Divide and Conquer: Price Discrimination vs. Flat Rate in Music Streaming Services. Working Paper

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Abstract

Pricing information goods is a difficult task. Usually given their almost zero marginal cost they are offered in a bundle for a flat rate. This is a clear characteristic in the case of music streaming platforms. Still, price discrimination could be applicable by pricing different bundles to different prices and inducing individuals to self identify and chose the bundle tied to their class of consumer. In other words, platforms could find ways to do a second degree price discrimination. We examine the effects in profits of applying such an scheme and the possible conflicts arising from it.

Keywords. Streaming, Music Industry.

1 Introduction

Information goods differ from physical goods in the sense that their value depends on the information they hold and not in their material value. They also differ in the sense that their marginal cost is extremely low, this means

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that the cost to serve one additional consumer is almost zero. But even with this essential characteristic the presence of price discrimination schemes is very rare. By contrast, industries as telecommunications present not a fixed price but several combinations of goods and services in different qualities of service[1]. They not only bundle their services but also provide the possibility of a ceiling of consumption and then a pay as you consume options[2]. They bundle not only telecommunication services as internet, telephone and mobile communications but also entertainment by providing access to cable television, radio channels and others.

This has been possible because of the continued advance of technologies such as the optic fibre that have made it easy and cheaper to bundle all of this services in a less costly and efficient manner. We can see some similarities between them and the streaming platforms; in the case of the later the new technology of streaming and the internet and the greater access of the population to both has provided a way in which is possible to supply a service by a near if not zero marginal cost; this creates an environment in which price discrimination is the most optimal way to extract the surplus of the consumers but, they do not do it. They have preferred to stay with the model of a fixed flat rate for a high quality and unlimited access to the services they provide. What is the reason of not using the tools provided by price discrimination schemes?.

Price discrimination is a strategy by which a firm sells the same product or service to different costumers at different prices. In first degree the firm charges a different price for each unit that is consumed, this means that the firm is capable of creating a personalized price. Clearly because of the requirements of information that this process requires and the possible violations towards piracy this is least applied form of price discrimination. The second degree price discrimination applies different prices for different quantities of a good being consumed and the third degree price discrimination

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[1]An example of this is SFR, they present several plans under this trademark where the clients have access to support and other elements that elevate the quality of the services sold. SFR also operates RED, which does not provides personal client service, does not has stores,and the interaction between the client and the enterprise is relegated to the web page of RED.It also delivers a lower quality in the services provided. The difference in quality between both and the markets that they target is a combination of different price discrimination schemes which is present through other firms in the service industry but not in the case of experience goods.

[2]A quick visit to different telecommunications operators such as SFR, Orange, AT&T and others can provide more examples and proof of this.

charges different prices for different groups of consumers. Based of the used of a service or good individuals can be divided between those that use it extensively and those that use it occasionally. This is the simplest and most common way to price discriminate because the individuals are invited to self identified. This means that the firms do not require the information of the consumers because with the information revealed in the price individuals will self identified and take the price that corresponds to the type of consumer that they are. Armstrong [1999] provides a good review related to price discrimination.

The difficulty to apply any price discrimination scheme in the correct way befalls in the fact that firms do not have the relevant information about the individual consumers to know how to divide them and set prices depending on their valuation towards an specific characteristic of the product they sell. Even when applying third degree price discrimination individuals could select the prices that are not in line with the group to which they correspond. To be able to gather this information firms have established ways in which people reveal their preferences such as fidelity programs, cookies in websites, data mining from social networks, etc.

The flat rate as a price scheme is more profitable when the marginal costs are low. In the case of music streaming platforms the price of serving an additional consumer or providing an additional bundle is almost negligible[3]. Which means that they could offer their catalogue plus the specific characteristics of their platform as a bundle for a flat rate in a profitable manner. And in fact we can observe that in general music streaming platforms apply this idea of bundling their services and characteristics with the catalogue of music that they posses for a flat rate.

In the case of various music streaming services we can observe that, in general, even thought they are able to know almost all the required information[4] to create this personalized price they choose to operate in a freemium business model[5] or in a pay only subscription service[6]. Usually, they charge a flat rate for their premium service.

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[3]Aguiar and Waldfogel [2017]

[4]They already know some demographics of each individual and all their past consumption of songs, they know how many songs, of which genre, from which artists and for how long they have heard them plus any additional information that can be mined from the connection of the platform to facebook or other social networks.

