

# Consumer Behavior in the Virtual Economy

by

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**Abstract:** In-app purchases have been more common due to the accessibility of them in our digital age. In the gaming community, a spectrum of online spenders have been identified, ranging from free to play players who spend no real currency for in game items to “whales” who will spend massive amounts of currency on the virtual platforms. This thesis strives to recognize the spending habits of these players on items in real life in comparison with those in a virtual economy and explore the economic factors in fictional, in-game societies in regard to consumer behavior and reflects upon how this affects their decisions in purchasing in the real world.

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## Glossary

*F2P* - Free to Play, a player in a game who does not spend any real currency.

*GDP* - Gross Domestic Product, a measurement of economic output based on the market value of all final goods and services produced within a set year.

*IAPs* - In-App Purchases, virtual items bought with real currency.

*Luxury Goods* - Goods in which demand generally falls to the wealthy or those with an increase in income, such as a yacht or luxury car.

*Marginal Utility* - The measurement of satisfaction after each additional unit of good is consumed.

*Monopoly* - A market in which a certain good is controlled by that market alone, such as the goods within certain games.

*Normal Goods* - Goods in which demand increases as income does, such as buying tomatoes as opposed to canned tomatoes (which would be deemed an inferior good in comparison).

*RNG* - Random Number Generator, essentially luck.

*Utility* - The measurement of a consumer's satisfaction in the consumption of a good.

*Whale* - Player in games who rely on spending to get items they want, typically thousands a month at times.

## Introduction

The term "gacha" was originally developed from the term gachapon -the first usage dating back to the early 1960s in Japan. Ryuzo Shigeta and his brother had been exporting inexpensive trinkets via vending machines for the United States, but were ultimately dissatisfied by how the items were being randomly dispensed with seemingly no order. To remedy this, they started using capsules -small, spherical shell casings made of plastic that would encase the trinkets. Thus on February 17, 1965, gachapon dispensers were officially established when Shigeta placed these newfound vending machines outside of his shop in Tokyo (Hornyak, 2017). Since then, the gachapon industry has risen exponentially and continued to dramatically grow. With partnerships with some of the biggest companies in Japan, these small machines dispense products that feature television show characters, gaming protagonists, and other rare prizes well over the value of the cost paid by the consumer to gain an item. The fun of these machines is the random nature of the rewards -while the items within each individual machine is explicitly listed, at a relatively inexpensive price consumers are able to receive an item at random. Logistically speaking, spending more money would offer a player higher chances at getting the item they want, with regards that it is also very possible to spend well over the value of the item without receiving it. The items available in modern day gachapon machines also are exclusive in that they cannot be bought in stores and must be purchased from third party sellers. Today, there are many online vendors who sell specific characters for absurdly marked up prices to take advantage of collectors who have had no luck in gacha.

The system of gachapon machines is quite universal in that it does not require the player to have skills in order for a chance to win an item -gachapon is purely luck based. As the popularity of these capsule machines grew and continues to grow today, this system has been developed for online gaming purposes. Games that "dispense" characters of varying rarity and strength have taken this random luck to player bases, allowing them to either save up or pay big for a small chance (typically ranging from a standard flat rate or either 1% or 3%) at getting what they want. These games are casually known today as gacha games, and are some of the highest grossing apps on worldwide servers across both iOS as well as Android devices.

In Japan, Granblue Fantasy is a free app and browser gacha game, fluctuating between second and seventh in overall top grossing apps. The game has a player base of over 20 million people and earned so much, that for their third year anniversary in early 2017, the company was able to purchase an ad featuring all its characters in the newspaper, double sided and spanning across four pages. This was estimated to be approximately 318,840,000 yen or 2.8 million USD in worth -the ad itself offered many prizes to players, some being of over 87,000 USD in value (Sherman, 2017). It was also in this game, that a player spent 6,065 USD in a single sitting before getting the specific character they wanted (Nakamura, 2016). Mobile gacha games such as Granblue Fantasy are similar to these vending machine games in the sense that players are aware of what's available in the prize pool, but are not guaranteed the item they want. In gacha games, consumers are given the option of spending a seemingly "low" price for a chance for a higher value output.

Because of the emphasis on the free-to-play nature of gacha games in which players aren't trapped behind paywalls to access the full gameplay experience, in order to make revenue, the system of these games do make it more tedious for players to receive resources of value at no cost. While games like Granblue Fantasy may offer a free pull for an item of varying value for only 300 crystals, the virtual currency which is only worth 300 mobacoins (or approximately 3 USD including tax) will take two weeks of meticulously logging in or completing anywhere from 6-24 lengthy story quests. In regards to this, certain gacha games also allow cheaper bundles, in which spending more gives a bigger discount and provides players with a bonus. For example, Love Live is a rhythm game in which "love gems" are the most significant resource. One pull equates to 5 love gems, but a "ten plus one" or just pull of 11 equates to 50 gems with an added bonus of a guaranteed resource of a higher rarity. Furthermore, buying love gems in the in-game store becomes increasingly discounted as one love gem is the value of 0.99USD while 50 love gems only costs 29.99USD in comparison. This encourages players to wait to reach a certain amount before pulling, a process which is rather tedious and thus entices them to spend to collect the last few love gems immediately.

Gacha games also offer multiple formats of currency, although the main observed type (the premium currency) is what players typically spend to receive, as it is rare and tends to be limited until new gameplay is added. These less significant forms of currency are easier to obtained and usually gained by selling higher valued resources or merely by playing; these typically are used in order to proceed through more simple elements of in-game activities and are later replaced by the premium currency as gameplay increases.



In our real-world economy, the primary system of measurement lies in calculating gross domestic product (GDP). GDP is determined yearly based on the value of all goods and services produced during that period. Thus, the measurement of economic success depends on how much a consumer spends. In gacha games, a similar economic system is observed; all gacha games offer some sort of exclusive events that are either one time or rerun only a few times a year, in which players in this player vs. environment styled game have a chance to compete against others. The better a player does in these events, the more rare prizes that are given to further the efficiency of the gaming experience. Without high ranking accounts or good resources, however, events are hard for players to significantly rank in and typically dominated by either whales, who constantly spend money, or seasoned players. In addition, the amount of time put into a game -coined by the term “grinding” -varies depending on how strong a player is. The stronger the player, the less they’ll have to grind to receive better items, and the weaker a player, the more effort they’ll have to put in while potentially still losing out on getting the rewards. Because of these implementations, the economies of gacha games are set by the players who dominate the environment, and those who either play more or spend more in order to catch up. While this system may not seem worth it for new players who are just starting out, the free rewards and log in bonuses or campaigns that gacha games typically give to newcomers when first starting entices them to stay playing. The more players that spend on contributing to the game’s economy, the longer the platform is able to survive and the more general players will be rewarded with special bundles and new items, which in turn continuously pulls in other new players to join the game.

