \alpha\big\{1 - (1 - \theta)\big[\gamma + (1 - \gamma)F_0(p - k)\big]\big\} = \alpha q_0(p - k) - (1 - \theta)(1 - \alpha)\gamma,$$

where the second equality is based on the fact that, for $p \geq p^*$, $q_0(p)$ equals $[1 - (1 - \theta)(\gamma\alpha + (1 - \gamma)F_0(p))]$. Therefore, profits at such a deviation equal

$$q_1(p)(p - m) = \{\alpha q_0(p - k)(p - k - m)\} + \alpha q_o(p - k)k - (1 - \theta)(1 - \alpha)\gamma(p - m).$$

The term in curly brackets is independent of p while both other terms decline when p rises. Thus profits decline as a firm with $e = 1$ raises its price above $p^* + k$.

Now consider deviations involving $e = 0$. Raising price above v eliminates all sales and is thus unprofitable. A firm with $e = 0$ and a price below p^* sells to every immune customer it encounters and to all customers whose other salesperson sets $e = 0$. It also sells to susceptible customers whose offer from a firm with $e = 1$ has a price that exceeds $p + k$. Thus, expected sales for such a firm are

$$q_0(p) = 1 - (1 - \theta)\gamma\alpha F_1(p + k) = q_1(p + k) + 1 - \alpha,$$

where the second equality stems from the fact that, for prices below $p^* + k$, $q_1(p) = \alpha[1 - (1-\theta)\gamma\alpha F_1(p+k)]$. Its profits are therefore

$$q_0(p)(p-m) = \{q_1(p+k)(p+k-m)\} - q_1(p+k)k + (1-\alpha)(p-m).$$

The term in curly brackets is independent of p while the others rise with p. Therefore, profits decline as the price is reduced below p^*.

Proof of Proposition 12

When $\gamma > 0$, equation (36) implies that (30) holds, so that no equilibrium where all firms set $e = 0$ would exist if (27) held. Moreover, using (40) to substitute for p^* in the first inequality of (39) and then using (36) to substitute for $(v-m)$ leads to the conclusion that $\alpha k > w^e$. An equilibrium where all firms set $e = 0$ would therefore also fail to exist if (27) were violated.

Equations (43) and (41) are the solutions to the following two equations

$$q_0(p)(p-m) = \theta(v-m) \qquad q_1(p)(p-m) = \theta(v-m) + w^e$$

where

$$q_0(p) = \theta + (1-\theta)\big[(1-\gamma)(1-F_0(p)) + \gamma(1-\alpha)(1-F_1(p))\big]$$
$$q_1(p) = \theta + (1-\theta)\big[(1-\gamma)\big(\alpha + (1-\alpha)(1-F_0(p))\big) + \gamma(1-F_1(p))\big].$$

The first inequality in (39) requires that $p^* + k > v$. As a result, susceptible customers do not buy from salespeople that set $e = 0$ if they also meet a salesperson with $e = 1$ that charges v or less. This implies that, if the $F_i(p)$'s are the cdf's of equilibrium prices, the $q_i(p)$ above measure the probability of selling for a firm that charges p and sets $e = i$. This further implies that these F's lead expected profits per customer to equal $\theta(v-m)$ for all firms that charge between p^- and v.

Equation (36) implies that $F_0(v) = F_1(v) = 1$ solves these equations. Moreover, the definition of p^- in (44) implies that $F_1(p^-) = 0$. Since (41) is increasing in p, $F_1(p)$ is thus a proper cdf for a distribution taking values between p^- and v.

$F_1(p)$ continues to equal zero for prices below p^-. Moreover, (38) ensures that $p^* < p^-$. Thus $F_0(p)$ in (42) implies that $q_0(p)(p-m)$ is equal $\theta(v-m)$ for prices between p^- and p^*. It remains to show that $F_0(p)$ is a proper cdf. We saw that it equals one for $p = v$. In addition, the definition of p^* ensures that $F_0(p^*) = 0$ in (42). Moreover, (42) rises with p. For (43) not to fall with p, we must have $\alpha\theta(v-m) \geq (1-\alpha)w^e$. Using (36) to substitute for w^e, it is readily verified that (37) ensures that this is indeed the case.

