Exploring the Player Economy of In-Game Purchases: Focus on Steam Community Market of Counter Strike Global Offensive

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Abstract

For this paper, we will examine the emerging phenomenon of in-game transactions and their implications for the business models of gaming studios. Specifically, we will analyze the Counter-Strike: Global Offensive marketplace as a case study of a player-driven economy facilitated by in-game item trading.

The “Counter-Strike Market Sale Data” from Kaggle provides detailed transaction information for skins and other in-game items sold on the Counter-Strike market. The dataset captures the activity of in-game item trading over time and includes the following key fields:

Date and Time: The exact timestamp when each transaction occurred, allowing for time based analysis of market activity. Price: The sale price of the item, typically in USD or equivalent currency. Quantity: The number of items sold in a single transaction. Item Information: Details about the specific item being sold, such as the name of the skin, weapon type, and any special attributes

By analyzing transaction data, using linear regression, we aim to determine the extent to which this economic model represents a sustainable trend within the gaming industry ecosystem.

Keywords: *Microtransaction, Counter Strike, items , Transactional data, Linear regression, gaming industry ecosystem*

Contents

1. A bit of history

One of the earliest examples of a player-driven economy can be found in Sony’s EverQquest, an early MMORPG that allowed players to trade in-game items for virtual currencies and even convert them into real-world money. As early as 2001, Edward Castronova published an influential paper arguing that the "virtual world" labor in these economies was generating US dollar output roughly equivalent to the gross national product of Russia and Bulgaria (Castronova, 2001). There are many other examples of thriving player economies and a growing number of academic works are exploring this field using a number of often interesting interdisciplinary approaches (ie. economics, political economy, game studies). For example, Castronova & provide an excellent primer on the types of in-game economies, economic actors involved as well as macro- and micro-economic analysis in their 2014 work VirtualEconomies: design and analysis.

2. Interesting facts of microtransactions

For the purpose of this paper, we’d like to focus on examining the economic actors participating in the SCM and the behaviours that can be observed from a dataset of actual transactions taking place there. Some important overall game revenue facts:

Total revenue in the games market is projected to reach US$182.60bn in 2022.

Total revenue is expected to show an annual growth rate (CAGR 2022-2029) of 7.38%, resulting in a projected market volume of US$308.20bn by 2029.

In-app purchase (IAP) revenue in the games market is projected to reach US$102.60bn in 2022.

Paid app revenue in the games market is projected to reach US$1.18bn in 2022.

Advertising revenue in the Games market is projected to reach US$78.84bn in 2022.

Conclusion: Paid downloaded games contribute very little to the game economy; the two main forms of income nowadays are advertising and in-game purchases. We can observe that the revenues of video games keep increasing year by year; it peaked in 2020, as people had more free time during the pandemic, and then it decreased once it was over. This exception aside, every year increases revenue. (In-app purchases too)

Figure 1. Revenue change graph of each game category

That’s data from Statistica market insights; it shows that Role-playing games have the highest revenue, while it’s only

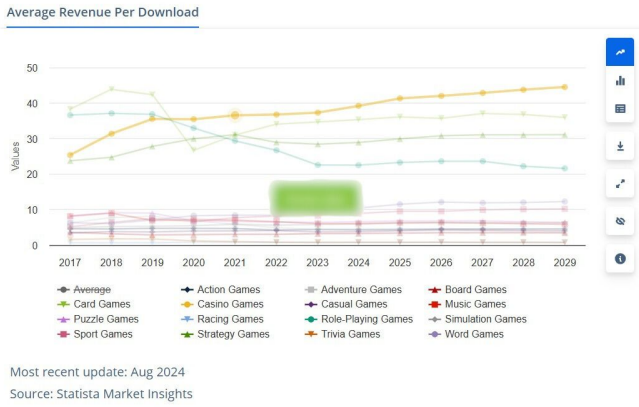

Figure 2. Revenue per download of each game category

the 5th or 6th most downloaded game genre. This gives us a hint that role-playing games have more options (products) for marketing—microtransactions/in-app purchases. We can see the trend of that genre that doesn't have many options for marketing, like trivia games; both their revenue and downloads are low. But, role-playing games, like CS: GO, are the median of the genre type in total downloads, yet their revenue is dominating by far. From now on, we are going to focus on CS:GO.