[5]Platforms such as Spotify and Deezer operate in this way

[6]Platforms such as Apple Music, Google Music, Tidal and others operate in this way

The flat rate provides unlimited and uninterrupted access (as long as the internet connection enables it) to the entire catalogue of songs that the platform has. It also enables other characteristics as being able to download content to be used off-line, high fidelity sound and the possibility to use it in mobile devices. The freemium model provides two very clear tranches of service: A free restricted[7] ad based service and a premium unrestricted flat rate paid service.

The flat rate is not the best way to capture the entirety of the consumer surplus and generate the highest profits. Through this pricing schedule individuals with a higher reservation price end by paying less than what they are willing. Meanwhile, individuals that can be served at a lower price do not enter because the flat rate is over their reservation price. Clearly the platforms are not using a powerful tool that would bring more people to enter the paid service and to generate greater profits.

Second degree price discrimination could be applicable and more profitable than a single flat rate. This would mean creating different bundles of characteristics and services of the platform combined with access to the catalogue they posses. By this they could in theory obtain a greater part of the consumer surplus and for so enhance their profit and paid base. The present article aims to study the effects in profits and the possible misalignments between the providers of this catalogues and the platforms when applying a second degree price discrimination scheme. The analysis is motivated by the current trend in on-line services to provide flat rates not only for information goods such as music but in general to provide several goods and services under the umbrella of a flat rate.

Our model shows that applying a second degree price discrimination scheme generates a positive effect overall, it increments the profits generated by the platform, it makes that users that otherwise would have not paid for the service now paid a lower rate but they are not longer using it by free; this will be true as long as the price that is paid by advertisers in the free tranche of service is very small. Restricting access to only one kind of music for the low tranche of service makes that the earnings obtained by applying price discrimination depend also on the preferences of the individuals expressed in the share of the major labels music that they listen to which will have to be greater than the relation between the parameters measuring the quality of

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[7]When we refer to restricted we mean restricted in functions such as downloadable songs, skipping, high fidelity sound between others.

the low price and free tranche.

The article proceeds as follows: Section 2 covers the literature review relative to price discrimination and pricing schemes and the advancements in the general area of this article. Section 3 and 4 describes the model. Section 5 presents the discussion and section 6 concludes.

2   Literature Review

There are papers [Carroni and Paolini, 2016, Thomes, 2013] that analyse the strategic choice of the platform regarding business models to either choose an ad supported free subscription service, a paid only service or a combination of both. This decisions have to take into account the different interactions between the different actors. Carroni and Paolini [2016] describes the complications that can arise with the different actors and what are the motivations to opt either for a freemium[8] business model or a paid subscription only describing the size and grade of innovation of the firms as defining characteristics to chose either model. A solution to solve this miss-alignments can include the imposition of a flat rate for the use of the high quality paid trench of service provided by the platform. The flat rate in music has been present for a long period of time for new releases. Shiller and Waldfogel [2011] establish that price is a way to observe the quality of a good when no information about quality has been disclosed. This is specially characteristic of experience goods such as music for which all new releases are priced at the same value so consumers can't observe the quality before using them but, after using them the same price can not be used because consumers know the real quality of the product so they are less willing to pay a pooling price for the good. Another paper [Richardson and Stähler, 2016] supports this idea by showing that a pooling equilibrium for goods with different qualities is reasonable explanation for the application of uniform pricing by the publishers of recorded music.

Miettinen and Stenbacka [2015] considers the effectiveness and profitability of first degree price discrimination when confronting it to the intrinsic value of privacy for the consumers resulting in an increase in inefficient[9] switching and

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[8]A freemium model presents 2 different trenches of service, a low quality, ad supported free service and a high quality, ad free paid service.

[9]Inefficient means that consumers that should be in the higher trench end up in the lower trench. The contrary can be thought when talking about efficient switching.

a decrease in efficient switching. Furthermore, Sundararajan [2004] observes the effects of a non-linear pricing scheme in information goods. It demonstrates that for second degree price discrimination the absence of transaction costs is a necessary condition for it to work and, that the absence of variable costs leads to usage based pricing being not optimal. also, it founds that it is optimal for the firm to propose both a fixed price and a usage based pricing system.

