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Price Elasticity and Strategic Pricing in Music-Streaming Platforms

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Abstract. In the digital age, digital platforms have gradually replaced traditional consumption patterns and become an essential part of daily consumption. The emergence of new consumption has reshaped the way consumers access services and altered the factors influencing consumption decisions. This change is particularly apparent in streaming or cultural consumption, with strong personalized features. This study investigates consumer demand for Spotify, Apple Music, Tencent Music, and NetEase Cloud Music, focusing on the impact of subscription price, differences among various consumer groups, and strategic competition between platforms. Using quarterly panel data from 2021 to 2025, this paper employs a log-log regression model to estimate price elasticity. The result show the estimated values, -0.062 (Apple Music), +0.051 (Spotify), -0.125 (Tencent Music), and +2.002 (NetEase Cloud Music). Only Tencent Music's result is statistically significant at the 5% level. Interactions effects within user groups further show that the 2020-21 user groups of Apple Music (-0.145) and Tencent Music (-0.190) are the most price-sensitive. When cohort price elasticities are incorporated into a constrained constant-elasticity revenue model, all four platforms price reach the upper testing price limit. A Bertrand-style competition model then produces constrained equilibrium prices of $13.19 (Spotify and Apple Music), $2.52 (Tencent Music), and $1.44 (NetEase Cloud Music). The results indicate that cohort heterogeneity matters for demand responses, but weak estimated price sensitivity causes the strategic models to favor higher prices within the tested range.

Keywords: price elasticity of demand, music streaming, consumer cohorts, subscription pricing, game theory

1. Introduction

In a rapidly developing digital economy, subscription-based platforms have become an important part of everyday consumption, especially relevant in music streaming. Pricing has also become more dynamic: for example, Spotify's U.S. Premium Individual price increased from $9.99 to $10.99 in July 2023 and then to $11.99 in June 2024 [1]. Pricing adjustment like this makes the demand response to price changes significant economically as it must consider between receiving higher revenues through raised prices and the potential risk of losing current users due to higher prices. Existing research shows that price sensitivity can vary across markets, time periods, and stages of platform development [2-5]. However, less attention has been given to whether consumer cohorts,

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which is consumers that started using the app since different time period, differ systematically in price sensitivity and how those differences affect strategic pricing between competing streaming platforms.

Therefore, this paper will investigate how cohort-specific price sensitivity affects the strategic subscription pricing of leading music-streaming services. The different groups of consumers have reacted differently to price adjustments at various times on different platforms. First, a log-log regression model will be used to estimate price elasticity of demand. Otherwise, the direct interpretation as elasticity in the regression coefficient is lost. A cohort model is used to identify how the price of different group of consumer vary. Finally, a Bertrand-style pricing model of game theory is introduced to consider both consumer demand and the pricing decisions of competing platforms by these platforms.

Cohort analysis and game theory are used in this study to evaluates how heterogeneous consumer behavior may affect the strategic pricing choices of various firms in a competitive market. The findings may provide more reasons for the increase in subscription platforms prices despite a drop in demand. It can also be applied to explore pricing strategies for other subscription-based models.

2. Literature review

2.1. Music subscription case study: investigating the behavioral changes of consumers upon subscription price changes

In this study,Feng investigates consumer behavior following price increases in well-known music platforms such as Spotify, Pandora, and YouTube. It compares how the percentage of paid subscribers changes over time and associates these changes with subscription price increases using secondary data such as Statista [2]. The study concludes that music-streaming subscriptions are generally price elastic, suggesting that increases in subscription prices tend to reduce the share of paid users as consumers shift toward alternative platforms.

According to the findings of this study, my research aim to improve on based on this study. Instead of only measuring how sensitive consumers are to price changes, this project aims to predict the revenue-maximizing subscription price for different consumer cohorts on platforms such as Spotify, Apple Music, Tencent Music, and NetEase. By integrating cohort analysis and elasticity estimation, the study aims to create a pricing model that supports strategic decision-making for subscription-based music platforms.

2.2. Dynamic price elasticity and log-log regression

The second study mainly explores how seasonal factors also contribute to consumer purchasing behaviors, which also influences dynamic pricing as a whole. Petricek, Chalupa, and Chadt use a log-log regression model to estimate price elasticity by analyzing the relationship between price and quantity demanded [3]. Both variables are transformed into logarithmic form, which directly allows the slope coefficient to directly represent elasticity. For example, if the parameter equals (-0.5), a 1% increase in price causes a 0.5% decrease in demand. The elasticity coefficient is estimated using ordinary least squares (OLS) [3].

