

The Effect of Ambient Item Presence on Participation in a Virtual Microtransaction  
Economy

**Introduction**

This study, which spans psychology and economics, explores the influence of psychological factors on economic decisions made by video game players. My primary interest in this area of study stems from the recent shifts in monetization strategy occurring within the video game industry. These changes have been driven in large part by players' decisions, economic and otherwise. Traditionally, video games have been distributed in the same manner as the majority of the goods in our economy by means of a fixed, up-front cost. This model allows the companies to recoup production costs in a (reasonably) predictable and prompt timeframe and then move on to the next project. However, some game developers have (relatively) recently started exploring alternative monetization strategies, several of which have had phenomenal success. The game I am focusing on for this study is *Team Fortress 2* (generally abbreviated TF2), arguably the foremost game in terms of successful unconventional monetization.

TF2 was originally offered at a fixed price like most games. It is a cartoon-styled FPS (first-person shooter) created by Valve (one of the world's foremost game companies). After several years, Valve decided to also build an optional microtransaction economy inside (and eventually extending beyond) the game. It consisted of various items that a player could equip to their character in-game. These items generally only made cosmetic changes, although some additional

unlockable weapons were added that were similar to the stock weapons but had a trade-off that made them neither better nor worse than stock, but provided more variety of options about how to play the given character. None of the items confer an in-game performance advantages over any other players, even the items that provided any performance changes (tradeoffs, not advantages) are readily available to F2P players through random drops and achievements. The cosmetic items account for the vast majority of the economy, especially hats.

This economy began to generate quadruple the revenue of game sales, so the company decided to just offer the game for free and rely on the microtransaction economy (Ludwig, 2012). TF2 and its monetization strategy have remained wildly successful since then, and have increased both revenue and player base. Around the same time, and increasingly after this success, other developers began to shift their monetization models as well. There have been a variety of different strategies arising from this, but TF2 remains something of a gold standard of free-to-play (F2P) monetization. It has come to be referred to, even by Valve, as the world's "#1 war-themed hat trading simulation." For that reason, TF2 is an ideal game to use in studies of novel monetization strategies.

The strategy of offering a game F2P is a sensible reaction to the advent of the digital age. The Internet and computers have rendered digital goods effectively free of scarcity. The cost and time required to duplicate a piece of information on a computer and distribute it anywhere in the world are so insignificant at this point that anything digital is effectively infinitely replicable in the hands of the right company. Traditional economic wisdom generally says that a company will do best

when it offers its goods at the point where the marginal cost of the good equals the marginal price a customer would be willing to pay (assuming perfect competition, etc.). This equilibrium status has long been the sought-after standard for firm-level profit maximization. However, since the marginal cost of any digital good in downloadable form is now generally a fraction of a penny, it makes sense to offer games for free and create an alternative, tandem economic system that allows players to pay however much they want by creating their own unique bundle of optional in-game item purchases. Assuming people create their own bundle in such a way to maximize their enjoyment for a given budget, this creates perfect price discrimination (i.e. each customer pays the most they are willing for a given product), maximizing potential revenue for the company and providing its best chance at breaking even or profiting. This type of price discrimination is the holy grail of economics in general, and video games represent, in my view, one of the closest approximations yet seen in the free market to date.

The fixed-price model might convince some people to spend more than they would on microtransactions because it's all or nothing. However, real world experiences show that this can be offset by capturing revenue from all of the players who are willing to pay some, but not as much as the fixed cost. This group forms the 'long tail' of video game customers. They were previously largely shut out or opted to pirate because of price floors/entry barriers, including, ironically enough, Digital Rights Management software (DRM) that is intended to foil pirates— which we'll cover more later. They now contribute a significant portion of video game revenue, and the digital distribution of video games has increased its revenue 16% to nearly

\$6 billion. At the same time, physical sales including consoles and physically distributed games dropped 21% to just below \$9 billion, still accounting for the majority of sales, but seemingly not for much longer (Makuch, 2013).

