Retailers' Gambit: A deep dive into the gaming retailers' pricing behaviors

A comparative case study between Xbox 360 and PlayStation 4

Abstract: Over the last few decades, product consumers have become highly aware of the price setting strategies and voluntary efforts of market retailers to influence consumers' decision making patterns. Consequently, price comparison websites like PriceSpy came into existence in 2002 **(Om Prisjakt - Kunskap före köp, 2022)****. The main objective of this website is to provide the readers with sufficient price analytics basis across various products' ranges at nil cost to enhance their buying efficiency. The objective of this report is to extract the essence of price setting strategies via prices and related variables from the price comparison website, PriceSpy Sweden for the years 2012 until 2017 and discuss the implications of such behaviors with respect to the regulatory authorities and end consumers as well. Moreover, this report will shed light on clustering patterns (if any) among different retailers to highlight any trends or relationships among them.**

Keywords: pricing, clustering, retailers, price dispersion, descriptive statistics, regulation

I. INTRODUCTION

As today's economy has developed into a highly structured and efficient market in terms of product differentiation, end consumers have also become highly selective in choosing the right product for themselves, which lies in the right pricing bracket. There are a number of factors that influence the selection of products for customers but one of the most important factors that acts as a trigger in this situation, is how the retailers set their pricing strategies and what are the implications of these pricing strategies on the product's existence and life cycle. This effect is even more pronounced in case of online sales. For this very reason, price comparison websites came into existence, one of which is PriceSpy. These websites make it easier for its subscribers to search for competitive prices at a single portal and helps them in making informed shopping decisions at nil cost and in return these websites charge a commission fee on the lead generation. Price comparison websites have proved themselves as distinguished disruptors in online marketing space the last 20 to 30 years, highlighting consumers' rights and assisting them in securing the products that provide best price and value.

Regulation

As the level of public interest and consequently their investments in a particular industry are increased, the government and regulatory authorities tend to focus more and more attention towards such price comparison websites to place a control and regulate these price wars to safeguards the public interest and enforce antitrust laws on retailers and large corporations. Regulators often try to ensure that high competition breeds innovation and revolutionary products are introduced in the market to maintain a high income generating economy. Monitoring the prices also becomes essential when the underlying commodity is volatile and can become sensitive to the public interest e.g., insurance products where public investment occurs noticeably. This ensures that the general consumers are not over charged for any specific type of product and that there is sufficient reasonableness in the pricing in comparison to the levels set by similar retailers in the market. In short, regulatory authorities are interested in such platforms in a supervisory capacity. One such authority is the Swedish Competition Authority, Konkurrensverket.

Price Comparison Websites (PCWs)

The underlying price comparison engines ingest raw pricing data from various e-commerce websites and then use that information in its algorithms to match and present the best price for a particular product, across different retailers, tailored to the search preference of the user. There are a large number of sources from where these feeds can be gathered e.g., merchants, third party APIs and web scraping. (Chauhan, 2020).

The retailers are expected to publish the prices aside from characteristics of goods and price dispersion is the resultant that arises due to the difference in consumer perception regarding supplied goods from retailers in the marketplace. (Chudik, 2012)

As the number of suppliers for a specific product within a market increases, so does the competitiveness of the market. (Daniel B. Leiter, 2007)

Price Elasticity

A related concept of this competitiveness occurs in the form of price elasticity. Numerous factors affect the quantity demanded for a particular product and the responsiveness of that quantity is known as elasticity. These factors include, prices of specific products, prices of related products, consumers' income etc.

With respect to gaming consoles category, the consumers have partially elastic behavior as they tend to stick to the same gaming environment until a drastic price hike occurs. Both the gaming consoles belong to different realms in terms of the hardware and the gaming experience. Gaming enthusiasts all over the globe consider these factors when deciding on their shopping spree. In the gaming world, there are two most distinct products that confront each other head on. These are *Microsoft Corporation's Xbox* and *Sony Computer Entertainment's PlayStation 4*.

Users of the pricing information

The users of the pricing information from such price comparison portals are not just confined to the enthusiasts and players. Instead, a number of other organizations, also take special interests in pricing strategies, so as to develop their own brands and associate themselves in the profit generating mechanism as well.

