A Note on the Regulation of Add-ons

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Abstract

We model a situation where a seller trades a base good, and a bundle of higher quality comprising of the base good with an add-on, through an intermediary which charges a flat commission fee each time it makes a sale. In addition, the add-on can also be bought elsewhere, i.e. from a different provider, on a stand-alone basis. Apart from differences in valuations of quality and their distance from the seller, consumers differ in their levels of sophistication. Specifically, we assume that there is a fraction of consumers who are naive and either unaware that add-ons can be purchased separately from a different provider, or unwilling to deviate (de-select) from the options that have been set for them by default by a seller. This paper examines the impact of regulation (proposed, for instance, by the Financial Conduct Authority in the UK), that requires intermediaries to prompt consumers regarding the availability of stand-alone alternatives. We find that, ironically, regulation that seeks to protect the interests of the naive consumers may sometimes be detrimental to their welfare.

Keywords: add-on pricing, consumer naïveté, regulation, platform fee, cost pass-through

JEL classification codes: L11, L15, L14, D43

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1 Introduction

This paper is motivated by the finding that consumers making purchases, either directly or via an intermediary such as a platform, often suffer poor outcomes when they buy a product as an add-on to a primary or base product. In addition, they are often unaware that the add-on can also be bought elsewhere on a stand-alone basis. Indeed, a market study by the Financial Conduct Authority (FCA) in the UK into general insurance add-ons found that "*[a]dd-on buyers are less likely to shop around*" as they invariably use a false reference point, namely the price of the base product, for comparison, "*... were much less likely to be able to correctly recall how much they paid*" and "*... more likely to end up with products they do not need or use*".[1] The study further concluded that add-on providers "*... will not face a material competitive constraint from firms that sell [...] on a stand-alone basis unless consumers are aware they can buy the product separately.*"[2] Remedies proposed by the FCA to address these adverse effects on competition include, amongst others, the requirement that platforms such as price comparison websites provide alerts during the sales process that add-ons can also be bought separately from a different provider.[3]

One would expect that raising awareness about stand-alone sales via such alerts can only improve consumer welfare; that when consumers have outside options, that is bound to exert a competitive pressure on sellers. However, we find that this is not necessarily the case. Specifically, regulation that requires intermediaries to inform consumers about the availability of stand-alone alternatives can sometimes be detrimental for consumer welfare.

In our model, a seller trades a base good, and a bundle of higher quality comprising of the base good with an add-on, through an intermediary which charges a flat commission fee each time it makes a sale. The seller's marginal cost of production is increasing in quality. In addition, the add-on can also be bought elsewhere, i.e. from a different provider, on a stand-alone basis. Consumers differ from one another in three dimensions. First, consumers differ in their costs of travelling to the seller. Second, they differ in their valuation of quality. Thus, consumers can either have a low valuation of quality (be of "low type"), or a high

[1] General insurance add-ons: Provisional findings of market study and proposed remedies, FCA (2014), p.7.
[2] Ibid., p.24.
[3] Ibid., p.60.

valuation of quality (be of "high type"). Third, consumers differ in their level of sophistication. Specifically, a fraction of consumers are naive and either unaware that the add-on can be purchased separately from a different provider or unwilling to deviate (de-select) from the options that have been set for them by default by a seller, making them particularly vulnerable to opt-out presumptive selling.

The timing of the game is as follows. First, the intermediary decides the commission fee to be paid by the seller. Next, the seller chooses the price and quality of its goods. Finally, consumers decide whether to purchase the base good only or the bundle (with the add-on purchased either from the seller or elsewhere).

We examine two cases, namely, the benchmark case where the intermediary does not prompt its customers about stand-alone alternatives, and the case where it is required to do so by regulation. In the former case, we find that there is an equilibrium where both the low type and the sophisticated, high type consumers buy the base good from the seller, with the latter buying the add-on from a different provider. The naive high type consumers, owing to inertia/ lack of information, buy the bundle from the seller. On the other hand, under regulation, there is an equilibrium where it is optimal for the high type consumers to buy the bundle from the seller despite prompts by the intermediary regarding stand-alone alternatives. We find that while the quality of the seller's bundle remains unchanged at the socially efficient level across both cases, its price may be higher under regulation. This is because regulation, in some cases, leads to an increase in the demand faced by the seller; this attracts a higher fee from the intermediary which is subsequently passed on by the seller to consumers in the form of higher prices.