Self selection is used as a mechanism to evade the problems that arise with the lack of information while doing price discrimination schemes, for so it is useful when designing third degree discrimination strategies. The seminal paper of Mussa and Rosen [1978] proposes such a scheme where the firms present different products with different levels of quality and consumers engage in self selection by buying the product that is over their respective value of quality. Salant [1989] shows that for self selection to be optimal the cost function of the firm must be strictly convex if not, Kuhn-Tucker conditions are not satisfy and both self selection and price discrimination are suboptimal. Other papers [Anderson and Celik, 2015, Dubovik and Janssen, 2012] analyse how firms react when competing in prices and quality and how they decide on the qualities to produce and sell to their consumers when under perfect and imperfect competition. Versioning [Belleflamme, 2005] presents other view to the competition in quality where the firm charges different prices for the same product with varying qualities between them. Belleflamme [2005] designates it as a "degraded" version. In this case the consumers have a valuation of a characteristic of which the firm can control it's quality; this valuation acts as a self selection variable for consumers.

Other strategies regarding second degree price discrimination are treated by Bakos and Brynjolfsson [2000] who describes how bundling can act to improve the profits of the firm when marginal costs are near zero and that in the case of information goods such as music an economy of aggregation has the same effects as an economy of scale in the way of extracting a greater part of profit and consumer surplus but at the same time they note that this strategy can only work for goods for which their marginal cost is near to zero. Self selection is in display Mussa and Rosen [1978] In other papers [Bakos and Brynjolfsson, 1999, Adams and Yellen, 1976] piracy can be seen as a way of self selection, users that do not have the entire information about the quality of band would rather obtain for a zero price the production of the artists so they can experience the quality of their production and decide if they assist to live performances or obtain the legal copies of their

work. Gayer and Shy [2006] present an analysis of the effects of enforcing anti-piracy laws and the effects on the quantity of people that is using the content produced by the artists. This shows that piracy expands the the number of user but takes the monopoly power from the firms. Belleflamme [2005] creating different valuations of a characteristic that is under control by the platform and is known to be of value to the consumers. This leads to the creation of different bundles of catalogue, characteristics and services provided by the platform that induce consumers to auto-identify themselves by subscribing to obtain one of the bundles offered.

3   The Model

To understand what could be the effects of applying a second degree price discrimination scheme the reality has to be simplify. In this sense we observe the effects on the profit gathered only by the streaming platform. In a first step the platform decides to implement the freemium model. This means that the platform offers either access with publicity/advertisement, with restrictive characteristics and lower quality or a flat rate premium service with no advertisement, high quality and all the characteristics available to the platform. In a second step the platform introduces a second degree price discrimination scheme. In this there exist three tranches of service, the free tranche, the high price tranche that is the same as premium and a low price tranche. The low price tranche has no advertisement, lesser characteristics and less quality than the high price trance but is better in quality than the free tranche. In a final step the platform decides to limit the access to content for the low price tranche of service. In this case the consumers of this tranche can only listen to major labels music while in the high price tranche they have access to all the library that the platform possesses. In this last step the preference towards the type of music that a consumer listens to comes into play, it is measured by the share of majors labels music that they listen to. This specification can be used to isolate the earnings of the major labels and observe if there could be any miss-alignments between the platform and labels.

The present model is an adaptation of Belleflamme [2005] model. A difference between Belleflamme [2005] and our paper is that we consider that the cost for the platform to produce a unit of one or the other quality is marginally zero. In this sense we consider for all the present section that $c = 0$. To

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create a benchmark for the model we consider only paid streaming and it's free version. After obtaining this results we observe what happens if we add a third trench where there is a low paid restricted version. Finally, we observe the effects of having a grade of predilection to an additional characteristic that affects the self selection of the individuals based in their valuation of the characteristic controlled by the platforms. First we analyse the standard free vs. paid.

3.1 Freemium

We define the following utility functions for the freemium case:

$$
U = \begin{cases} (1)\beta + \phi\theta, & \text{if free.} \\ (2)1 + \omega\theta - P_p, & \text{if paid.} \end{cases}
\tag{1}
$$

Where:

1. $\omega > \phi > 0, 0 < \beta < 1$ with ω and ϕ measuring the different qualities between the free and paid versions; β measuring the marginal tolerance of individuals towards advertisement. There is a continuum of potential users and θ is their valuation for their respective quality of the service.