Moreover, governments and regulators also play a vital role in parallel to other stakeholders as they monitor the pricing tactics in order to maintain the necessary level of competition and encourage the notion of a healthy economy as a whole. For instance

Aim of the report

This report works upon the economic data extracted from PriceSpy's online portal study, against a time period of 6 years ranging between 2012 till 2017. The aim of the report is to study the retailers' behavior operating within the gaming industry and are specific to the sales of Xbox 360 and PlayStation 4. The aim of this report is to try and establish relationships (if any) among the pricing strategies of

different suppliers and whether they engage into pricing wars and correspondingly react to each others' actions or not. Furthermore the role of complementary and supplementary products will also be pondered upon in conjunction with the sales of the above said gaming consoles with respect to pricing tactics.

II. METHODS AND MATERIALS

Programming Language

Considering the required analysis that is being presented visually in this report, a robust statistical programming language was required. This programming language had to be open source, so that its usage could be unrestricted due to regulations. Furthermore, unlike MS Excel, the vast array of visualization packages and ability to handle large amounts of data, makes it necessary to choose R over alternatives in this realm. Data wrangling abilities of R make it an even more preferred language for such an analysis.

Packages and Libraries Used

Different packages were used in the visualizations that follow and some of them are listed being listed here. ggplot2 package was the most widely used amongst all the packages which applies the layered grammar of graphics and is diverse enough to present the visuals in a very effective manner. data.table package was also used in order to manipulate and structure the data as per the needs of the visualizations. This is helpful in various scenarios, especially when we the author has to work with data frames (Introduction to data.table, 2021). ggally package is used as an extension to the ggplot2package and shrinks the complexity of geometric objects with transformed data (GGally: Extension to 'ggplot2', n.d.). gapminder is another package that is used for data wrangling and visualization (Gapminder, 2022). hrbrthemes is an add-on package for ggplot2 which aids typography-centric themes and theme components for ggplot2 (hrbrthemes themes - RDocumentation, 2022).

Data

The data utilized in this study was extracted from PriceSpy Sweden as part of a research project on Microdata Analysis. For the purposes of this study a random sample of economic data was retrieved and then divided into subsectors of Xbox 360 and PlayStation 4, which was saved in a csv file. This was accomplished in order to direct the software to the specific sector of study instead of increasing the load on the memory and systems, since R is a resource intensive program.

After loading the data from the csv file into R, around 275,000 observations from 14 variables were reflected and for that of PlayStation 4, there were 470,000 observations with 14 variables. As the subsets for both Xbox360 and PS4 had been established by this point, it was decided to select only those stores that had high volume of relevant data present in them. These included 9 store_ids, namely 18761, 428, 2151, 127, 236, 164, 578, 112 and 12377 for Xbox 360, whereas 9 store_ids 18761, 428, 2151, 127, 236, 164, 578, 112 and 12377 for PS4. The same procedure was applied to retrieve only those stores with the highest product count. This was done in order to rationalize the data and remove information asymmetry in the subsectors.

Data Variables

A number of data variables have been extracted from the master date that contains the entire economic information of the selected sample as shown in Table 1 below:-

Name	Variable Type	Description
product_id	integer	id variable to identify each individual product.
date	date	daily pricing date
category	character	product category name
price	integer	raw price for consumers
weekday	character	price posting day of the week
store_id	integer	serial id for each store
year	integer	product sale year
month_numerical	integer	month's serial number
cpi_adjusted_price	numerical	inflation adjusted price
log_of_cpi_adjusted_price	numerical	natural logarithm of CPI adjusted price
number_of_store_per_product_and_day	integer	specific product stores and day
total_days_for_product	integer	total days with product prices
total_products_in_category	integer	total unique products category wise

Table 1

Retailer observations

After preparing the data for the observation, the study pursues a step by step approach in decoding the retailer behavior in the market for Xbox 360 and PlayStation 4.

Initially it is important to identify the correlation amongst different variables, in order to establish the possibility that there might be interrelated influences that may have the potential to circumvent the final results. This is evident from the correlation plot in Figure 1 as shown below:-
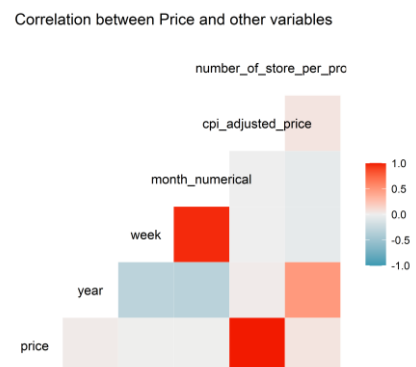

Figure 1

As apparent from **Figure 1**, there is somewhat a strong positive correlation among price and week variables, which means that the price hikes translate as the weeks proceed.