Therefore, under regulation, the naive, high type consumers may end up paying a higher price for a bundle which is of the same quality as before, resulting in a drop in their surplus. In addition, it also leads to fewer consumers buying from the seller due to its higher prices. Thus, it appears that the naive consumers, whom the regulation seeks to protect, may actually suffer a welfare loss.

Related Literature: This paper is at the interface of three streams of literature. The first examines add-on pricing strategies of firms; more specifically, the factors influencing a firm's decision to bundle add-ons, their pricing and the impact on profits. These include Gabaix and Laibson (2006), Lal and Matutes (1994), Verboven (1999), Ellison (2005), Geng

et al. (2018), to name a few.

The second stream of literature studies how consumer naïveté affects market outcomes. Notable among these are Shapiro (1995), Verboven (1999), Gabaix and Laibson (2006), Armstrong (2015), Shulman and Geng (2013, 2016), Johnen and Somogyi (2021) and Inderst and Obradovits (2021).

More recently, an emerging stream of literature, including Hao and Fan (2014), Ronayne (2020), Tian et al. (2017), Hao et al. (2016) and Wang and Wright (2020), focuses on agency pricing and examines how involvement of trading platforms and the nature of the contract between them and firms influences pricing strategies.

2 Model

We model a situation where a seller trades its goods through an intermediary which charges a flat commission fee, k, each time it makes a sale. These include a base good of quality, q_l, and a bundle of higher quality, q_h, comprising of the base good with an add-on, at prices p_l and p_h respectively. The seller's marginal costs of production are $\frac{q^2}{2}$ for a good of quality $q \in (q_l, q_h)$. We assume that the add-on can also be bought elsewhere, i.e. from a different provider, on a stand-alone basis.

There is a measure one of consumers distributed on a unit interval who differ from one another in three dimensions. First, consumers differ in their distance, x, from the seller. Second, consumers differ in their valuation of quality; a proportion λ of consumers have a low valuation of quality, θ_l, while the remaining consumers have a high valuation, θ_h. Third, consumers differ in their level of sophistication. Specifically, only a fraction, β, of consumers are sophisticated and able to exercise the option of buying the add-on product elsewhere from a different provider. The remaining consumers are naive and either unaware that the add-on can be purchased separately from a different provider or unwilling to deviate (de-select) from the option that has been set for them by default by a firm, making them particularly vulnerable to opt-out presumptive selling. [4] We assume that θ_h is high; specifically, $\theta_h \geq \frac{3\lambda\theta_l}{(\lambda - 2\beta(1-\lambda)}$.

The utility of a consumer of type (θ, x) is $\theta q_h - p_h - tx$ from consumption of the bundle

[4] For instance, the FCA found that "... *25% of those who bought insurance as an add-on were not aware they could buy the product separately elsewhere.*" Ibid., p. 25

purchased from the seller and $\theta q_l - p_l - tx$ if he buys the base good only, where $\theta \in (\theta_l, \theta_h)$. Further, for a consumer of type (θ_h, x), his utility if he buys the base good from the seller but the add-on product from a different provider equals $\theta_h q_l - p_l - tx + u$ while the corresponding utility for a consumer of type (θ_l, x) is $\theta_l q_l - p_l - tx + v$, where u, v denote the maximum surplus attainable from such outside options.[5] Each consumer buys at most one unit of the good and derives zero utility if he does not make a purchase.

The timing of the game is as follows. First, the intermediary decides the commission fee, k, to be paid by the seller. Second, the seller chooses the price and quality of its goods, p_l, p_h and q_l, q_h. Finally, consumers decide whether to purchase the base good only or the high quality bundle (with the add-on purchased either from the seller or elsewhere on a stand-alone basis). We examine two cases, namely, the benchmark case where the intermediary does not prompt its customers about stand-alone options, and the case where it is required to do so by regulation.