The main difference between the virtual economy of gacha games and the real world economy lies in the improbability of what the player is getting. While spending money helps the GDP of the gaming world much as it does in our real world economy, consumers are not guaranteed strength due to the Random Number Generator (RNG) or the luck based implementation of gacha game systems. Furthermore, this observed structure serves to bring about a system of virtual gambling, as players cannot readily contend the value of what they are purchasing versus the amount of money they are actually paying for it.

This thus introduces the concept of overspending and addiction on in-app purchases (IAPs), and in some severe cases, make players develop gambling problems and issues with monetary management. While F2P players may find it easy to not spend money at first, the rapid pace of the gacha economy plays a considerable role in convincing players to take short-cuts by buying their way into receiving a more successful and easier gameplay experience. In a 2017 article on Intelligent Economist by Prateek Agarwal, he cites numerous reasons that players are increasingly likely and edged towards making in-game microtransactions, citing that a technique used by gaming industries is to essentially provide players with “a significant reward” then “threatening to take it away if you don’t make a purchase”. This concept validates the inability of many players who step out of their F2P mindsets and spent real currency for the first time to suddenly stop doing so, especially when they are encouraged by how much quicker it is to proceed in gameplay afterwards. In my experience, I have found that mass spending on IAPs is not solely an expenditure made by higher income

players, but low income ones who do not have readily accessible disposable income as well.

Furthermore, spending in virtual realities is encouraged as social gaming has taken a dramatic rise in the past few years, as many mobile games now give people the option of “sharing” on platforms such as Twitter and Facebook to receive daily, exclusive rewards. This exposure also introduces players to others within the community, creating a sense of competitiveness and a need to be at the same level of progress as their peers. A study conducted in 2012 by Linda K. Kaye and Jo Bryce found that collaborative play between multiple players of the same community have been shown to make the overall gameplay experiences more satisfying as well, while feelings of frustration were commonly elicited from competitiveness (26). In gacha games, although no content is blocked by paywalls, making microtransactions help players keep up with both friends and compete on a fair level with stronger opponents while simultaneously providing them with an instant, but fleeting experience of gratification that can only be maintained with continuous purchases.

When people think of gambling today, it’s easy to automatically picture someone sitting in a casino or in front of a slot machine, pulling down the level as their coins and chips disappear through the evening. However, what’s not realized especially when it comes to younger generations playing harmless mobile games is how dangerous virtual gambling can become -with rising technology in our current society, players can make payments up to thousands with just the mere push of a button or touch of a finger to verify one’s identity and decision. An article by Jeremy Kressmann in 2017 cites a steady increase to the amount of IAPs made in mcommerce (mobile commerce) in the

past few years and states that in a survey, it was found that “one-quarter of US internet users ages 18 to 34 said speed was a key consideration for mobile shopping”. While the efficiency of using mobile platforms can be enticing especially towards a younger generation, those who focus their attentions on repeated mobile gaming and virtual spending may face detrimental effects over the value of currency lost. Without the presence of any sort of physical currency such as cash or chips disappearing from sight, it can be hard for virtual players to realize how much money they’ve spent, as there is not an instant physical or visual consequence. This study attempts to bring light to an otherwise understudied and widely accepted issue of virtual gambling addictions while providing insight on how fictional economies can impact consumer behaviors and decision making.

## **Research Questions**

1. Do IAPs (In-App Purchases) affect a consumer's resource management behavior in real life situations and can a correlation be found between the two?
2. How is consumer utility maximization calculated in a simulation or game in which a virtual gambling economy is present?

## **Hypotheses**

1. My first prediction is that while income and age will play a big part in the amount of IAPs made, the younger the player, the more frequent the IAPs - although I hypothesize that total overall expenditures will amount to less. I further do not believe that there is a high correlation between income class and spending, but that the more a player is willing to spend on IAPs, the more willing they become to spend on luxury goods outside of the virtual economy, regardless of income class.
2. My second prediction is that the less and more infrequent someone spends on IAPs, the lower the consumer's in-game utility. I predict that this then leads to either the player quitting the game and thus being outside of the data pool or staying within the game and increasing expenditures to maximize in-game satisfaction, thus becoming a “gambler”.

## **Methods**

For this project, I observed data from three types of players in a sample of a few games -free to play (F2P) players who don't spend money at all, self-proclaimed "regular" players who occasionally spend a few times a year, and whales who regularly spend from hundreds up to thousands a year. When comparing the differences in spending habits found in game in comparison to luxury goods outside for these participants, real life situations such as country of residence, income, and age were also taken into consideration.

In conducting research for this project, data was collected in two different ways. The first method was conducted through anonymous online surveys in which English speaking players of gacha communities from around the world were asked questions to help me determine and contrast their virtual and real-life spending patterns. These questions served to give an idea of the players' spending patterns with regard to the income they receive (if applicable) as well as their occupation. In addition, further questions such as "Why do you spend real currency for in-game items?" with given options "[collection purposes/to get stronger/retail therapy]" to allow for better understanding of the player's individual utility.

Due to the fact that most gacha games or spending platforms connected to them such as Paypal do not allow minors to make purchases, I limited the pool of participants I surveyed to players who were 18 years old and above only. Furthermore, only English speakers were allowed to participate due to the possibility of misunderstanding questions based on language barriers. Despite this, there were participants who answered from around the world, as the survey was advertised through the social media

platform Twitter. The survey was also created through Google Forms, due to the anonymity it allowed. With this, I was able to download all the data of the responses via timestamps on Excel and could conceal any other identifiers.

The second method of data collection was conducted through personal interviews by voluntary gacha players to directly model their utility and observe their behaviors both in and outside the virtual reality. I observed the spending patterns of players from each of the three categories for a span of a week, contrasting their behaviors with a week of not spending on IAPs. Furthermore, I was able to calculate their marginal utility using a point system I've developed depending on information provided from within the game -since all gacha games run a similar economy, I was able to adjust the table to suit each player's preferences, and calculate their marginal utility after each pull by asking them to rate how they feel on a scale of 1-10, with 10 represented as successfully pulling the character or item they wanted.

After determining the player marginal utility in terms of money spent and contrasting it with the economic system I've created from the specific game (which will all be converted to USD), the player's threshold for spending in the virtual reality was modeled. This data was then directly compared with information gathered on their regular day to day spending habits. USD was chosen as the universal currency for this study for easier scaling purposes, as the value of the currency for each game remains the same across all countries and regions -thus a player from France looking to buy 50 love gems in Love Live would pay the equivalent of approximately 29.99USD in euros. These prices are subject to change in-game depending on tax (VAT or Value-Added Tax) of the specific country.