We have thus shown that the proposed $F_i(p)$ are cdf's that lead firms to be indifferent among all the prices in their ranges. It remains to show that firms do not benefit by deviating to different prices. For a firm that sets $e = 0$, raising its price above v eliminates all sales. Prices between $(v-k)$ and p^* yield the same expected sales than the price p^* and are therefore less profitable. For any price p below $v - k$, the expected probability of selling $q_o(p)$ equals $[1 - \alpha\gamma(1-\theta)F_1(p+k)]$. Using the second of the two equations above to substitute for $F_1(p+k)$, expected revenue per customer $q_o(p)(p-m)$ at these prices equals

$$(1-\alpha)\big[1 + \alpha(1-\theta)(1-\gamma)F_0(p+k)\big](p-m) + \alpha\big\{q_1(p+k)(p+k-m)\big\} - \alpha q_1(p+k)k.$$

Since the term in curly brackets is independent of p, this expression is increasing in p. This means that cutting price below $v - k$ is unprofitable as well.

Now consider the firms that set $e = 1$. If they were to raise the price above v, the earlier argument implies that their most profitable deviation is to set it equal to $p^* + k$. To prevent this deviation it must be the case that

$$\alpha(\theta + (1-\theta)(1-\gamma))(p^* - m + k) < \theta(v-m) + w^e,$$

where the term multiplying $(p-m)$ is the probability of sale. Using (36) to substitute for w^e, it can be verified that the second inequality in (39) ensures that this is true. If firms that set $e = 1$ lower their prices below p^-, the linear equations above imply that their revenues per customer fail to fall only if F_1 becomes negative, which is impossible.

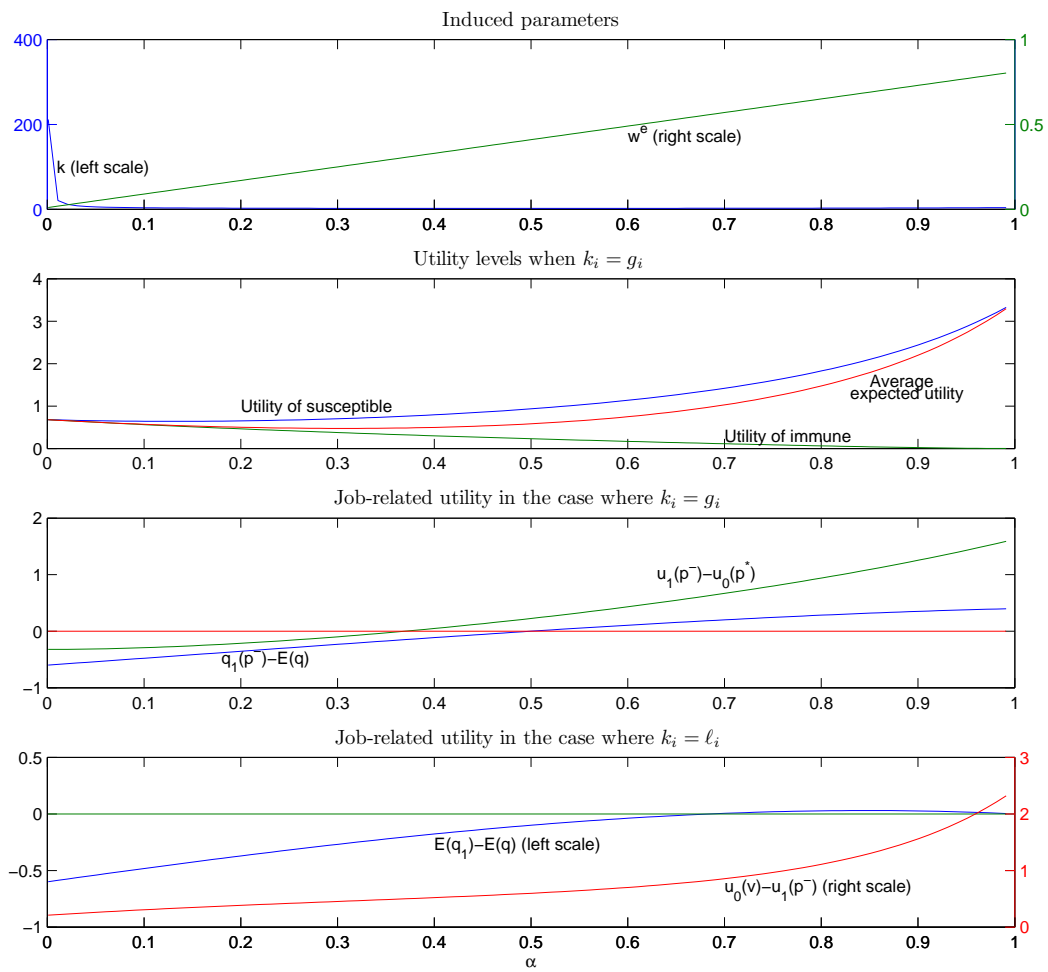Figure 1: Utility and output levels in "high-w^e" stochastic model

Figure 2: Relative utilities and relative outputs in "low-w^e" stochastic model