Price Dispersions

Price dispersion plotting among the retailers for a specific product is a representation of the similarities or differences in their approaches as to how they tend to price their products and how they react to each other's actions over a period of time.

Keeping simplicity in mind, price is plotted against time in years with the legends color coded according to the store_id. This is shown in

Figure 2 below, where different stores jumped into the market at different instances in time for a particular product which was an Xbox 360. Stores like 164, 112 and 18761 moved in the market at considerably high price levels, which shows that the product life cycle was relatively in the beginner stage, where the retailers could charge relatively high for such products from the consumers. This also depicts that the consumers were willing to pay more in the early stages of the product's life cycle. This is reminiscent of a market skimming strategy. In contrast, stores 127, 428 and 578 entered the market when the product life cycle had become relatively stagnant. This behavior reflects a market penetration strategy. Although there are some clustered fluctuations and irregular price movements within these two distinct groups, there are still some uniform patterns in a wider context and there is a downwards trend showing declining product lifecycle:-
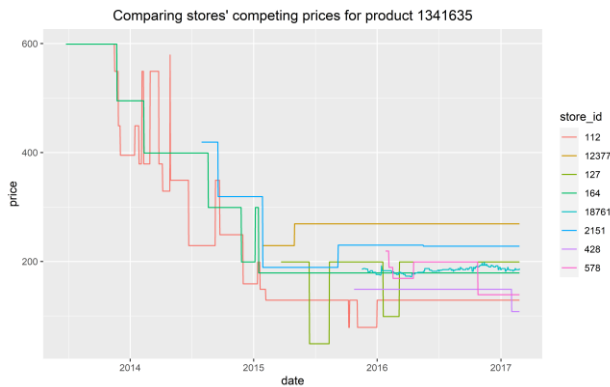

Figure 2

With the same logic in place, price dispersion ranges can also be referred to using the box plots with Xbox 360 plotted in black whereas PlayStation 4 plotted in colors in terms of different retailers. In **Figure 3** below, there is a mix approach with respect to the median positions, meaning that the retailers have a comparatively similar way of pricing these items. Notice the median lines of store 112, 12377, 127, 164, 236 and 578 being almost equal for PlayStation 4.
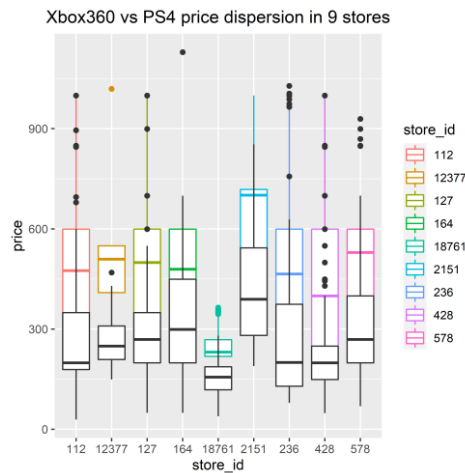

Figure 3

On the other hand, **Figure 3** also shows a similar effect in terms of the Xbox 360 pricing. However, even in this case, there is always a margin for potential outliers and violators that do not conform to the boundaries and relationship of these variables. These were not removed in order to show the extrapolation capacity of the price range.

For the purpose of breaking down **Figure 3** above, a supplementary plot in **Figure 4** is being shown for simplicity. This is related to just Xbox 360 pricing. Note that the median ranges of the first 4 stores,

112, 12377, 127 and 164 is almost the same and there is also a sufficient proximity among others as well.
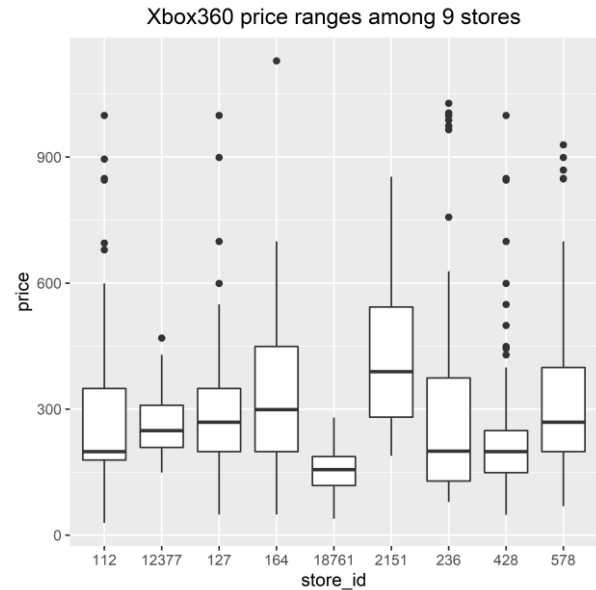