As an incentive to participate, I offered a drawing in which four winners each received a \$30 giftcard to either Google Play or iTunes, as these are the platforms upon which the games I researched are accessed. Those who chose to enter the drawing for the possible giftcard compensation were given the option to input an online contact handle for me to contact them for the prize at the end of the survey. Since my research pool consisted of those in the gacha gaming community, these giftcards were an extremely good incentive for all players to participate, as the reward was valued higher for them. The drawing was conducted in a completely randomized website picker to eliminate any possible bias, in which I took the Excel document from my survey with the usernames of participants who choose to enter and pasted it within in separate lines, with the website generating the number of winners (an adjustable option on the platform). The winners were contacted on the platform of choice in which I provided them with the code of the giftcard.



## **Data and Models**

### **1. Survey Results and Accompanying Analysis**

Survey data was used from 155 anonymous participants, with 52 identifying as upper to upper middle class, 55 as lower middle class, and 48 as low income. While the amount of unemployment was significantly greater amongst participants of the upper to upper middle class, the majority of those who reported as students also fell into this category. Furthermore, although the amount of F2P subjects were fairly spread amongst the differing income classes, there was an observed decrease of occasional spenders in higher income households. This is most likely explained by the increase of whales in this class, more than doubling the percentage reported in comparison to the other categories. Taking the data in Table 1 shown below for consideration, employment did not appear to play as big of a part in IAPs as I had presumed prior to starting this project, with data leaning towards household income as the primary cause of increased IAPs amongst players. However, it can also be observed that while income class may significantly affect the monetary amount of IAPs purchased, it does not appear to impact the amount of virtual transactions made in general.

I also noted that there was a large margin of income difference between those who reported as lower income and lower middle class to upper middle class. This is most likely caused by my decision to merge those who reported as upper middle class and upper-class households after collecting my data, due to the substantial similarities in reported incomes by both groups.

Table 1: Survey Data Breakdown by Income Class

<i>Income Class</i>	<b>Low Income</b>	<b>Lower Middle Class</b>	<b>Upper / Upper Middle Class</b>
<i>Total Reported</i>	48	55	52
<i>Student</i>	58.33%	63.64%	75.00%
<i>Employed</i>	56.25%	54.55%	38.46%
<i>Employed Student</i>	31.25%	25.45%	19.23%
<i>Non-Spender / F2P</i>	18.75%	21.82%	17.31%
<i>Occasional Spender</i>	62.50%	63.64%	50.00%
<i>Frequent Spender / Whale</i>	12.50%	14.55%	32.69%
<i>Avg. Household Income</i>	\$18,676.83	\$28,204.69	\$114,633.40

Household income calculated annually, in USD.

In Table 2, I directly compared the reported virtual spending data of participants in 2017 and found that low income players shared significant similarities in spending habits. Low income players were found to spend in drastically varying quantities, while lower middle class players tend to spend on the lower spectrum. In consensus with the data from Table 1, players of the upper to upper middle class were observed to spend more on average, with less than ten non-F2P players having spent less than \$100 on gacha games in the previous year.

Table 2: USD Spent on IAPs in 2017 by Income Class

<i>Income Class</i>	<b>Low Income</b>	<b>Lower Middle Class</b>	<b>Upper Middle Class</b>
<i>Minimum</i>	\$ 5	\$ 7	\$ 5
<i>Mean</i>	\$ 484	\$ 272	\$ 625
<i>Median</i>	\$ 150	\$ 113	\$ 300
<i>Mode</i>	\$ 500	\$ 50	\$ 200 and 500
<i>Maximum</i>	\$ 5,000	\$ 1,838	\$ 6,000

Income was converted to USD and rounded to the nearest whole number. F2P players were not included in the calculations of Table 2.

Table 3 below shows a direct comparison of regular players who spend occasionally in game to whales that spend more frequently. Although the maximum spent currency of the regular player could be considered to fall under the category of

whaling, it should be further noted that whales tend to spend massively in single bursts, whereas regular players could potentially fall into the mistake of gacha gambling, causing their occasional spending habits to eventually rack up in larger costs than expected. In addition, there was only one regular player who reported to spending \$1,000 in 2017 and the remainder of the data accurately reflects my findings of the lower amounts of real currency spent on virtual reality by regular players as opposed to whales.

On the other hand, whales were found to average approximately \$1,009 in the previous year (Table 3), which is an average of nearly \$170 spent on gacha games per month, a statistic that I found to be significantly higher than the average spent by regular players. Furthermore, the occasionally irregular spending habits of whales should be taken into consideration when looking at data as a whole; while whales will readily spend large amounts and frequently, this will not occur if they have no reason to. Thus in times where either large in game rewards are given or no new characters are released, there will be no need to spend as whales are generally collectors who already have otherwise previously released desired items. This can be observed in Figure 1, when looking directly at the sales ranking of company Cygames.

Table 3: Regular vs. Whale Spending in 2017

<i><b>Player Type</b></i>	<b>Regular</b>	<b>Whale</b>
<i>Minimum</i>	\$ 5	\$ 50
<i>Mean</i>	\$ 168	\$ 1,009
<i>Median</i>	\$ 100	\$ 500
<i>Mode</i>	\$ 50	\$ 300
<i>Maximum</i>	\$ 1,000	\$ 6,000

Income was converted to USD and rounded to the nearest whole number.

Lastly, I looked at the spending habits by age group, taking the average purchased amount in the previous year along with the average amount of transactions in the last month. Because the survey used [ 0, 1-5, 5-10, 10+ ] as the only options for transactions in the last month, values of more than one number were averaged and used in Table 4. Although the average transactions tend to show little variation, there is a slight upward trend between age and number of transactions made, with a slight decrease amongst older players. There also does not appear to be an observable pattern in average purchase amount amongst age groups, although there is a slight increase in the average monetary value of IAPs found in those of age groups 23 and above.

Table 4: Age Breakdown of IAPs

<i>Age</i>	<b>Avg. Purchase Amount (2017)</b>	<b>Avg. Transactions Last Month</b>
<i>18</i>	\$ 106	1.29
<i>19</i>	\$ 334	1.13
<i>20</i>	\$ 259	2.43
<i>21</i>	\$ 446	2.84
<i>22</i>	\$ 528	2.37
<i>23</i>	\$ 321	2.38
<i>24</i>	\$ 152	2.40
<i>25</i>	\$ 535	1.29
<i>26</i>	\$ 111	3.17
<i>27+</i>	\$ 585	2.00

All statistics calculated and converted into USD. Purchase amount was rounded up to the nearest dollar, but due to similarities, average transactions were given two decimal points. F2P data information was included in this table.

Given this table, I find the data largely inconclusive in determining whether there is a correlation between age and IAPs. I would have preferred to study transactions per year to contrast it with spending, but given that transactions heavily vary from month to month, I was unable to do so without the possibility of getting

severely inaccurate data, which would also have been the case if I had instead asked participants to report the total number of transactions for the duration of 2017.