3 Equilibrium

We examine an equilibrium where the low type consumers, owing to their low valuation of quality, purchase the base good only while the high type consumers purchase the add-on too from the seller or elsewhere. We begin by analysing the benchmark case where the intermediary does not inform consumers that add-ons can be purchased elsewhere on a stand-alone basis. As discussed above, this implies that only a fraction β of consumers - who are sophisticated and aware of stand-alone alternatives - are able to exercise the option of purchasing only the base good from the seller and the add-on elsewhere, if the terms are more favourable. The remaining consumers are naive and locked-in at the point of sale. For such purchasing behavior to hold, the following individual rationality and incentive compatibility constraints must be satisfied.

[5]The surplus u, v may be interpreted as follows. There are multiple competitive firms that sell the add-on at prices that are close to its marginal costs of production; in this case, u, v equals the surplus (net of cost) obtained by the high and low type consumers, respectively, from consumption of the add-on. Alternatively, the seller comprises a very small share of the market, so that the net surplus u, v obtained from consumption of the add-on bought elsewhere is largely invariant to the pricing strategy of the seller.

i. For the low type consumers who purchase the base good from the seller:

$$\theta_l q_l - p_l - tx \geq \max(0, \theta_l q_h - p_h - tx, \theta_l q_l - p_l - tx + v)$$

ii. For the high type, sophisticated consumers who purchase the base good from the seller and the add-on elsewhere:

$$\theta_h q_l - p_l - tx + u \geq \max(0, \theta_h q_h - p_h - tx, \theta_h q_l - p_l - tx)$$

iii. For the high type, naive consumers who purchase the bundle from the seller:

$$\theta_h q_h - p_h - tx \geq \max(0, \theta_h q_l - p_l - tx)$$

Then, the seller's optimisation problem may be written as

$$\max_{q_h, q_l, p_h, p_l} \pi_S = \lambda\left(\frac{\theta_l q_l - p_l}{t}\right)\left(p_l - \frac{q_l^2}{2} - k\right) + (1-\lambda)\beta\left(\frac{\theta_h q_l - p_l + u}{t}\right)\left(p_l - \frac{q_l^2}{2} - k\right) + (1-\lambda)(1-\beta)\left(\frac{\theta_h q_h - p_h}{t}\right)\left(p_h - \frac{q_h^2}{2} - k\right) \quad (1)$$

Suppose the prices and qualities that maximise the seller's profits are $p_l^*(k), p_h^*(k), q_l^*(k)$ and $q_h^*(k)$. Then, the intermediary's optimisation problem is given by

$$\max_k \pi_I = k\left[\lambda\left(\frac{\theta_l q_l - p_l}{t}\right) + (1-\lambda)\beta\left(\frac{\theta_h q_l - p_l + u}{t}\right) + (1-\lambda)(1-\beta)\left(\frac{\theta_h q_h - p_h}{t}\right)\right] \quad (2)$$

Now consider the case where the intermediary is required, by regulation, to prompt consumers about stand-alone sales. Now, all high type consumers are aware that the add-on can be bought separately from a different provider. For the seller to extract the relatively higher surplus of the high type consumers, it must sell them the bundle, but now, stand-alone sales exert a greater competitive pressure on the price and quality of the bundle as *all* consumers are fully informed about their outside options. Accordingly, we examine an equilibrium where the low type consumers buy the base good and all high type consumers buy the bundle from the seller. The following incentive compatibility and individual rationality constraints now hold.

i. For the low type consumers who purchase the base good from the seller:

$$\theta_l q_l - p_l - tx \geq \max(0, \theta_l q_h - p_h - tx, \theta_l q_l - p_l - tx + v)$$

ii. For the high type consumers who purchase the bundle from the seller:

$$\theta_h q_h - p_h - tx \geq \max(0, \theta_h q_l - p_l + u - tx, \theta_h q_l - p_l - tx)$$

Now, the seller's optimisation problem may be stated as

$$\max_{q_h, q_l, p_h, p_l} \pi_S = \lambda\left(\frac{\theta_l q_l - p_l}{t}\right)\left(p_l - \frac{q_l^2}{2} - k\right) + (1 - \lambda)\left(\frac{\theta_h q_h - p_h}{t}\right)\left(p_h - \frac{q_h^2}{2} - k\right) \quad (3)$$

while the intermediary's optimisation problem is given by

$$\max_k \pi_I = k\left[\lambda\left(\frac{\theta_l q_l - p_l}{t}\right) + (1 - \lambda)\left(\frac{\theta_h q_h - p_h}{t}\right)\right] \quad (4)$$

The lemma below summarizes the equilibria in the two cases.