2. P_p is the flat rate subscription price to access the paid service.

3. P_a price paid by the advertisers for commercial spaces and given exogenously.

From equating equation 1 to zero we obtain $\theta_f = -\dfrac{\beta}{\phi}$. And equating both equations we obtain:
$\theta_p = \dfrac{1 - \beta - P_p}{\phi - \omega}$.
As it is clear this value is negative. As it represents the market share of the free service it can't be negative. In that sense, we assume that $\theta_f = 0$ and that there are no non-users.
The profit function is as follow:

$$
\begin{aligned}
\Pi &= (\theta_p - \theta_f)(P_a) + (1 - \theta_p)(P_p) = \\
&\quad (\theta_p - 0)(P_a) + (1 - \theta_p)(P_p).
\end{aligned}
\tag{2}
$$

Derivating we obtain the following optimal values:

- $P_p^* = \dfrac{P_a + 1 + \omega - \phi - \beta}{2}$

- $\theta_p^* = \dfrac{P_a + \omega + \beta - \phi - 1}{2(\omega - \phi)}$

And the optimal profit function:

$$\Pi^* = \left(\frac{(P_a + \omega + \beta - \phi - 1)(P_a)}{2(\omega - \phi)} \right) + \left(\frac{\kappa}{4(\omega - \phi)} \right) \tag{3}$$

Where:

$$\kappa = 2\omega(1 - \phi - \beta) - 2(\phi + \beta(1 - \phi)) + \omega^2 + \beta^2 + \phi^2 - P_a \tag{4}$$

In this simple benchmark we can observe two things. The first is that indeed the benchmark and price of the premium service depend on the parameters ω and β. This means that they depend on the quality offered in the premium service and their tolerance towards advertisement. It is clear then that people whose tolerance is low (β closer to 0) will prefer the premium service as people who value the quality of the service/music that they are consuming will also end up taking the premium service.

Given this results we could also think that there are consumers who are in the free subscription that would be willing to pay for a limited, less functional version of the platform.

3.2   Price Discrimination

The platform decides to discriminate prices by offering a third price in which individuals are constraint in some form (being able to listen to major labels content only, time constraint use, etc.). The following utility functions represent the general case:

$$U = \begin{cases} (1)\beta + \phi\theta, & \text{if free.} \\ (2)1 + \lambda\theta - P_l, & \text{if low paid version.} \\ (3)1 + \omega\theta - P_h, & \text{if premium paid version.} \end{cases} \tag{5}$$

As before we have that:

1. $\omega > \lambda > \phi > 0, 0 < \beta < 1$ with ω, λ and ϕ measuring the different qualities between the free and paid versions; β measuring the marginal tolerance of individuals towards advertisement. There is a continuum of potential users and θ is their valuation for their respective quality of the service.

2. P_h is the flat rate subscription price to access the premium service.

3. P_l is the flat rate subscription price to access the paid basic service.

4. P_a price paid by the advertisers for commercial spaces and given exogenously.

From equating equation 1 to zero we obtain $\theta_f = -\dfrac{\beta}{\phi}$. From equating equations 1 and 2 we obtain $\theta_l = \dfrac{P_l + \beta - 1}{\lambda - \phi}$; doing the same with equation 2 and 3 we obtain $\theta_h = \dfrac{P_h - P_l}{\omega - \lambda}$.

The profit function is as follow:

$$\begin{aligned}\Pi = (\theta_l - \theta_f)(P_a) + (\theta_h - \theta_l)(P_l) + (1 - \theta_h)(P_h) = \\ (\theta_l - 0)(P_a) + (\theta_h - \theta_l)(P_l) + (1 - \theta_h)(P_h).\end{aligned} \tag{6}$$

As before we can observe that the value of the $\theta_f < 0$ so, again we assume that $\theta_f = 0$ and that there are no non-users.

