Customer Intimacy and Cross-Selling Strategy

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Technical Appendix

Solution of the model. The profit function is $p+\theta\alpha i$. Because of the participation constraint, $p=\theta-\mathrm{r}(\alpha)i^2$. By replacing p with $\theta-\mathrm{r}(\alpha)i^2$ in the profit function and taking the derivative with respect to i, we find the optimal values for an interior solution. (Note that second derivative is negative and there exists a unique solution.) The optimal profit equals $\theta(1+\alpha i^*)-\mathrm{r}(\alpha)i^{*2}$. When $i^*<i_0$, the firm cannot profit from the information and finds it beneficial to ask either for no information or i_0. The firm asks for $i^*=i_0$ as long as $\alpha\theta i_0-\mathrm{r}(\alpha)i_0^2\geq 0$; otherwise the firm asks for no information. On the other hand, the firm asks for the maximum information when the interior (unconstrained) optimal calls for more than $\bar{i}$. The complete solution can be represented as $\left\{(i^*,p^*)\middle|\left[I,\theta-\mathrm{r}(\alpha)I^2\right] \mathit{for}\ I\ \geq i_0;\left[i_0,\theta-\mathrm{r}(\alpha)i_0^2\right] \mathit{for}\ 2I\ \geq i_0>I\ ;(0,\theta)\ \mathit{for}\ i_0>2I\right\}$, where I equals $\frac{\alpha\theta}{2\mathrm{r}(\alpha)}$ if $\bar{i}>\frac{\alpha\theta}{2\mathrm{r}(\alpha)}$, $\bar{i}$ otherwise.

Proof of Proposition 1. p^* becomes negative if $\alpha^2\theta>4\mathrm{r}(\alpha)$. As $\mathrm{r}(\alpha)$ increases, since $\frac{d}{d\mathrm{r}(\alpha)}i^*<0$, $\frac{d}{d\mathrm{r}(\alpha)}p^*>0$, information level decreases and price increases. In turn, the profit decreases since $\frac{d}{d\mathrm{r}(\alpha)}\Pi^*=-\left(\frac{\alpha\theta}{2\mathrm{r}(\alpha)}\right)^2<0$. $\frac{d}{d\theta}p^*<0$ if $\alpha^2\theta>2\mathrm{r}(\alpha)$ and $\frac{d}{d\theta}p^*>0$ otherwise. Then, as customer valuation increases, low-risk customers pay a lower price while high-risk customers pay a higher price.

Proof of Proposition 2. The derivative of the optimum information level is $\frac{d}{d\alpha}i^* = \frac{\theta}{2\mathrm{r}(\alpha)}\left[1 - \frac{\alpha}{\mathrm{r}(\alpha)}\mathrm{r}_\alpha(\alpha)\right]$ which is negative when $\mathrm{r}_\alpha(\alpha)\frac{\alpha}{\mathrm{r}(\alpha)} > 1$. Similarly, for price and profit, we have $\frac{d}{d\alpha}p^* = -\frac{\theta^2\alpha}{4\mathrm{r}(\alpha)}\left[2 - \frac{\alpha}{\mathrm{r}(\alpha)}\mathrm{r}_\alpha(\alpha)\right]$ and $\frac{d}{d\alpha}\Pi^* = \frac{\alpha\theta^2}{4\mathrm{r}(\alpha)}\left[2 - \frac{\alpha}{\mathrm{r}(\alpha)}\mathrm{r}_\alpha(\alpha)\right]$, which are positive and negative when $\mathrm{r}_\alpha(\alpha)\frac{\alpha}{\mathrm{r}(\alpha)} > 2$. Hence, the profit increases as cross-selling decreases if $\mathrm{r}_\alpha(\alpha)\frac{\alpha}{\mathrm{r}(\alpha)} > 2$. Then, the firm finds it beneficial to limit the cross-selling. The optimum cross-selling is set to a level such that it will collect the maximum information. Then, $\frac{\mathrm{r}(\alpha^*)}{\alpha^*} = \frac{\theta}{2\bar{i}}$. Note that $\frac{\mathrm{r}(\alpha)}{\alpha}$ is an increasing function of α given $\mathrm{r}_\alpha(\alpha)\frac{\alpha}{\mathrm{r}(\alpha)} > 2$. Hence, as $\bar{i}$ increases, α^* decreases. When a firm does not follow a commitment strategy and the customers do not know the cross-selling activity, the firm always has an incentive to sell more than what customers expect. For example, assume that customer expectation for cross-selling is $\tilde{\alpha}$. Then, the firm can charge according to $\mathrm{r}(\tilde{\alpha})$, but profit by setting α to its maximum level. However, the customers, knowing the firm incentives, rightly expect that and set $\tilde{\alpha}$ to its maximum level.