Lemma 1. *i. In the absence of intervention by the intermediary, for $\hat{u} \leq u \leq \tilde{u}$ and $v < 0$, there exists an equilibrium where the low type and high type, sophisticated consumers purchase the base good (of quality exceeding the socially efficient level, θ_l) from the seller, with the latter also purchasing the add-on product elsewhere on a stand-alone basis. The naive, high type consumers buy the bundle (of socially efficient quality, θ_h) from the seller.*

ii. When the intermediary is required to prompt consumers about stand-alone sales by regulation, then for $u \leq \bar{u}$ and $v < 0$, the low type consumers buy the base good and all high type consumers buy the bundle from the seller. The quality of both goods is socially efficient.

iii. Suppose, further, that $u < u^*$. Then, the intermediary charges a lower fee from the seller when it is not required to prompt its customers by regulation.

Consider now the welfare of the naive, uninformed high type consumers who buy the bundle from the seller. In both cases, the seller's bundle is of the socially efficient quality,

q_h; however, for a range of values of u, its price is higher under regulation leading to a lower surplus for these consumers. This is because, *at a given* k, the demand faced by the seller is higher under regulation. This, in turn, drives up the fee charged by the intermediary and, subsequently, the price of the bundle due to cost pass through by the seller.

That the demand faced by the seller is higher under regulation, for a range of values of u, is due to the following reason. To begin with, note that for a given k, the demand from the naive, high type consumers is the same as the price and quality of the bundle sold by the seller is identical in the two cases ($q_h^*(k) = \theta_h, p_h^*(k) = \frac{3\theta_h^2+2k}{4}$). Next, the demand from the low type consumers is higher when the intermediary prompts - irrespective of the surplus, u, derived from the stand-alone product - because regulation results in greater surplus for these consumers. This is due to the following reason. In the absence of regulation, the quality of the base good exceeds the socially efficient level, θ_l, with the extent of the distortion directly proportional to β. Specifically, as β increases, so that an increasing number of consumers (of low type and sophisticated high type) buy the base good only, its quality increases. Conversely, when the intermediary is required to prompt about stand-alone alternatives and all the high type consumers buy the bundle, the quality of the base good drops (to the socially efficient level) due to the seller's own product-line competition, with a corresponding drop in price as well. We find that this drop in quality and price of the base good under regulation, nevertheless, results in a higher surplus for these consumers, resulting in greater demand. Finally, the demand from the sophisticated, high type consumers is higher under regulation for a range of values of u. This is partly because a low surplus from consumption of the add-on bought on a stand-alone basis (when the intermediary does not prompt) has the immediate effect of reducing the total payoff, and hence, the demand from such consumers.

Thus, under regulation, the naive, high type consumers pay a higher price for a bundle which is of the same quality, θ_h, as before. This not only lowers the surplus of a consumer but also leads to a drop in the number of such consumers who buy from the seller. Therefore, it appears that the uninformed consumers, whom the regulation seeks to protect, may actually suffer a welfare loss.

Proposition 1. *Suppose* $\hat{u} \leq u \leq \min(\tilde{u}, \bar{u}, u^*)$. *Then the naive, high type consumers are worse off under regulation that requires the intermediary to prompt them about stand-alone*

alternatives.

4 Conclusion

This paper examines the impact of regulation that seeks to address the adverse effects on competition and market outcomes brought about by consumer naïveté, whereby a section of the population is unaware that add-ons need not be tied to the purchase of the base product but can also be bought separately on a stand-alone basis.