Derivating we obtain the following optimal values:

- $P_l^* = \dfrac{1 + P_a - \beta - \phi + \lambda}{2}$

- $p_h^* = \dfrac{\omega + 1 + P_a - \phi - \beta}{2}$

- $\theta_l^* = \dfrac{P_a + \beta + \lambda - \phi - 1}{2(\lambda - \phi)}$

- $\theta_h^* = \dfrac{1}{2}$

We obtain the following optimal profit:

$$\Pi^* = \left(\frac{P_a(P_a + \beta + \lambda - \phi - 1)}{2(\lambda - \phi)} \right)$$
$$+ \left(\frac{(1 - P_a - \beta)(1 + P_a - \phi - \beta + \lambda)}{4(\lambda - \phi)} \right) \quad (7)$$
$$+ \left(\frac{\omega + 1 - P_a - \phi - \beta}{4} \right)$$

We can observe that $P_p = P_h$. It means that in both case the flat rate price is the optimal price to charge for the premium service offered by the platform. It is clear that two segments are not affected by the new prices; those that have a great tolerance towards advertisement (β closer to zero or a $\theta < \theta_f$) and those whose value of the quality/music they receive is extremely high($\theta > \theta_h$). For the consumers that are between this values the new option could cause both an expansion effect by attracting consumers that where in the free service to this new quality but, it also could cause a cannibalization effect by taking users that were paying for the premium service because they did not have any other option to access the content or high quality that they value the most.

3.3   Cannibalization and Expansion

We can consider that there are two effects at play when discriminating prices in this way. We can consider a cannibalization effect, which means that certain individuals for which $\theta_h > \theta > \theta_p$. This means that there are certain people that under the freemium model would choose to pay the flat rate price for the premium service because for them $\theta > \theta_p$ but that in the new price discrimination model would choose to pay the low rate because in their case $\theta < \theta_h$. This means that a part of the revenue generated by the premium service in the freemium model will be lost to the new low price. For this to happen the following condition has to be fulfilled:

$$\text{Cannibalization} = \theta_h - \theta_p > 0 \quad (8)$$

In the case of expansion, individuals whose $\theta < \theta_p$ would not choose to subscribe to the premium service and would use the free service. But there are

some individuals for whom $\theta > \theta_l < \theta_p$ that will choose to opt for the low rate subscription service in time that choosing the free service. In this way, the platform makes a profit from people that would not be willing to pay for the service before. For this to happen the following condition has to be fulfilled:

$$\text{Expansion} = \theta_p - \theta_l > 0 \tag{9}$$

In both cases we see cannibalization and expansion exists if and only if $P_a < 1 - \beta$. Which is in more accordance with the idea that usually the revenues from free advertisement based streaming are very low. We now examine the how this elements affect the profit.

$$\Delta \Pi = (\theta_p - \theta_h)[P_l - (P_p = P_h)] + (\theta_p - \theta_l)(P_l) > 0 \tag{10}$$

This presents us with the following equation:

$$\Delta \Pi = (\theta_p - \theta_h)[P_l - (P_p = P_h)] + (\theta_p - \theta_l)P_l > 0 \tag{11}$$

Replacing the corresponding optimal values we obtain the following:

$$\Delta \Pi = \left[\frac{(P_a + \beta - 1)(\lambda - \omega)}{4(\omega - \phi)} \right] \left[\frac{\lambda + 1 + P_a - 2\phi - \beta}{\lambda - \phi} \right] > 0 \quad \text{if} \quad P_a < 1 - B \tag{12}$$

It is clear that the effect of discrimination in prices in this case would turn to be positive. The addition of a new tranche of service with a restricted access or lower quality would generate more profits for the platform by attracting additional individuals from the free service to the paid one, even though they will pay a lower price than those in the premium tranche. This rises the question of why we do not see any other prices besides the flat rate?. The non-existence of price discrimination schemes can be due to misalignments between the platform and the labels.

4 Discrimination With Music Taste

We consider that the low price tranche gives only access to majors labels music and but not to independent music and the high price tranche provides

access to both. Consumers that have a high preference for the majors music would prefer the low price tranche of service rather than the high price tranche of service. We consider the parameter $\alpha \in (1, 0)$ is the preference of an individual towards majors music. The closer α gets to 1 the more probable is that individuals will value the consumption of majors' music over the consumption of independents' music. Furthermore, we use the present section to observe the effects of this parameter in the valuation of the individuals θ, in the prices of the tranches of the services, the profit functions and the effects it has on the conditions that must occur for the variation of profits to be positive. In this sense we present the following utility equations:

$$
U = \begin{cases} (1)\beta + \phi\theta, & \text{if free.} \\ (2)1 + \alpha\lambda\theta - P_l, & \text{if low paid version.} \\ (3)1 + (1-\alpha)\omega\theta - P_h, & \text{if premium paid version.} \end{cases} \tag{13}
$$

As before we have that:

1. $\omega > \lambda > \phi > 0, 0 < \beta < 1$ with ω, λ and ϕ measuring the different qualities between the free and paid versions; β measuring the marginal tolerance of individuals towards advertisement. There is a continuum of potential users and θ is their valuation for their respective quality of the service.