Important self-explanatory graphs:

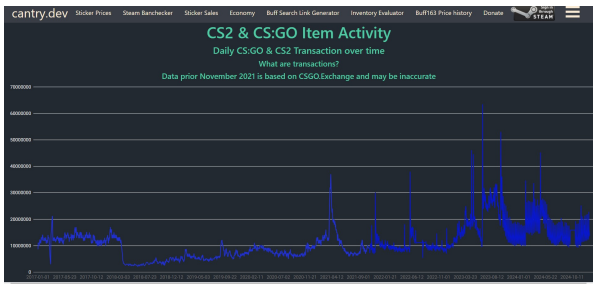

Figure 3. True data of CS:GO total microtransactions

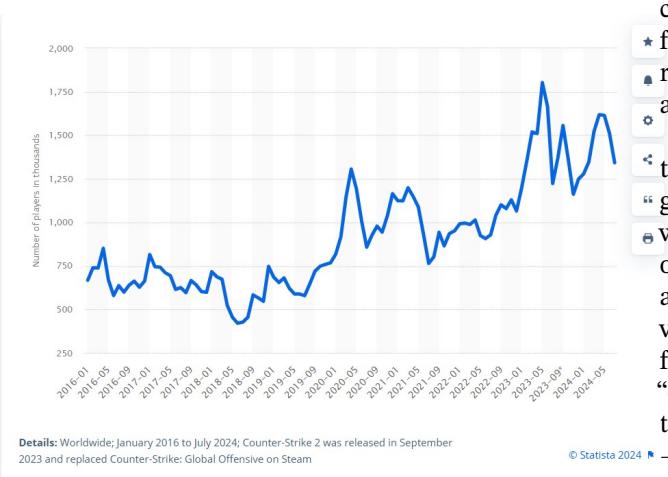

Figure 4. Total number of players

In these first two graphs, we can see that the total number of players playing the game directly reflects the items' daily transaction over time, which makes sense. In the next 2 graphs, we deduct that no matter what, the revenue was positive and could influence it whenever it decreased. But how? We must figure out and test whether events influence the transactions, or is it the new items from new updates? Or both? Or maybe streamers have a say in microtransaction behaviour? For that, we collected important dates of updates, peak streaming months and events happening. (View appendix)

One of the top grossing games regarding microtransactions is CS:Go which is now replaced by CS2, will be our main focus for microtransactions generalisation in the gaming ecosystem.

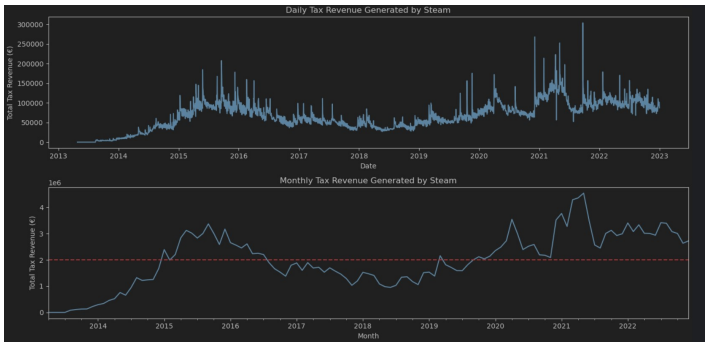

Figure 5. Monthly revenue generated by steam of CS:GO

3. Introduction and exploratory topic definition

The Steam Community Market (SCM) as part of a broader evolution of the gaming industry's business models, shifting from focusing on selling individual game copies to also monetizing in-game purchases, downloadable content and, finally, also enforcing "excise taxes" on economic activity amongst players themselves. This transition reflects a move towards more complex systems of monetization that capture value from various aspects of gameplay and player interaction. The SCM can be understood as a key development in this evolution, extending the reach of economic exchange within the gaming space. Launched in 2012, the Steam Community Market is an online platform that allows gamers to trade virtual in-game items such as skins, loot boxes, weapons, and other collectible content with their Steam Wallet funds. It is distinct from the Steam Store, which sells the games themselves, and represents a move from direct sales of games to the creation of a secondary market in virtual goods.

Created to formalize (and allow Steam to profit from) a practice already existing within the Steam community, SCM has grown into a massive platform with millions of US dollars worth of virtual goods being traded every month. This secondary market enables players to engage in peer-to-peer transactions, influencing in-game economies and the perceived value of virtual goods, instead of being limited to purchases from developers. It is worth noting that the emergence of an "official" community marketplace in the context of Valve's vertically integrated value chain (games development/production → distribution → monetization) is not surprising or truly innovative and can be understood as the most likely outcome of several key trends in the gaming industry of the last two decades:

Digital distribution is becoming the dominant mode of game purchase with services like Steam, Xbox Live and others bypassing the physical retailers and creating a direct relationship

between the game's distribution service and the player.