Table 5: Spending Breakdown by Age (2017)

<i>Age</i>	<b>% Spent Luxury Goods</b>	<b>% Spent Other Goods</b>
<i>18</i>	15.38%	44.62%
<i>19</i>	21.25%	48.75%
<i>20</i>	27.50%	55.94%
<i>21</i>	26.67%	48.81%
<i>22</i>	33.29%	46.45%
<i>23</i>	29.62%	43.85%
<i>24</i>	28.50%	50.00%
<i>25</i>	23.14%	49.00%
<i>26</i>	27.50%	48.33%
<i>27+</i>	28.33%	50.00%

F2P players were not included in this data, IAPs were not included in statistic of luxury goods purchased.

However, when taking observations by player classification and disregarding household income, a notable pattern in spending habits was found.

Table 6: Spending Breakdown by Player Type (2017)

<i>Player Type</i>	<b>% Spent Luxury Goods</b>	<b>% Spent Other Goods</b>
<i>F2P</i>	23.00%	43.90%
<i>Regular</i>	23.45%	51.44%
<i>Whale</i>	36.08%	39.17%

IAPs were not included in statistic of luxury goods purchased.

There was an increase in purchases of luxury goods the more frequently a player spent on IAPs. Since the label of a regular player was varying in comparison to F2P and whales, it was not surprising to find only a slight increase in the amount of luxury goods purchased along with a large increase in the amount of other goods purchased.

Furthermore, whales spent less on other goods than both regular and F2P players, sharing an inverse relationship with the spending habits of F2P players.

## **2. Individual Interviews**

### *2.1 Analysis of Games Played*

Of the interviewees, there were three observed games: Granblue Fantasy (GBF), Love Live: School Idol Festival (LL), and Fire Emblem Heroes (FEH). Granblue Fantasy was developed by the studio Cygames in March of 2014. While it is a Japanese based game, it is widely accessible worldwide and operates on a single server on Android, iOS, and browser platforms. As of December 18<sup>th</sup>, 2017, Cygames reported to be at its all time high of a profit of 165 million USD. Although Granblue Fantasy is one of Cygames' more profitable games with a continuously growing player base of currently over 20 million, it is not without its controversies. Noted by a significant dip in sales ranking in early 2016, Granblue Fantasy was criticized when hundreds of players spent thousands of dollars in attempts to pull one character. A recorded incident in March of 2016 showed a Japanese player spending \$6,065 before finally pulling the character he wanted, who had been supposedly given a rate up appearance chance. Due to this, Cygames publicly apologized to all players who pulled during this time and refunded them with in game credits, as well as developed a "sparking" system in which if any player spent approximately \$834.30 (excluding tax), they would be guaranteed a character of their choice in the current available pool. Since then, their sales ranking for Granblue Fantasy has significantly stabilized and continued to grow, until last quarter in which the game faced a slight decrease of approximately \$24.1 million.

Figure 1: Cygames Sales Ranking Quarterly Breakdown by Game

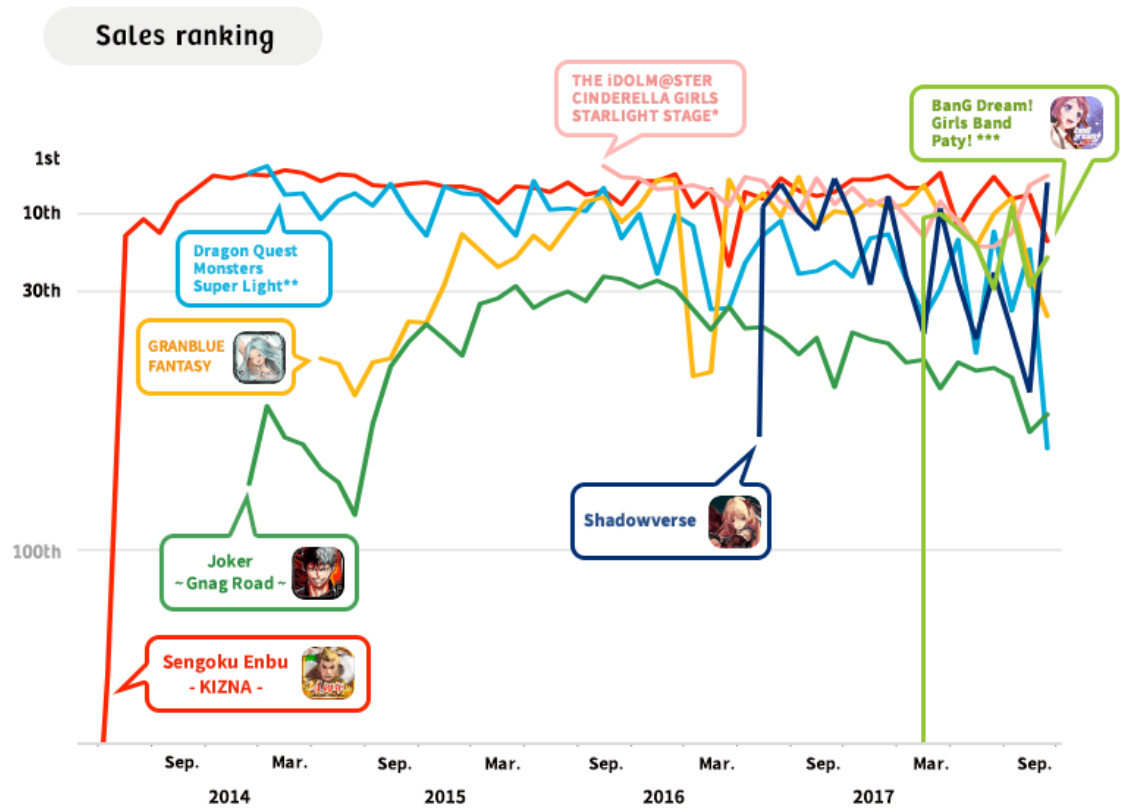


Figure from Cygames company website. The dip in sales shown in March of 2016 was caused by “Monkey Gate” scandal in which players quit but were ultimately refunded for not getting the character that had an increased rate up. Note that the game has recovered since, with the dip in late 2017 possibly explained by GBF’s player milestone celebration, in which players were rewarded numerous prizes as well as free pulls, making it unnecessary to spend money.

Love Live is one of the most popular rhythm gacha games, with over 40 million players on their global servers as of October of 2017. Developed by company KLab in 2013, it was released worldwide just a year afterwards, and has consistently increased in popularity since, with spinoffs and a strong franchise backing the game. As one of the older app based gacha games, it contains a rarest pull rate of 1%, which is significantly lower than the normally standard 3% within games of the same community. The standard gacha system of Love Live also does not offer what other gacha games

typically do, which is a double rate during special events or promotions. However, as of the recent two years, they have created cheaper bundles called “Starter Packs” that provide significant value for what they cost -due to this implementation, player purchasing rate has been increasing steadily.