The paper also associates positive elasticity with the Veblen effect, which suggests that a higher purchase price can sometimes be justified by consumers aiming to increase their perceived status [3]. This may be one possible explanation for positive elasticity, while industry expansion and platform improvements could be other factors. Furthermore, the study suggests that price elasticity

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is dynamic rather than constant over time. Therefore, similar dynamic pricing strategies exist in online music-streaming companies, where consumer price sensitivity may vary across different cohorts, stages of platform growth, and levels of user loyalty.

2.3. Changing their tune: how consumers' adoption of online streaming affects music consumption and discovery

Datta, Knox, and Bronnenberg found that Spotify streaming increased overall music consumption by 43%, while also stimulating the increase of music variety and the discovery of new songs and artists [4]. This change, according to the paper, is mainly caused by the subscription model reducing the marginal cost of music variety and lowering search frictions. After adopting Spotify, consumers no longer needed to pay separately for each song or album, which make the consumers more willing to explore and consume a wider variety of music.

The study also shows that Spotify adoption decreases consumption on other music platforms such as iTunes. In terms of method, the study first uses propensity score matching to make the treatment and control groups as similar as possible, then uses a difference-in-differences approach to investigate how long changes in consumption, variety, and discovery last.

2.4. The transformation of broadband demand: from discretionary service to essential infrastructure (2010–2024)

According to Orujov, Ismayilov, and Huseynzade, broadband gradually changes from a luxury good to a necessity good, which thus cause demand to become more price inelastic [5]. It uses a two-way fixed-effects panel-data model to estimate the price elasticity of broadband demand across 33 European countries from 2010 to 2024, comparing changes across both countries and years [5].

The study also finds that price elasticity becomes positive after the pandemic. Higher prices may signal better quality, more unique features, more advanced features, or stronger brand reputation. Therefore, some consumers will still choose to subscribe even when prices rise. This provides another explanation for positive elasticity in digital subscription markets. It also confirms that consumer price sensitivity may change as platforms' market position becomes more established.

3. Method

This study uses a quantitative panel-data approach to investigate how subscription prices affect paying-user demand across Spotify, Apple Music, Tencent Music, and NetEase Cloud Music [6].

3.1. Data resource

The dataset contains observations divided into quarters from 2021 to 2025 and is divided into four consumer cohorts: 2018–19, 2020–21, 2022–23, and 2024–25. Paying Users is used as the measure of quantity demanded, while Monthly Active Users (MAU) is included as a control for overall platform growth. To estimate price elasticity directly, Paying Users, subscription price, and MAU are transformed into logarithmic form. This allows the coefficient on log price to be interpreted as the percentage change in paying users associated with a 1% change in subscription price.

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3.2. Related work

The analysis is consists of the following steps. First, a simple log–log regression is estimated for each company using the model $\ln Q = \alpha + \beta \ln P + \epsilon$, where β represents the naïve price elasticity of demand. However, because both prices and subscriber numbers tend to rise over time, this specification may incorrectly attribute platform growth to price changes. A controlled regression is therefore used in the main analysis

$$lnQ_{ict} = \alpha + \beta lnP_t + \gamma lnMAU_{ict} + \delta Time_t + QuarterFE + CorhortFE + \epsilon_{ict}$$

This model controls for total platform size, long-term market growth, seasonal variation, and persistent differences between cohorts. These controls are especially important because the review section identifies industry expansion, platform improvements, perceived value, and customer loyalty as possible explanations for apparently positive elasticity.

To test whether different consumer groups respond differently to price changes, the model is extended using interaction terms between subscription price and cohort membership. The cohort specification is

$$lnQ = \alpha + \beta lnP + \sum_c \theta_c Cohort_c + \sum_c \lambda_c (lnP \times Corhort_c) + Controls + \epsilon$$

The elasticity for each cohort is therefore calculated as $\epsilon_c = \beta + \lambda_c$. This allows the study to compare whether earlier adopters, pandemic-era consumers, post-pandemic consumers, and newer consumers exhibit different levels of price sensitivity. This approach reflects elasticity may change across different stages of platform growth, consumer groups, and levels of user loyalty rather than remaining constant over time.

The estimated cohort elasticities are then used to construct a price-optimization model. For each cohort, predicted demand at a new price is calculated using the constant-elasticity demand function $Q_c(P) = Q_{c0}(\frac{P}{P_0})^{\epsilon_c}$ where $Q_c(P)$ and P_0 represent baseline 2025 paying users and subscription price. Total predicted demand is the sum across all cohorts, and annual subscription revenue is calculated as $R(P) = 12P\sum_c Q_c(P)$. The price producing the highest predicted revenue within this interval is recorded as the model's constrained revenue-maximizing price.