Even though the long-tail, small-purchase consumer has become increasingly important, the so-called 'whales' (people who spend hundreds or even thousands of dollars on games annually) still provide the majority of game revenue. However, the microtransaction model helps capture more revenue from them as well. Instead of semi-effectively catching a few additional price points with 'collectors editions' or other perks targeted directly at serious fans of a game, a microtransaction economy allows players to spend exactly as much money as they want on the game.

The somewhat staggering result in TF2 is that some hat collections are estimated to be worth over \$30,000 (<http://backpack.tf/top/backpacks>). This is admittedly not a perfect estimate and it would take a fair amount of time and effort to liquidate the collection effectively for its full price. Earbuds (a cosmetic item that looks like a pair of the white Apple/iPod earbuds) were given to players who played TF2 on a Mac within a set time period. Because they are fairly rare and there is fixed supply, they have become the de-facto high-level currency in TF2 used for trading the rarest hats and similarly expensive items. They are worth approximately \$36 apiece via PayPal on the grey market as of this writing. The estimated value of the collection mentioned above (867 pairs of earbuds) is crowd sourced by the website based on prior trade values of the hats in the inventories. However, these values are quite speculative and rely on the ongoing favor and interest of TF2 players to sustain them, just as ultimately the stock market and paper money rely on the

ongoing faith of consumers and continued existence of the US government. In this way, if the game changes popularity over time, the value of these items is likely to fluctuate accordingly. While this can be problematic for in-game investors, it also creates the arbitrage opportunities that make the game's barter economy engaging and vibrant (Varoufakis, 2012).

On the flip side from the whales, the effective lack of marginal cost for video games now also means that companies can allow free-riders at no cost to themselves without worrying about a tragedy of the commons type situation in which the free good is exploited in an unsustainable manner. This has been true of the actual intellectual property of games since their inception. Once an idea (game) can be committed to code it can easily and cheaply be almost infinitely replicated across and between computers. Historically this has been done on physical media from floppy drives to CDs/DVDs and thumb drives (or proprietary cartridges and devices developed by Nintendo, Microsoft, Sony, or a handful of others to hold and operate the code). There are still advertising, shipping, and other distribution costs, but the code itself and the medium on which it was carried are very cheap. However, only with the relatively recent advent of a fast and reliable enough internet/server infrastructure and digital download platforms such as Steam has the marginal cost of distribution been effectively nullified. Even though games have always been marked up significantly from their production cost, they used to at least have material costs – disks, packaging, cartridges, shipping and physical distribution, etc. Those have been eliminated now, although well placed advertising and some other traditional production costs remain present.

However, replacing these costs are the ongoing development costs for these free, easily distributed games. The old mentality of moving on to another product once a game has shipped is now completely upended: the shipping of a game is just the beginning for a company monetizing in the F2P realm. With the extremely easy and fast update features built into digital distribution platforms like Steam, continuing to add content to the game after the fact, both economic and otherwise, is coming to be expected by the players of the game. Many F2P game makers have made the mistake of releasing a game with an initial set of monetization options and never revising them, generally leading to failed games (San Filipo, 2012; Cook, 2013). Not only does ongoing development have benefits for the game and company in terms of participation rate, revenue, etc., it also means that stronger communities develop around the games because there is faith in the developers and indication that the developers have faith in their games.

Many consumers view some high-profile games (well-known, AAA titles with huge budgets; the game equivalent of a Hollywood blockbuster) as a risky gamble of an entertainment purchase, particularly if the company has a longstanding tradition of releasing high production value games but generally failing to take the time and effort to revisit them and fix bugs. A surprising number of the best games from the past decades remain plagued to this day by poorly optimized code and other bugs. *Halo: Combat Evolved* is one of the most influential games of the modern age of gaming, and was far and away the most popular launch game (and a console-exclusive game) for the original Xbox, Microsoft's first foray into the console market (McLaughlin, 2012). It played a very important role in boosting sales of the console