Emergence of additional in-game purchases (ie. DLCs, downloadable content) as a net new revenue stream for game developers and publishers and leading to major titles being released as free-to-play games with DLC purchase being the main contributor to the game's business performance.

Mobile gaming and introduction of microtransactions first in casual games and later on in "traditional" A-list titles. Currency distancing as means of creating a one-way value exchange between real world currency and in-game economies.

Gaming is becoming a mainstream global cultural phenomenon, increasing the size of the overall market by expanding into more "casual" player categories and streaming audiences with the popularity of esports.

In-game items are becoming valuable commodities and subject of commodity fetish in the Marxist sense (Wang, 2006). Secondary marketplaces are established to trade items between players and speculate on their future value. "Mining operations" are set up in order for player labor to be converted into in-game currencies and, inevitably, unofficial exchanges allow for converting virtual currencies into cash.

4. Microtransaction design in CS:GO

Satisfaction

Microtransactions in CS:GO center around the acquisition of cosmetic items, such as skins, weapon finishes, stickers, and cases. For many players, the ability to personalize their in-game experience with rare or visually appealing items adds a layer of satisfaction. The excitement of unboxing cases and the potential to obtain rare items create moments of thrill and anticipation. However, dissatisfaction can arise due to the randomness of case drops, the cost of cases and keys, and the perception of gambling mechanics. These issues can alienate some players or lead to frustration, especially when the desired item feels out of reach.

Learning

The microtransaction system encourages players to learn about the rarity and value of items within the game's ecosystem. Players often research market trends, item tiers, and trading opportunities, which fosters an understanding of CS:GO's virtual economy. The system also teaches players about risk versus reward through case openings, emphasizing decision-making and resource management.

Efficiency

The microtransaction system is highly efficient from a design perspective, as it generates consistent revenue for the developers while remaining optional for gameplay. The trading and marketplace system allows players to directly buy, sell, or trade items, enhancing the efficiency of acquisition. However, the randomness of case openings may lead some players to spend more time or money than intended to achieve their goals, which could detract from the perceived efficiency of the system for those players.

Immersion

Cosmetics obtained through microtransactions enhance immersion by allowing players to express individuality and creativity within the game.. However, the emphasis on cosmetic purchases may disrupt immersion for players who feel pressured to participate in the system to "keep up" with peers.

Motivation

Microtransactions act as a motivational tool by offering players aspirational goals, such as acquiring rare or prestigious skins. The combination of seasonal events, exclusive items, and limited-time offers drives engagement by creating urgency and a sense of achievement. Moreover, the marketplace economy motivates players to trade and strategize to maximize their collections. On the downside, reliance on microtransactions for customization can demotivate players who are unable or unwilling to invest money into the system.

Emotion The emotional experience of microtransactions in CS:GO is a blend of excitement, anticipation, and frustration. Case openings provide a unique thrill, similar to gambling, as players hope to obtain rare or valuable items. The joy of securing a rare skin is a memorable highlight for many players, while the disappointment of repeated low-value drops can lead to dissatisfaction.

Socialization

The microtransaction system fosters socialization by enabling trading, sharing, and showcasing of items. Players often discuss the value and aesthetics of skins, collaborate on trades, and celebrate rare acquisitions within their communities. The system's social component strengthens connections and creates a shared cultural experience within the CS:GO community.

Conclusion The microtransaction system in CS:GO is a sophisticated design that enhances player engagement, supports the game's long-term financial sustainability, and contributes to the social and emotional aspects of gameplay. While it offers opportunities for creativity, personalization, and social interaction, its reliance on randomness and monetary investment can alienate some players. Addressing these concerns, such as by providing more direct acquisition methods or clearer odds disclosure, could improve the experience and maintain the system's appeal to a broader audience.