3.3. Results

3.3.1. Naïve and controlled elasticity estimates

The first model is $\ln Q = \alpha + \beta \ln P + \epsilon$. This log-log model estimates price elasticity of demand by measuring the percentage change in quantity demanded associated with a 1% change in price, where β is the estimated elasticity. The results for price elasticity are

Table 1. Naïve price elasticity estimates by platform

Company	Naïve elasticity
Spotify	+1.373
Apple music	+1.342
Tencent music	+0.969

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Table 1. (continued)

NetEase Cloud Music	+1.645

At first, this would suggest an uncommon result of higher price leading to higher demand. However, this is unlikely to represent a pure price effect because prices and platform size both increased during the same period.

The main model that this study used is

$$\ln Q_{ict} = \alpha + \beta \ln P_t + \gamma \ln MAU_{ict} + \delta Time_t + QuarterFE + CorhortFE + \epsilon_{ict}$$

This model controls for platform growth through MAU, long-term growth through the time variable, seasonal differences through quarter fixed effects, and differences between cohorts through cohort fixed effects. Using this model, the result can be processed again.

Table 2. Controlled price elasticity estimates by platform

Company	Controlled elasticity	SE	p-value	R^2
Apple music	-0.062	0.064	0.343	0.973
Spotify	+0.051	0.092	0.586	0.946
Tencent music	-0.125	0.051	0.024	0.920
NetEase Cloud Music	+2.002	1.563	0.216	0.298

For Apple Music, the controlled price elasticity is −0.062, meaning that a 1% increase in subscription price will lead to an approximately 0.062% decrease in paying users. Tencent Music shows a stronger negative response, with a controlled price elasticity of −0.125, indicating that a 1% increase in price is associated with around a 0.125% decrease in demand. Tencent is also the only platform where the controlled price coefficient is statistically significant at the 5% level, with a p-value of 0.024. In contrast, Spotify's estimate is very close to zero, which suggests a rather small measurable response to price changes, while NetEase's estimate is highly uncertain. Overall, the large positive elasticities observed in the simple regressions largely disappear once platform growth and other controls are included.

3.3.2. Analyzing based on cohorts

Next, the cohort model was used to test whether different consumer groups respond differently to price changes. The results show that price sensitivity varies across cohorts. For Apple Music and Tencent Music, the 2020–21 cohort showed the strongest negative response, with price elasticities of −0.145 and −0.190 respectively. This suggests that consumers from different cohorts do not react to subscription price changes in the same way.

These cohort elasticities were then used to predict demand and revenue under different subscription prices. The model tested prices between 80% and 120% of the 2025 baseline price. For all four platforms, the revenue-maximizing price within this range is the upper boundary, meaning the model generally favored higher prices. This happened because most of the usable elasticity estimates were relatively inelastic, so the predicted percentage loss in paying users was smaller than the percentage increase in subscription price.

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3.3.3. Using the game theory

Finally, game theory is being used to show the competition between different online streaming platforms. Spotify and Apple Music are modeled as one competitive pair, while Tencent Music and NetEase are modeled as another based on that Spotify and Apple Music are used across the world, while Tencent Music and NetEase is most prevailing in China. Best-response functions were calculated for each company, and the Nash equilibrium was identified where both firms were choosing their best responses at the same time. The constrained equilibrium occurred at $13.19 for both Spotify and Apple Music, and $2.52 for Tencent and $1.44 for NetEase. These results suggest that, within the tested range, weak switching effects and relatively inelastic demand cause the strategic model to favor higher prices.

4. Conclusion

This study investigates the different levels of price sensitivity among various consumer groups and analyse how these different needs affect the long-term subscription pricing strategies of Spotify, Apple Music, Tencent Music, and NetEase Cloud Music. Based on the results, consumers' demand for music streaming is generally relatively inelastic. However, the degree of impact differs among different companies and age groups. Different groups have different demands for the price, the 2020–21 cohorts of Apple Music and Tencent Music are typical case. When the demand response is incorporated into a Bertrand-style game-theory model, the resulting strategic pricing generally favor a higher prices in the tested range because the predicted loss of subscribers is less than the increase in revenue per user.

However, this study also has several limitations. First of all, the subscription price has not changes periodically in time. Thus, elasticity analysis cannot be performed. Due to price competition, the overall prices are not significantly different, and it is difficult to obtain a price advantage. A game-theory model aims to maximum revenue rather than profit. Due to the absence of reliable marginal-cost data, the firm predicted to have the highest revenue might not be the one with the highest profit. Therefore, the results are also less accuracy.

Based on the problems listed above, the future research will improve the model by using longer time-series data, more detailed user subscription records, clearer definitions of user segments, and so on. Other reasons for the actual price of the product may include family circumstances, student discounts, the quality of the platform, and brand loyalty.

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