2. $\alpha \in (0, 1)$ being the preference[10] of individuals towards music produced by major labels to independent music which is established in exogenous way.

3. P_h is the flat rate subscription price to access the premium service.

4. P_l is the flat rate subscription price to access the paid basic service.

5. P_a price paid by the advertisers for commercial spaces and given exogenously.

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[10]We could treat this as a random variable, formally we could say that $f(\alpha) = prob(\alpha > 0) = \alpha > 0$ with $f(\alpha) \sim \mathcal{N}(\mu, \sigma^2)$ or any other distribution function depending on how we consider or measure the preference towards the type of music. In this case, and for simplicity we consider that α is a cross-section measurement of individuals preferences towards music types.

From equating equation 1 to zero we obtain $\theta_f = -\dfrac{\beta}{\phi}$. From equating equations 1 and 2 we obtain $\theta_l = \dfrac{P_l + \beta - 1}{\alpha\lambda - \phi}$; doing the same with equation 2 and 3 we obtain $\theta_h = \dfrac{P_h - P_l}{\omega - \alpha(\omega + \lambda)}$.

With this elements we are able to depict the profit function as follows:

$$
\begin{aligned}
\Pi = (\theta_l - \theta_f)(P_a) + (\theta_h - \theta_l)(P_l) + (1 - \theta_h)(P_h) = \\
(\theta_l - 0)(P_a) + (\theta_h - \theta_l)(P_l) + (1 - \theta_h)(P_h).
\end{aligned}
\tag{14}
$$

As before we can observe that the value of the $\theta_f < 0$ so, again we assume that $\theta_f = 0$ and that there are no non-users.

Derivating we obtain the following optimal values:

- $P_l^* = \dfrac{\alpha\lambda - \phi - 1 + \beta + P_a}{2}$

- $p_h^* = \dfrac{\omega(1 - \alpha) - 1 + P_a - \phi + \beta}{2}$

- $\theta_l^* = \dfrac{\alpha\lambda + 3\beta - \phi - 3 + P_a}{2(\alpha\lambda - \phi)}$

- $\theta_h^* = \dfrac{1}{2}$

We obtain the following optimal profit:

$$
\begin{aligned}
\Pi^* = {} & \left(\frac{P_a(\alpha\lambda - \phi - 3 + 3\beta + P_a)}{2(\alpha\lambda - \phi)} \right) \\
& + \left(\frac{[3(1 - \beta) - P_a](\alpha\lambda - \phi - 1 + \beta + P_a)}{4(\alpha\lambda - \phi)} \right) \\
& + \left(\frac{\omega(1 - \alpha) - 1 + P_a - \phi + \beta}{4} \right)
\end{aligned}
\tag{15}
$$

As before we consider both expansion and cannibalization effects. This time we consider the effects of both when the preference towards a type of music is in play. As before we search for the conditions under which the profit variation would be strictly positive. We define this variation as follows:

$$
\Delta\Pi = (\theta_p - \theta_h)[P_l - P_p] + (\theta_p - \theta_l)(P_l) > 0
\tag{16}
$$

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Replacing the corresponding optimal values we obtain the following:

$$\Delta\Pi = \left[\frac{(P_a + \beta - 1)(\alpha\lambda - \omega - 2 + 2\beta)}{4(\omega - \phi)}\right]$$
$$+ \left[\frac{[\alpha\lambda(P_a + \beta - 1) + \omega(3 - P_a - 3\beta)](\alpha\lambda + P_a + \beta - \phi - 1)}{4(\alpha\lambda - \phi)(\omega - \phi)}\right]$$
$$- \left[\frac{2\phi(1 - \beta)(\alpha\lambda + P_a + \beta - \phi - 1)}{4(\alpha\lambda - \phi)(\omega - \phi)}\right] > 0$$
$$\text{if} \quad P_a < 1 - \beta, \quad \& \quad \alpha > \frac{\phi}{\lambda}$$

(17)

This conditions are necessary for the effects on profits to be positive ($\Delta\Pi > 0$).