5. Methodology

From the Kaggle dataset we import the data (billions of data), we will mainly focus on AK47 – a weapon that has existed through the end of times, consisting of a mix of every rarity group. It will be the representative of all weapons datasets, we combined desert eagle, another type of weapon like AK-47 and it had negligible change in the regression analysis. Then, from resources on the internet, we collect data of important dates and apply it to our database for comparison. For analytics audience: Then, we had to import the total Microtransactions revenue from an online source which we didn't have access, so I used an AI to replicate points (we managed to get more than 2000 points which is more than sufficient) on the graph and then we transformed every variables to the same scales so that we can proceed to the analysis without measurement errors. For the regression model, I decided to remove outliers since there are some skin prices that's very out of range from the norm, and also, I used log of prices since the total transaction price for a day is very big and it will make the regression analysis misestimate the standard errors and t-statistics, thus the relevance of the variables in the regression. Throughout the regression analysis, we conduct checks for structure validity, multicollinearity, heteroskedasticity, endogeneity, and autocorrelation. We did not have any issues except autocorrelation, which we adjusted by introducing forward and backward lags

depending on the variable. In the end; we plot a residual graph to estimate the strength of the validity of the graph.

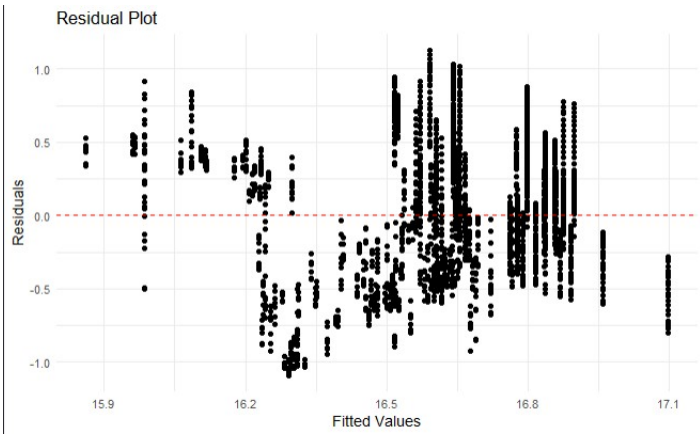

Figure 6. Residual graph

There might be a residual normality problem, nothing serious and the analysis seems valid.

6. Results and Analysis

The figure below is the price plots of the various types of in-app purchases in CS:GO. We can see a pattern in all of them, their prices fall and rise at almost the same timeframe except for the "others" which are not so popular purchases. Note: They all have the schema of total item activity as seen in figure above. This indicates that all prices rise and fall directly impacts the total transactions in the game – which is how the stock market also works. So, definitely prices have a say in it but as per statistics, the prices explain only around 30% of microtransactions as per our dataset.

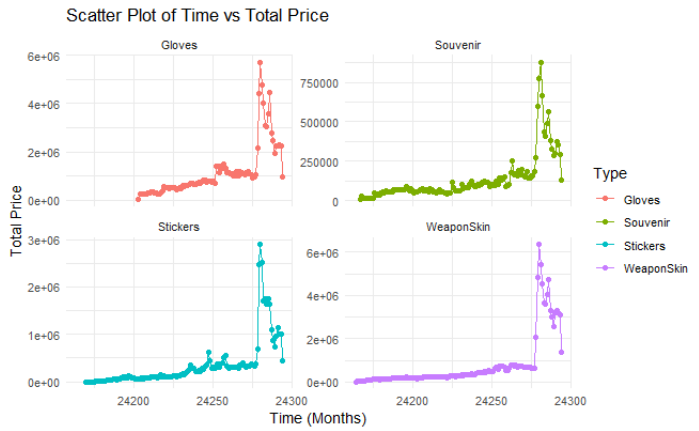

Figure 7. Price chart of items

In the screenshot above, we provide an insight that the price, event and streamers have an impact on microtransactions. Event not really. Why? Because the economy of microtransactions in CS:GO works fine, each update brings in automatically more skins and in-app purchases, updates here provide better gameplay but not microtransactions itself. From this analysis, we could explain only 22% of the microtransactions using AK47 (representative purchase of the whole game – encompasses both lower and upper bounds of microtransactions). This backs up the idea that new updates and introduction of new skins and items do increase microtransactions. Note: Testing with the whole dataset is too computationally demanding. The whole dataset was of 100 million observations. [Took almost an hour to run it to prove that price explains around 30% (28.78%) of microtransactions in the game as stated above. More transformations and wrangling of data was not possible with a normal gaming PC].