Figure 2: KLab Quarterly Revenue Breakdown

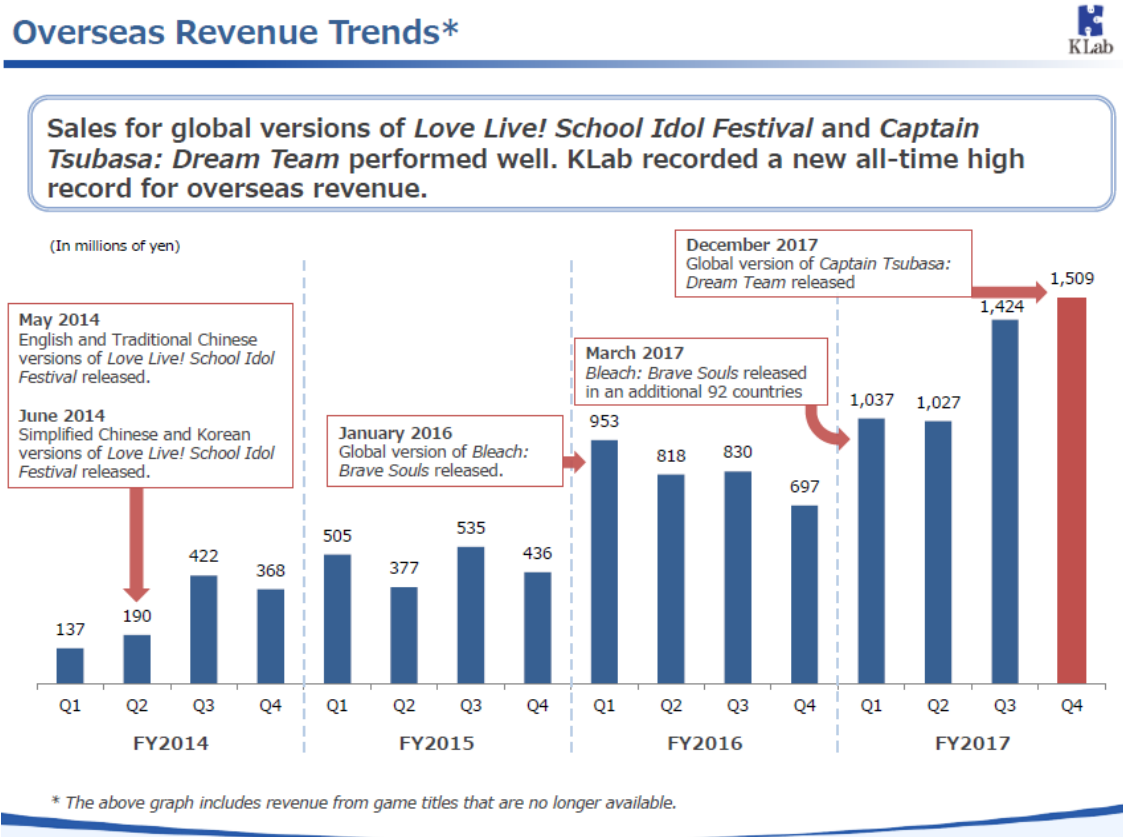


Figure from KLab corporation. KLab reported a revenue all time high, with Love Live’s global servers increasing sales from last quarter due to their 40 million players campaign.

Of the three, Fire Emblem Heroes is both the newest gacha game as well as the only game to be released worldwide on the same day across regional servers. Developed by Nintendo and Intelligent Systems, it is a spinoff game of a popular existing franchise, as well as the first official game of the series to be created for iOS and



Android platforms. While it offers the same standard 3% rate for the highest tier as other gacha games, it also allows players to use resources to turn certain lower valued characters into a higher tier, and thus gives more value for slightly weaker characters. Furthermore, it is also different from the other gacha games in that it will steadily increase the rate for higher tiered characters the longer a player goes without pulling one from the limited pool available at the time. Its current daily revenue is approximately \$46,505 with around over twelve thousand daily installs.

Figure 3: FEH Daily Statistics via Think Gaming

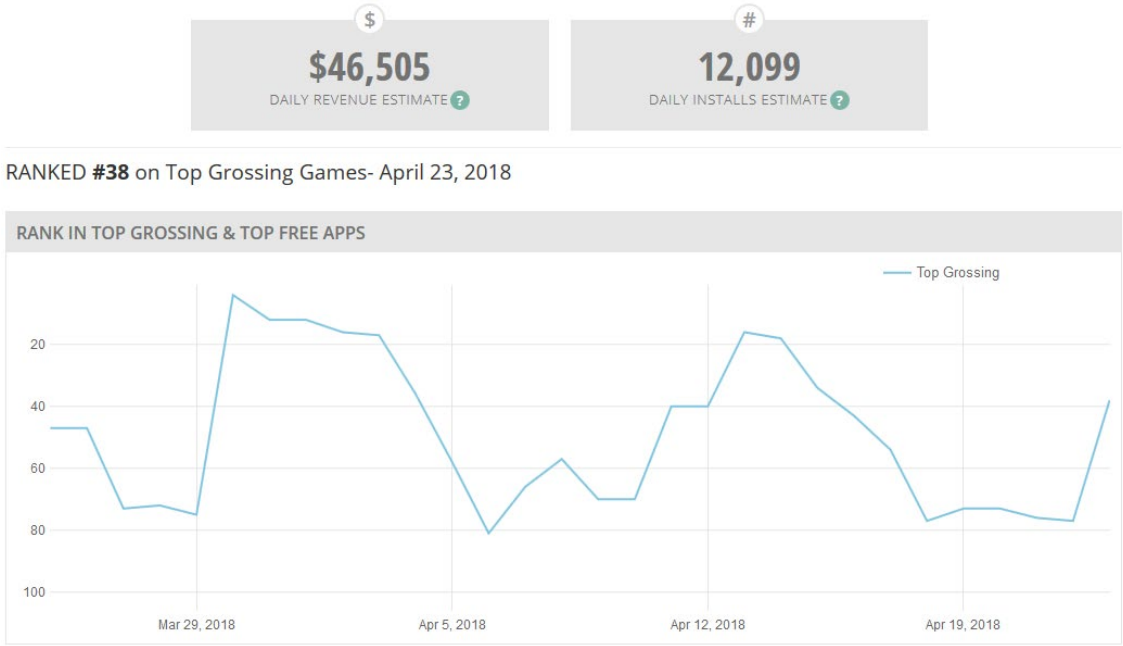


Figure from Think Gaming.

2.2 Data of F2P Subject

Interviewee 1 was an employed F2P player who did not graduate university. They reported to coming from a low income household, with a weekly income of approximately \$250. Their observed day to day spending was nearly evenly divided between the purchase of other goods and luxury goods, with approximately 51.22% of

spending going towards the former and 48.78% to the latter. Interviewee 1's gacha game of choice was FEH, where I observed them to pull four times using 18 total orbs, converting to a value of \$10.63 if purchased with real currency. The subject's total marginal utility, calculated using the table below, came out to be  $1(10)+3(1) = 13$ , out of a maximum desired  $4(0.03)*100+4(0.58)*10+4(0.36)*1=36.64$ , taking appearance rates of each rarity into consideration. Furthermore, the subject reported their utility as diminishing after each pull, having started at a 10 and ending at a 3 on a scale of 1-10.