Figure 4

Clustering Analysis

Although its a box plot, but **Figure 4** can also be loosely used as a way of showing clustering among different stores to show the similarities in pricing strategies and their standing on the box plot, e.g., stores 112, 12377, 127 and 164 are in close proximity and tend to show a similar pricing strategy, hence they form a cluster among themselves. Similarly stores 236, 428 and 587 tend to follow a similar strategy of their own in pricing Xbox 360. The only store that stands out from other is 2151. It has a pricing methodology of its own.

Supplementary and Complementary Products

There are multiple ways in which intelligent retailers use marketing techniques to lure customers into their selling traps.

Complementary goods usually have a negative cross elasticity of demand. This means that the market demand for both products fall even if the price of only product increases. So, it's not wrong to consider that the linkage of goods is directly proportional to the cross elasticity of demand (Complementary Goods, 2022). The concept of supplementary goods is somewhat similar as well.

There is however a third concept that is known as substitute goods, where two products are substitutes to each other and the retailers have to keep a price equilibrium in order to maintain the competition. If prices of one product go down, then the price of the substitute product is likely to follow to avoid being perceived as overly expensive. But at the same time different brands build their reputation in different ways. Some are know as cost-effective and beat the market competition, while other pose themselves as differentiators and are known for their premium products, even though both brands sell the same category products.

IV. CONCLUSION

Although the preceding study is carefully prepared and compiled, it still remains subjective to the observer's perception, knowledge and understanding and most importantly the motive for use of knowledge gathered herein.

While preparing this study, various methodologies were utilized to gain insights into the pricing behavior adapted by the market retailers for different products. There are some correlations among various variables involved in the data like price and time. Moreover, the time period during which a specific retailer enters into the market competition, dictates heavily the strategy adapted by the retailer to overcome the barriers to entry by the market competitors. This study

tried to shed some light on the responsiveness of market forces, especially competing retailers in setting gaming console prices against each other. geom_path plots supported the above trends and strategies in conjunction with the price dispersion patterns.

In addition, box plots used in this research paper described a mix behavior of retailers in setting prices with respect to each other. It was evident that some retailers set their prices in close proximity to their competitors to maintain a high level of competition and gain maximum market share in the meanwhile. Whereas, other retailers focused on a more off-center approach and liberated themselves from the pricing wars of other competitors.

Box-plots were also used to show clustering between different stores and highlight their proximity patterns.

The role of regulators in their antitrust capacity ensures to oversee and react against malpractices and low competition monopolistic behaviors.

V. REFERENCES

Chauhan, B. (2020, Dec 3). *3 Ways Popular Price Comparison Websites Gather Data*. Retrieved from www.datahut.co: https://www.blog.datahut.co/post/how-popular-price-comparison-websites-grab-data

Chudik, A. (2012). *A Simple Model of Price Dispersion.*

Complementary Goods. (2022, Mar 11). Retrieved from Economics Help: https://www.economicshelp.org/blog/glossary/complementary-goods/

Daniel B. Leiter, T. W. (2007, Sep). *An Empirical Study of Price Dispersion in Homogenous Goods Markets.* Retrieved from https://sandcat.middlebury.edu/: https://sandcat.middlebury.edu/econ/repec/mdl/ancoec/0710.pdf

Gapminder. (2022, Mar 11). Retrieved from RDocumentation: https://www.rdocumentation.org/packages/gapminder/versions/0.3.0

GGally: Extension to 'ggplot2'. (n.d.). Retrieved from CRAN: https://cran.r-project.org/web/packages/GGally/index.html#:~:text='GGally'%20extends%20'ggplot2',several%20functions%20to%20plot%20networks.

hrbrthemes themes - RDocumentation. (2022, Mar 11). Retrieved from RDocumentation: https://www.rdocumentation.org/packages/hrbrthemes/versions/0.1.0

Introduction to data.table. (2021, Sep 22). Retrieved from CRAN: https://cran.r-project.org/web/packages/data.table/vignettes/datatable-intro.html

Om Prisjakt - Kunskap före köp. (2022, Mar 9). Retrieved from prisjakt: https://classic.prisjakt.nu/info.php?t=about_company