and helped Microsoft compete viably with Sony and Nintendo despite these two having been long established in the console industry. The game sold over 5 million copies and spawned a series that currently includes 8 games across a variety of platforms and has earned over \$3 billion in revenue. The original game was also ported to PC and Mac, but remains somewhat plagued by poor performance on high-resolution monitors and high-quality graphics settings, even on current high-end PC hardware. In general, PC hardware should outperform consoles from the same time period. The fact that current computers still struggle with a game originally meant for consoles over a decade ago is almost unheard of. It occurred in this case because the PC version was only patched and updated a few times shortly after release to fix significant errors and then hasn't been touched since. A similar thing happened to the PC port of Halo 2, although not to the same degree. Almost nobody plays *Halo* on the PC anymore, and the multiplayer components of Halo and Halo 2 have been shut down.

However, games whose developers not only fix bugs but go above and beyond to add fresh content periodically tend to develop very committed followings, allowing for years of extremely successful monetization and a happy customer base. Standout examples include TF2, League of Legends, many MMOs, notably WoW (also a subscription model) and Guild Wars 2 (up front cost, but no subscription, which is very rare for top-tier MMO titles).

Finally, F2P solves perhaps the oldest and most prevalent problem in the gaming industry: piracy. The servers that handle the distribution of games for free, such as those powering Steam, are significantly cheaper than the costs of

implementing and enforcing serious DRM on a major game. And that's just money, not to mention all of the customers lost from bad publicity resulting from overzealous DRM. EA has been voted the worst company in America by a Consumerist poll two years in a row (Matyszczuk, 2013). This is due in large part to their recent debacle game launches in which the games were crippled by their DRM to the extent that a significant percentage of paying customers were unable to access the game for days or weeks after the launch. There are certainly other contributing factors, including general industry practices and frustrating monetization schemes, but the financial fallout from the DRM problems during launches have also been cited as the primary factor in the recent resignation of the CEO. It has also pushed EA to change the monetization model of some of their games to F2P, including huge titles like their intended World of Warcraft competitor, Star Wars: The Old Republic. The transition has apparently had positive impacts for them as well – according to recent financial statements – helping generate significant revenue, although they are cautious about long-term success (Olivetti, 2013). It is worth noting that SWTOR's F2P model is pay-to-win, with less focus on cosmetic items and significant advantage granted to paying customers.

By contrast, companies are generally lauded for embracing DRM-free approaches. The 'Indie Humble Bundle' caught on as a major success by offering a bundle of cool games by smaller developers completely DRM-free on any/all platforms for which the games are available. They also allowed people to pay whatever they wanted for the bundle of games, whether it be \$1, \$100, or \$10,000 – and people could decide how to apportion the money they chose to spend between



the game developers, various charities, and the humble bundle team. Overall, they earned over \$5.1 million on their most successful indie bundle to date, averaging around \$1-2 million over the 6 major Indie Bundles they have done (Humble Bundle Customer Support, 2013). However, the reputation of the Humble Bundle came under fire when they started releasing bundles with DRM (a bundle that made \$5 million, just shy of the highest DRM-free indie bundle), and they made statements assuring their customers that they would still do DRM-free bundles primarily (Orland, 2012). Additionally, some studios have opted to simply go DRM-free, despite maintaining the fixed-up-front-cost model. The development team behind the Witcher 3, a highly anticipated upcoming release that is the follow-up to two critically and commercially acclaimed titles, has simply done away with DRM altogether, saying “If someone wants to pirate a game, eventually he will” (Makuch, 2013).