Note: Psychological concepts like correlation bias often remind us that just because two variables move together (e.g., increased study hours and higher grades). So we can only prove that something has an effect on the other. The following will show that changes in total prices of general representative skins, game updates and streamers has an effect on the total microtransaction economy of the game. As for updates, we see a negative effect, for the first 2 months. But ultimately, prices of the newly updated skins and items begin to rise and fall, older skins become rarer and rise in price leading the economy to rise and fall as shown earlier. (See appendix for output - Figure 6)

7. Discussion and conclusion

We can conclude that the microtransactions form something like an ecosystem. Follow the cycle well:

1. Platform revenues start to decrease (includes Steam and other official platforms of CS:GO) - Transactions ongoing between players are decreasing.
2. The game developer team introduces new updates (to pump up the sales again)
3. The updates itself decreases the income (+ game development expenses), the streamers are the ones who do the job of promoting and making the new skins and items to fashion. Introducing an impression of motivation, pushing players to consume those items and skins, thus inciting players to get to the same standards and conform to the game community.
4. While the players become more and more active in microtransaction purchases, the platforms that charge a little percentage of transaction fee, get on average 2 millions daily as net return, and have a daily cost of less than 500,000 in average. 1.5 million profit at least DAILY - only on microtransactions. Explaining valve 8 billion dollars worth.

In summary: Ecosystem –> Players having fun and conforming to trends, always something new, exciting for them. Players = happy. Streamers making money online and promoting the new skins. Streamers = happy. Valve making money out of all that. Valve = happy

8. Limitations

The inclusion of other variables would help explain the totality of microtransactions. And access to real data would be much more facilitating and I suppose it would have boosted our variables' variation explanation to the overall microtransaction by a lot.

9. Appendix and references

Appendix Major event: (To see if the number of players playing related to events or not) Nov 2013, March 2014, August 2014, November 2014, March 2015, August 2015, November 2015, March 2016, July 2016, January 2017, July 2017, January 2018, September 2018, February 2019, August 2019, October 2021, May 2022, October 2022, May 2023, March 2024 Major updates: February 2016; June 2016; November 2016; May 2017; November 2019; December 2020; September 2021; August 2022 Peak stream months: January 2017, July 2017, January 2018, September 2018, November 2021, May 2022, November 2022, March 2023, March 2024

Figure 6: Regression model output

```
Call:
lm(formula = log(total_price) ~ log(price) + Peak_stream + Updates,
    data = MT_no_outliers)

Residuals:
    Min      1Q  Median      3Q     Max
-4.8589 -0.5299  0.0341  0.9616  2.4208

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -5.82659    0.86489  -6.737 2.03e-11 ***
log(price)   1.22413    0.05202  23.533  < 2e-16 ***
Peak_stream  0.18955    0.08356   2.268   0.0234 *
Updates     -0.22738    0.07419  -3.065   0.0022 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.249 on 2362 degrees of freedom
Multiple R-squared:  0.207,     Adjusted R-squared:  0.2059
F-statistic: 205.5 on 3 and 2362 DF,  p-value: < 2.2e-16
```

Figure 8. Model output

References

[1] Blizzard Entertainment. (2004). *World of Warcraft* [Microsoft Windows, macOS]. Online game directed by Mark Kern and Chris Metzen, published by Blizzard Entertainment. Retrieved from https://worldofwarcraft.blizzard.com/pl-pl/.

[2] Castronova, E. (2001). Virtual worlds: A first-hand account of the market and society on the Cyberian frontier.

[3] Dyer-Witheford, N., & De Peuter, G. (2009). *Games of empire: Global capitalism and video games*. University of Minnesota Press.

[4] Wang, P. (2006). A Marxian analysis of *World of Warcraft*: Virtual gaming economies reproducing capitalistic structures. Retrieved August 30, 2014.

[5] Castronova, E., & Lehdonvirta, V. (2014). *Virtual Economies: Design and Analysis*.

[6] Statista databases. Retrieved from https://www.statista.com/outlook/amo/app/games/worldwide.

[7] Twitchstatistics. Retrieved from https://sullygnome.com/game/Counter-Strike_Global_Offensive/longtermstats.

[8] Cantry. Daily transaction graph. Retrieved from https://cantry.dev/volume.

[9] Valve, Hidden Path Entertainment. (2023). *Counter-Strike 2* (previously *Counter-Strike: Global Offensive*) [Windows, SteamOS+Linux]. Online game, published by Valve. Retrieved from https://store.steampowered.com/app/730/CounterStrike_2/.

[10] Verant Interactive, 989 Studios. (1999). *EverQuest* [Microsoft Windows]. Digital game designed by Steve Clover, Brad McQuaid, and William Trost; published by Sony Online Entertainment.