We find that contrary to expectations, regulation that requires intermediaries such as platforms to prompt consumers about the availability of such alternatives may have a detrimental effect on consumer welfare. This is due to an increase in the fee (charged by the intermediary) brought about by changes in demand faced by the seller under regulation, that are then passed on in the form of higher prices of its products. Thus, ironically, the naive uninformed consumers, whom the regulation seeks to protect, may actually suffer a welfare loss.

5 Appendix

Proof of Lemma 1

Differentiating equation (1) with respect to q_h, q_l, p_h, p_l and solving the first order conditions for the prices and qualities, given k, yields:

$$q_h^*(k) = \theta_h,\ q_l^*(k) = \frac{\beta(1-\lambda)\theta_h + \lambda\theta_l}{\beta(1-\lambda)+\lambda},\ p_h^*(k) = \frac{1}{4}\left(3\theta_h^2 + 2k\right) \tag{5}$$

and

$$p_l^*(k) = \frac{3\beta^2(1-\lambda)^2\theta_h^2 + 6\beta(1-\lambda)\lambda\theta_h\theta_l + 3\lambda^2\theta_l^2}{4(\beta(1-\lambda)+\lambda)^2} + \frac{2(\beta(1-\lambda)+\lambda)(k(\beta(1-\lambda)+\lambda)+\beta(1-\lambda)u)}{4(\beta(1-\lambda)+\lambda)^2} \tag{6}$$

Next, substituting $q_h^*(k), q_l^*(k), p_h^*(k), p_l^*(k)$, in the intermediary's payoff, (2), differentiating with respect to the fee, k, and solving the first order condition gives

$$k^* = \frac{-(1-\lambda)(\beta(2\lambda-1)-\lambda)\theta_h^2 + 2\beta(1-\lambda)\lambda\theta_h\theta_l + \lambda^2\theta_l^2 + 2u\beta(1-\lambda)(\beta(1-\lambda)+\lambda)}{4\beta(1-\lambda)+4\lambda} \tag{7}$$

Substituting for k^* in $q_h^*(k), q_l^*(k), p_h^*(k), p_l^*(k)$ yields the optimal prices and qualities $q_h^*, q_l^*, p_h^*, p_l^*$. Now, the incentive compatibility constraints for the sophisticated high type consumers, the low type consumers and the naive high type consumers are

$$u - \theta_h(q_h^* - q_l^*) + (p_h^* - p_l^*) \geq 0$$
$$\theta_h q_h^* - p_h^* - tx \geq \theta_h q_l^* - p_l^* - tx$$
$$\theta_l q_l^* - p_l^* - tx \geq \theta_l q_h^* - p_h^* - tx$$

Substituting for the optimal prices and qualities in the first constraint yields

$$u \geq -\frac{\lambda\left(\theta_h - \theta_l\right)\left((2\beta(1-\lambda) - \lambda)\theta_h + 3\lambda\theta_l\right)}{2(\beta(1-\lambda) + 2\lambda)(\beta(1-\lambda) + \lambda)} = \hat{u} \tag{8}$$

Similarly, the second constraint yields

$$u \geq \frac{\lambda\left(\theta_h - \theta_l\right)\left((2\beta(1-\lambda) - \lambda)\theta_h + 3\lambda\theta_l\right)}{2\beta(1-\lambda)(\beta(1-\lambda) + \lambda)} = \underline{u} \tag{9}$$

Note that $\hat{u}$ and $\underline{u}$ are opposite in sign. We assume that $\theta_h > \frac{3\lambda\theta_l}{(\lambda - 2\beta(1-\lambda)}$, i.e. θ_h is high enough. Then, $\hat{u} > 0$ and $\underline{u} < 0$ and (9) is trivially satisfied. Finally, the last constraint reduces to

$$u \leq \frac{\lambda\left(\theta_h - \theta_l\right)\left((6\beta(1-\lambda) + 3\lambda)\theta_h - (\lambda + 4\beta(1-\lambda))\theta_l\right)}{2\beta(1-\lambda)(\beta(1-\lambda) + \lambda)} = \tilde{u} \tag{10}$$

Thus, from equations (8) and (10), $u \geq \hat{u}$ and $u \leq \tilde{u}$.