Table 7: FEH In-Game Statistics

<b>Tier Rarity</b>	<b>Rarity Rate</b>	<b>Point Assignment</b>	<b>Value</b>
3★	36%	0	1
4★	58%	42	10
5★	3%	97	100

Tier rarity and rates were explicitly provided for on the banner. The lowest rarity was given a point assignment of 0 as rate up characters in FEH do not appear as 3★, thus rendering them worthless in this case. Value of pull was calculated by directly comparing the number of feathers each rarity of character would give you.

The participant's marginal utility equation is calculated by adding their pull worth according to in-game statistics ( $13/36.64$ ) with their perceived satisfaction ( $3/10$ ), divided by 2 (maximum value of full satisfaction and pull worth). For Interviewee 1, their total utility came out to be 0.327. Despite not having spent any money, they expressed disappointment as they were unable to receive any characters they deemed useful after they used up the remaining in-game resources they had saved up. This modeled equation will be used and adjusted for the other game observed, as all gacha game observe essentially the same system with only minor adjustments on the rarity of resources available.

### *2.3 Data of Occasional Spenders*

Interviewee 2 and 3 were both considered to be regular players, each coming from varying backgrounds. Interviewee 2 was self-reported to be upper middle class, employed, and a student at university. Their weekly income was approximately \$180 and they also played FEH. In their observed week with IAPs, 70.14% of their transactions went to luxury goods while 29.86% went to other goods. On the week in which the subject did not spend on IAPs, 32.09% of their spending was on luxury goods and 67.91% on other goods. Their spending on luxury goods significantly increased by more than double on the week they made IAPs, while also being able to stay under their weekly income for both perceived occasions. Interviewee 2, despite being a regular player who occasionally spends money, did not make IAPs on the day of their observed pulls, as they were able to get the desired character immediately. Due to this, they rated their satisfaction as a 10 and stopped pulling after the first turn. Using Table 7 for FEH, their marginal utility was calculated to be a 1 (the maximum score if the player were to only pull their desired character and stop as they did).

Interviewee 3 was an employed student identifying as lower middle class. They frequently spent at occasional intervals and identified as a regular player. Their weekly income was observed to be approximately \$30. For the week in which the participant was observed to make IAPs, their purchases appeared to be dominated by luxury goods, the value of those transactions making up 61.91% of all purchases that week. The week in which they did not make any IAPs showed a significant decrease in luxury goods, with only 10% of transaction costs going towards that category. Furthermore, Interviewee 3 was only observed to spend real currency on days where they made IAPs

as well -out of the seven days, they were observed to spend on luxury goods in four of those days, and of those four days, three were used to purchase other goods. I also noted that their weekly income was significantly less than how much they were spending on virtual items. In addition, there were more days in which no transactions were made at all during the observed week in which the interviewee did not spend on IAPs.

As a regular player, Interviewee 3 accumulated pulls in the game Granblue Fantasy in attempts to get an otherwise unobtainable character that was having a rate up. They pulled exactly 300 times, primarily in intervals of ten, and ended up spending \$150 on that day to get the character. However, despite pulling the character they wanted at the end, they stated that their satisfaction went from a 10 down to 7 after doing all 300 pulls due to resulting in spending real currency and ultimately remaining dissatisfied with the majority of the items they received. Their pull value, using the table below, was calculated to be  $\{[10(100)+8(10)+5(2)]/[100(0.03*300)+10(0.15*300)+2(0.82*300)]+(7/10)\}/2$ , with their total utility resulting in 0.646. It is further noted that despite pulling more than their weekly income, the player identified as a regular player and thus would only occasionally spend, and at inconsistent amounts. In addition, I have found in my experience that players who spend on gacha games do not limit themselves to using only their income from work, if they are employed. Interviewee 3 happened to fall in this category and was also reported to be a dependent.

Table 8: GBF In-Game Statistics

<b>Tier Rarity</b>	<b>Rarity Rate</b>	<b>Point Assignment</b>	<b>Value</b>
<i>Duplicate</i>	-	-	0
R	82%	18	2
SR	15%	85	10
SSR	3%	97	100

Values were calculated similarly to FEH. Tier rarity and rates were explicitly stated by the game. The value of the items was calculated using the in-game item moons to Damascus Ingot trade rate for all three tiers and comparing them. Unlike FEH and the other gacha games mentioned in this paper, GBF duplicates do not have observable values as the same character cannot be used multiple times on a team, nor can they be used to make another stronger.

#### 2.4 Data of Whale Subjects

Interviewee 4 identified as a Love Live Whale player and reported to being an employed graduate from a lower middle class household. During the week in which IAPs were made, the only purchases they made were luxury goods, in which 52.91% of the costs were spent on IAPs. Furthermore, the goods they purchased were primarily physical merchandise from the gacha games they played. In the week in which no IAPs were observed to be spent, 88.39% of the subject’s purchases were luxury goods, with the same amount of days as the first week in which no purchases were made at all.

When doing their pulls, they spent \$120 in one sitting to buy bundles for seasonal characters with increased appearance rates. While they did not specifically desire any character, they expressed that they wanted URs (Ultra Rares) or strong characters. They did four 10+1 pulls resulting and was disappointed although they received two characters of the highest tier, stating that they were not strong and did not look aesthetically pleasing. I calculated their total utility to be

$$\{[2(100)+0(20)+5(4)+37(0.8)]/\}$$

$[100(0.01*44)+20(0.04*44)+4(0.15*44)+0.8(0.80*44)]+(6/10) \} / 2 = 1.233$ . Their total utility was higher than the perceived maximum of 1 because they had not wanted any character in particular and managed to pull higher rarities against the odds.

Table 9: LL In-Game Statistics

<b>Tier Rarity</b>	<b>Rarity Rate</b>	<b>Point Assignment</b>	<b>Value</b>
R	80%	20	0.8
SR	15%	85	4
SSR	4%	96	20
UR	1%	99	100

Values were calculated similarly to FEH and GBF. Tier rarity and rates were explicitly stated by the game. The value of the items was calculated using the in-game exchange rate available for all tiers. Duplicates are desired in LL and thus have higher values than in games such as GBF.

Interviewee 5 was also a Whale player in Love Live. They reported to be an unemployed university student from an upper middle class household. Their spendings primarily consisted of luxury goods, with those accounting for 75.85% of transactions made during the week in which IAPs were observed. The recorded week in which there were no IAPs was not considerably different -such as with Interviewee 4, much of luxury goods bought were merchandise from mobile games played by the subject, with luxury goods accounting for 72.25%, a slight decrease.