Furthermore, α affects the prices and the valuations of the individuals θ, the only element that remains constant is the valuation θ_h. Moreover, $\dfrac{\partial P_l}{\partial\alpha} > 0$ and $\dfrac{\partial\theta_l}{\partial\alpha} => 0$ which means that the higher the value of α the higher the price of the lower price tranche. As the share of music from majors grows it will generate that the price for a plan that only gives access to this music be higher. The market share of the low price tranche will also increment as the share of majors music listen by consumers increments. Even thought the market share of the high price tranche is not affected the price of this tranche is. $\dfrac{\partial P_h}{\partial\alpha} < 0$; which means that the higher share of majors music that is listened by the consumers the lower the price of the high price tranche.

5 Discussion

As expected if two conditions ($P_a < 1 - \beta$ and $\alpha > \dfrac{\phi}{\lambda}$) hold then there would be an increase in the profit generated by the platform. One of the limitations of this model is that we do not consider heterogeneity of consumers in the case of their preference towards majors music. Which for sake of simplicity is considered as equal for all consumers. Analysing consumers that are heterogeneous in their preference can lead to innovative ways by which platforms

or majors could try to influence consumers to attain the optimal effect in the expansion of profits. Strategies of choice architecture as described by Thaler and Sunstein [2009] could apply to create different nudges to move the optimal number of individuals of the right type to the different trenches so, in that way platforms could extract a greater amount of the consumer surplus.

Other ways to consider a second degree price discrimination could be attached to the concepts of personalized pricing and history based pricing in which individuals could be prompted to choose a plan or service trench tailored to their specific preferences. This is possible in the case of music streaming platforms in which they have access to the history of each one of the users of the platform. This is an option already considered by Miettinen and Stenbacka [2015] and they show that even though there is a gain in income it is almost minimal to other price discrimination schemes. So the question that could be answered through the extension of the present model towards a two sided market is to see if the price and service quality compensate the lost of privacy of the individuals.

Another extension to the present work is to analyse the effects of introducing a low price tranche of service on the profits of the platform and on the isolated profits of the major labels. This considering that the low price tranche will grant access only to the majors music.

Furthermore, the application of not only one but several pricing schedules such as bundling, pay as you go, capped consumption, tc. as present in the telecommunications industry is a way that has not been explored in the present model. Given the specification of the model both marginal and transaction costs are zero. This means that the application of different price schedules would be more efficient than in the case of the existence of both marginal and transaction costs [Adams and Yellen, 1976, Bakos and Brynjolfsson, 1999, Mussa and Rosen, 1978, Dubovik and Janssen, 2012]; it could open unlimited possibilities for platforms to offer personalized subscriptions based on their listening history, by their activity in the platform and with the less possible inconvenience for the users. Such an specification could be discuss as future research as is the combination of a two sided marked, signalling games and Stakelberg competition.

6 Conclusions

The present model supports the idea that a price discrimination scheme has a positive effects towards increasing the profit that the platform could make. This is achieved by the application of second degree price discrimination by forcing individuals to self select based in their valuation of a characteristic that is controlled by the platform and then by seeing what happens when this characteristic and price is tied to a second limiting factor as the type of music the consumers would be able to access. It is clear that in both cases the results are positive and the application of such a price discrimination scheme would create a positive increase in profits for the platform. This can only happen if two conditions are fulfilled. First $P_a < 1 - \beta$ which means that the price paid by advertisers must be extremely small. Second that $\alpha\lambda > \phi$, which means that the value given to the low price trench must be high enough to compensate for the lesser than one percentage of people that would chose it in such a way that it is still more attractive that the free tranche so self selection could still be applicable and not generate a cannibalization effect that would take all the possible earnings from the price discrimination scheme. Another solution to this aspect is that α be close to one, the higher it is the lesser lost in the value of λ assuring that the expansion effects be enough to compensate the loss in the perception of value of this trench.

The self selection conditions showcased by θ are affected by the type of music that is attached to each trench. This is true in the case of θ_l. The view of the service is not only affected by the valuation of the service by individuals but by an additional limitation or characteristic attached to the trench or service provided.

In general it is clear that the strategy of price discrimination can create greater income for the platform but, depending of how it is applied and what characteristics are manipulated lesser income could be created and received by the producers of content depending on what trench they are assigned to and this would create misalignments between the content producers and the platform which could be one of the reasons to why this price schedule is not applied.

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