Now consider the case where the intermediary is required to prompt its customers about stand-alone sales. Differentiating equation (3) with respect to q_h, q_l, p_h, p_l and solving for the prices and qualities, given k, yields:

$$q_h^*(k) = \theta_h,\ q_l^*(k) = \theta_l,\ p_h^*(k) = \frac{1}{4}\left(3\theta_h^2 + 2k\right),\ p_l^*(k) = \frac{1}{4}\left(3\theta_l^2 + 2k\right) \tag{11}$$

Substituting $q_h^*(k), q_l^*(k), p_h^*(k), p_l^*(k)$, in the intermediary's payoff, (4), differentiating with respect to the fee, k, and solving the first order condition yields

$$k^* = \frac{(1-\lambda)\theta_h^2 + \lambda\theta_l^2}{4} \tag{12}$$

Note that the fee is lower when the intermediary is not required to prompt its customers if

$$u \leq \frac{\lambda(\theta_h - \theta_l)^2}{2\beta(1-\lambda) + 2\lambda} = u^* \tag{13}$$

Substituting for k^* in $q_h^*(k), q_l^*(k), p_h^*(k), p_l^*(k)$ yields the optimal prices and qualities $q_h^*, q_l^*, p_h^*, p_l^*$:

$$q_h^* = \theta_h,\ q_l^* = \theta_l,\ p_h^* = \frac{(7-\lambda)\theta_h^2 + \lambda\theta_l^2}{8},\ p_l^* = \frac{(1-\lambda)\theta_h^2 + (6+\lambda)\theta_l^2}{8} \tag{14}$$

The incentive compatibility constraints of the low and high type consumers reduce to

$$u - \theta_h(q_h^* - q_l^*) + (p_h^* - p_l^*) \leq 0,\ \text{or}\ u \leq \frac{(\theta_h - 3\theta_l)(\theta_h - \theta_l)}{4} = \bar{u} \tag{15}$$

and

$$\theta_h \geq \frac{p_h^* - p_l^*}{q_h^* - q_l^*} \geq \theta_l$$

Substituting for the optimal prices and qualities in the above two inequalities, we get

$$\frac{\theta_h - 3\theta_l}{4} \geq 0,\ \text{ or }\ \theta_h \geq 3\theta_l,\ \text{and}\ \frac{3\theta_h - \theta_l}{4} \geq 0 \tag{16}$$

which is satisfied trivially. Then, from equations (15) and (16), $u \leq \bar{u}$ and $\theta_h \geq 3\theta_l$. One can show that the latter inequality holds as long as $\theta_h \geq \frac{3\lambda\theta_l}{(\lambda - 2\beta(1-\lambda))}$. Thus, $\hat{u} \leq u \leq \min(\tilde{u}, \bar{u})$. Further, it is straightforward to show that $\hat{u} < \tilde{u}$, $\hat{u} < \bar{u}$ and $\hat{u} < u^*$. ■

Proof of Proposition 1

It is straightforward to show that the difference in demand when the intermediary is required to prompt vs. does not prompt equals

$$\frac{\beta(1-\lambda)\left(2u(\beta(1-\lambda)+\lambda) - \lambda\theta_h^2 + 2\lambda\theta_h\theta_l - \lambda\theta_l^2\right)}{4t(\beta(1-\lambda)+\lambda)}$$

and is negative for $u < u^*$. Note that the difference in demand from the low type consumers across the two cases equals

$$-\frac{\beta(1-\lambda)\lambda\left((\theta_h - \theta_l)\left(\beta(1-\lambda)(3\theta_h - \theta_l) + 2\lambda\theta_l\right) + 2u(\beta(1-\lambda)+\lambda)\right)}{4t(\beta(1-\lambda)+\lambda)^2}$$

and is negative for all u.

That k^* is higher under regulation when $u < u^*$ may be seen from (13). It results in a

higher price of the bundle ($p_h^*(k) = \frac{3\theta_h^2+2k}{4}$); the difference in the price of the bundle across these two cases equals

$$\frac{\beta(1-\lambda)\left(-\lambda(\theta_h-\theta_L)^2+2u(\beta+\lambda(1-\beta))\right)}{8(\beta+\lambda(1-\beta))}<0$$

when $u < u^*$, i.e. it is higher under regulation. ■

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