Interviewee 5 wanted a specific character when doing their pulls and spent \$200 buying all the available bundles before saying they were “cutting their losses” and giving up. They were not noted to receive any URs and ultimately rated their satisfaction level a 1/10, stating that it would have been slightly higher if they had not impulsively spent real currency. Using Table 9 for Love Live, I calculated their total utility to be  $\{[0(100)+1(20)+9(4)+57(0.8)]/$

$[100(0.01*67)+20(0.04*67)+4(0.15*67)+0.8(0.80*67)]+(1/10) \} / 2 = .072$ . I observed that

their disappointment was significantly higher than the other subjects but noted that this was most likely due to the bad RNG -when taking the game's appearance rates into consideration, the subject had a worse result than what was statistically expected. To directly compare the spending habits of the interviewees along with their respective pulls, I compiled their data into a table.

Table 10: Spending Habits of Subjects Between Two Weeks

<i>Interviewee</i>	<b>% Other Goods</b>	<b>% Luxury Goods</b>	<b>% Other Goods (IAPs)</b>	<b>% Luxury Goods (IAPs)</b>
Subject 1	51.22%	48.78%	-	-
Subject 2	67.91%	32.09%	29.86%	70.14%
Subject 3	90.00%	10.00%	38.09%	61.91%
Subject 4	11.61%	88.39%	0.00%	100.00%
Subject 5	28%	72.25%	24.15%	75.85%

The week in which IAPs were observed does not include calculations from spending on IAPs due to the bias it would cause in the data.

## Conclusion

While the results did not indicate a significant correlation between age and virtual spending habits, it was also observed that there did not appear to be any sort of correlation between income and amount as well as cost of IAPs made, supporting my original hypothesis. Furthermore, the number of F2P and regular players appeared to be spread relatively evenly across the different incomes, with Whales dominating in the upper income class. With this said, there were a surprising number of regular players who spent a thousand or more in the year 2017, showing that small transactions done in succession can add up to unexpectedly large quantities.

In addition, the survey asked for whether the participant paid for rent or utilities alongside other expenditures. It was found that the amount of people who checked either one or more of these boxes were considerably evenly spread amongst those who did not check any boxes, and thus was not further emphasized in the discussion of my findings as they did not significantly affect the data. I also noted that although some participants had to pay for their own rent, they specified that they were dependents through short answers on the survey, so it was difficult to discern whether a subject was a dependent or not through paid rent or utilities alone.

In each of the interviewees observed (with the exception of Interviewee 1, who was F2P), there was a pattern of increased expenditures made towards luxury goods in weeks in which IAPs were purchased. While this pool of data is likely not large enough to be significant, it is more than a little coincidental. However, it was difficult to directly compare and contrast marginal utilities as only two subjects that I observed



having failed to receive the character they had tried pulling for were extremely different classifications of gacha players.

The method in which I calculated total marginal utility in economies in which a gacha system is observed in the context of this thesis appeared to be fairly accurate in terms of reflecting satisfaction rate with whether the player received the character they wanted. However, due to the varying personalities of the subjects, their personally perceived scale of satisfaction after doing the pulls ended up affecting the data a lot. If I were to exclude that variable, the data would be as follows:

Table 11: Comparison of Utility Between Interview Subjects

<i>Interviewee</i>	<b>Personal Satisfaction</b>	<b>Total Utility(1)</b>	<b>Total Utility(2)</b>
Subject 1	3/10	0.327	0.355
Subject 2	10/10	1.000	1.000
Subject 3	7/10	0.646	0.592
Subject 4	6/10	1.233	1.866
Subject 5	1/10	0.072	0.381

Column 2 of the table shows total utility with consideration of personal satisfaction whereas the satisfaction variable is not observed in the last column.

Although this emphasizes the need for the personal scaling as Interviewee 4 was not completely pleased with their pulls, even though they were not specifically aiming to get anyone that they hadn't received yet. The data, shown this way, shows the observation of pulls based on a RNG standpoint alone. In this case, it can be determined that Interviewee 2 and 4 won against the odds, thus giving them much higher utilities. While Interviewee 3 was satisfied with their pulls, they did not rate their satisfaction at max utility, due to their dissatisfaction with how many times they had to pull and how

much they had to pay. Looking at the utilities in this format provides a better perception of disappointment amongst gacha players in comparison with the RNG based economic system, but ultimately does not give sufficient evidence to make a statement about whether spending gives a player more or less utility. However, taking in regard the personal satisfaction ratings given by the interviewees, if the threshold for maximized utility was set at 1 (according to the earlier formulas when modeling individual utility based on the gacha game played), the data from these numbers could potentially determine the likelihood for the player to keep spending until that threshold is reached, in order to become satisfied due to their personal preferences as they performed each pull. This could mean that players such as subject 3 are more susceptible to spending more in order to satisfy their in-game utility, shown by their disappointment with their pulls although they managed to get the desired resource.

Many of the anonymous participants who responded to the survey expressed regret and embarrassment at providing their spending habits, and a lot admitting that given the opportunity, they would spend the real currency used for in game transactions on merchandise instead. Given this, there could have been bias in the responses as players could have attempted to hide or falsify their spending habits or income as everything was self-reported, although nothing was noticeably detected, since I personally looked through all the individual data to match up to responses in regard to the other questions. There was also discrepancy between reported income vs. disposable income, as I only looked at the former and would therefore be unable to differentiate between the two.

Furthermore, I did not include factors such marital status or whether the participant had any children due to the lack of information of mobile gamers that are married or with children. While this could have affected the amount of disposable income they had towards decisions made on gacha games, it would not be a topic that was sufficient enough for me to further analyze. In addition, although a number of players in their 30s answered the survey, it was extremely small in comparison of the participants in their 20s, which is only a certain portion of the amount of mobile gamers today. Noting this, this data would likely only be able to speak for those who are in these age ranges.

Gacha games have been continuously rising in popularity, with companies increasingly creating full length games and spin offs using these systems that don't require as much time and effort to be spent on plot and game design. While advertising itself as an F2P gaming system, it provides players with incentives to do otherwise, taking advantage of the quick transactional systems of mobile devices to encourage impulsive spending. In the end, while gacha games can provide a great community and easygoing player base for general audiences, the desire to compete and keep up in an economy controlled by the players themselves causes it to become a form of legalized gambling that is easily accessible across all ages and platforms. In our currently surging digital age, connecting mobile games via social media have been increasingly sought out as a way to replenish certain resources to allow players to play more, thus giving gamers a view of their opponent and friends' inventories. This, in correspondence with ongoing gacha events, allows players a direct view into the progression of others. The incentives to perform better to be on par with peers has risen dramatically in this

method of social gaming, urging players to spend money to reach these heights more quickly. While the results of this study are not definitive, it does exhibit a correlation between players spending on IAPs and increasing luxury good expenditures, perhaps highlighting the understudied topic of impulsive and overspending in a younger generation.

## Appendix

### Appendix 1: Survey Consent

Hi everyone; this is Cici -as a long time fan of gacha games and a current senior at the University of Oregon, I've decided to revolve my research for my thesis around player spending preferences in gacha games, specifically in comparison to their actual spending and income in real life. However, just because I'm conducting a survey on player spending does NOT mean that you have to have spent money to participate! If you're F2P or even a whale, please do participate if you can.

In this survey, I will be asking you questions about gacha game spending habits that pertain to my research. This survey should take no more than 10-15 minutes. Everything will be anonymous (I will never ask for your name or contact you with follow up questions) and you will be allowed to skip any questions you are uncomfortable with answering; the survey will track your answers via time stamps and in no other method. This means that all information will be stored on a secure password protected computer that only I and my faculty advisor will have access to. I ask and encourage people of all residency to participate, provided that you are English speakers and over the age of 18, just for privacy purposes and making sure that there is no misunderstanding present in this survey due to language barriers. Any foreseeable risks will be possible leak of information but I will assure that I am taking all necessary measures to keep private information completely confidential.

Your participation is completely voluntary and may be discontinued at any time for any purpose. As a small thank you, four participants will be randomly chosen to win a drawing for a \$30 iTunes or Google Play gift card to spend on your preferred gacha

game of choice -but keep in mind that only those who answer at least 12 out of the given 15 questions to the best of your abilities, even if it is a rough approximation, will be eligible to win. Furthermore, there will be a maximum of 520 participants in this survey on a first come first serve basis. In order to enter this drawing, please just leave me a Discord, Twitter, or any other handle that I'll be able to reach you at. Of course, this is not at all necessary and do feel free to leave that part blank if you'd like to opt out. By clicking below and commencing the survey, you indicate that you have read and understand the information above and consent to participating in the survey. Thanks for reading and helping me out!

For more information or if you have questions about the study, you can contact me at:

Cecilia Wang

[ceciliaw@uoregon.edu](mailto:ceciliaw@uoregon.edu)

If you have questions about your rights as a participant in research, you can contact Research Compliance Services at:

[researchcompliance@uoregon.edu](mailto:researchcompliance@uoregon.edu)

Furthermore, feel free to copy or keep a printed version of this information for your reference.

## Appendix 2: Anonymous Survey

### Gacha Game Spending Preferences

**\* Required**

By checking "Yes", I am verifying that I am 18 years or over the age of 18 and not a minor. \*

Yes, I am 18 years or older

**What is your country of residence? \***

(Since currency and gacha game price values differ depending on relevance, this is necessary; there is no need to be specific, however, simply list whatever country your app store lists you as)

Your answer \_\_\_\_\_

**What is your age? \***

Your answer \_\_\_\_\_

**What is your current status? Please check all that apply. \***

- Student
- Employed
- Unemployed

**What is your approximate monthly income? Please put household income if you are a dependent. \***

Your answer \_\_\_\_\_

**Do you pay for:**

- Rent
- Utilities

**Would you consider yourself to be? \***

- Low income
- Lower middle class
- Upper middle class
- Upper class

**What is the gacha game you play/spend on the most? \***

Love Live, GBF, Diresute, FEH are such examples, please confirm the game you list falls under the gacha category.

Your answer \_\_\_\_\_

**What type of player would you categorize yourself as?**

- Free to play / F2P (no money ever spent)
- I spend a little, occasionally
- I tend to spend quite a bit, regularly/monthly
- I'm a whale and spend a lot regularly

**How much approximately did you spend on in app purchases in 2017? \***

Your answer \_\_\_\_\_

**Why do you spend in-game?**

- Collection purposes (ex: to get best girl or a limited character)
- To get stronger in game
- Retail therapy
- Other: \_\_\_\_\_

**If applicable, what would you use the money you've spent on gacha games for instead?**

Your answer \_\_\_\_\_

**When are you the most likely to spend?**

- After getting paid
- Exclusive character you want is released
- Something that will make you stronger in game is available (regardless of the aesthetics)
- Exclusive packs / bundles on sale
- I'm F2P and don't spend regardless

What percentage of your income or expenditures goes towards necessities or bills? (Transportation, food, textbooks, etc)

Your answer \_\_\_\_\_

What percentage of your income or expenditures goes towards material/luxury goods? (Games, consoles, nendoroids, makeup, etc)

Your answer \_\_\_\_\_

How many times have you made an in-app purchase in the past month? (Note: times and not days; for example, buying two packs one after another counts as two)

- 0
- 1-5
- 5-10
- 10+

Please leave a handle (Discord, Twitter, etc) for me to contact you at if you wish to be entered in the drawing for a \$30 iTunes or Google Play giftcard :D

Long answer text  
.....

SUBMIT

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### **Appendix 3: Interview Consent**

As you know, I am Cecilia Wang, a current senior at the University of Oregon. I've decided to revolve my research for my thesis around player spending preferences in gacha games, specifically in comparison to their actual spending and income in real life. I'd like to interview you about your spending habits in gacha games relative to real life situations, with your consent. This interview and all the recorded information that I receive from you will be used solely to help me in my thesis for my university. No personal identifiers will be included in my paper, research, or any publicized information I present in front of any persons or community that would be able to link you to the information you provide me with. Furthermore, by participating in this study, you are consenting for me to use any information you give me to help me conduct my research and write and present my thesis. While you will not be anonymous to myself in conducting this interview, you are guaranteed to retain anonymity to all others.

In this interview, I will be asking you questions about gacha game spending habits that pertain to my research. The interview should take no more than 10-15 minutes. Everything will be confidential and you will be allowed to skip any questions you are uncomfortable with answering; furthermore, I will ask if I have your permission for a follow up interview.

All the relevant information I collect from our conversation will be stored on a secure password protected computer that only I and my faculty advisor will have access to. Any foreseeable risks will be possible leak of information but I will assure that I am taking all necessary measures to keep private information completely confidential.

Your participation is completely voluntary and may be discontinued at any time for any purpose. As a small thank you, four participants will be randomly chosen to win a drawing for a \$30 iTunes or Google Play gift card to spend on your preferred gacha game of choice -but keep in mind that only those who answer at least 12 out of the given 15 questions to the best of your abilities, even if it is a rough approximation, will be eligible to win. Furthermore, there will be a maximum of 520 participants in this survey on a first come first serve basis.

For more information or if you have questions about the study, you can contact me at:

Cecilia Wang

[ceciliaw@uoregon.edu](mailto:ceciliaw@uoregon.edu)

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Furthermore, feel free to copy or keep a printed version of this information for your reference.

#### **Appendix 4: Interview Script**

1. First week: “Please record all of your expenditures made within this week.”
2. Second week: “Please record all of your expenditures made within this week.”
3. While spending on in-app purchases:
  - “Your expectations at this moment -no matter how high or low, we’ll represent that with a 10. Please go ahead and do a pull now.”
  - “Before you do your next pull, what are your expectations now? Assuming your expectations prior was a 10, on a scale of 1-10, how would you describe them now?”
  - Repeat question #2 until player stops pulling.
  - Calculate consumer marginal utility with the data given and the pull result recorded from within the game.

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