The developer is correct in that pirates have eventually cracked every single DRM mechanism introduced. Because of this, to claim legitimate loss of sales equivalent to the volume of piracy is facile. Most pirates were not potential customers to begin with. Considering a more specific population can provide a more accurate estimate: people who are inclined to pirate the game, but are so impatient they cannot wait for a pirated version and have the disposable income to be able to choose not to pirate the game. If they lack the inclination or knowledge to pirate they will buy the game regardless of DRM. If they pirate the game but lack the disposable income to buy it or actual interest in buying the game at its sticker price, they weren't really lost revenue. As such, statistics used by pro-DRM advocates, in

copyright lawsuit damage claims, etc. tend to be fairly inflated. Indeed, recent studies in the music industry have found that piracy does not seem to hinder legitimate sales (Aguilar & Martens, 2013). Most pirates were not actually potential customers before pirating the material; they would not have spent any money had piracy not been an option. Not only does a F2P model prevent piracy, it also allows all would-be pirates (who are now just F2P players) the opportunity to become paying customers. Needless to say, F2P customers convert at significantly higher rates than pirates will decide to pay the up-front-cost of games they have already pirated.

However, the economics of the shift only tell half of the story. Economics tells us that offering games for free is significantly more viable for a company than would be the case with physical goods. However, it doesn't explain why people are willing to spend money on a game (value creation) when they don't have to. There has been a variety of strategies tried by different developers to effectively extract revenue from players in F2P games. Some restrict parts of the game, allow players to purchase powerful items that affect gameplay, allow paying customers to advance more rapidly, etc. These types of games are considered pay-to-win, and are often quite effectively monetized. The pay-to-win items are obviously in quite high demand in competitive game settings, but many serious gamers often frown upon those types of games as a flawed attempt to get on the F2P bandwagon. It prevents people from having a fun, complete experience unless they pay – just like the old model. It also runs fundamentally counter to one of the core tenants of competitive video games: the most skilled player is supposed to do the best; now it is a hybrid

equation involving the skill level but also the amount of disposable income a player is willing to sink into the game.

Games that are single-player or otherwise lack a serious competitive element (many social/mobile games on Facebook and elsewhere, for example) have had some success with pay-to-win, but it has often proven pretty unsustainable over the long run. Zynga has provided perhaps the best example of this (Martin, 2012). It had a meteoric rise and a hugely publicized IPO, but their user base and stock prices fell just as quickly as soon as the initial interest in their games wore off – largely, I would argue, due to their coercive nature, as well as their decision to put all their eggs in that one design basket. They are now getting out of real games and into the online gambling industry as various pieces of legislation look poised to open that market up to some new opportunities – incidentally an industry where coercion and repetition of design are the norm.

Many of the most successfully monetized F2P games offer the full version of the game completely free and unrestricted, with the purchasable items being as close to purely optional as possible. Cosmetic items that change a character's appearance but do not affect actual gameplay or game balance are generally the most common of these optional purchasable items. However, the possibilities inherently depend on what type of game the economy is being built upon and the choices and priorities of the developers. These types of cosmetic items, while allowing people to assert their status to other players, do not fundamentally change the equation: skill = success. A TF2 player with thousands of dollars worth of hats and strange weapons has no advantage over other players who have spent no

money. For this reason among others, they have become very popular means of monetizing games, partly because they involve such little coercion. Trust is a key part of commercial relationships, as Morgan and Hunt explored in their 1994 study. They found that trust and commitment formed an underlying mediating variable for myriad other indicators of strong marketing relationship, and are not just independent indicators themselves. They tested this as a series of 13 hypotheses (i.e. 'there is a positive relationship between commitment and propensity to leave, or between trust and cooperation) using survey data from a variety of NTDR (National Tire Dealers and Retreaders Association) firms. All of the hypotheses were supported by correlation analysis, and structural equation modeling supported 12 out of the 13.

The importance of building trust between the game developer and the customer is all the more relevant in the entertainment industry, where even the slightest hint of coercion or foul-play can send customers to one of the myriad competing offerings (Stoll, 2002). While consumers often tolerate some degree of economic coercion, in entertainment it completely undermines the point of the purchase in the first place in an industry with thousands upon thousands of substitutes. Additionally, Stoll argues that deception around the character of the company itself is especially destructive. This is very relevant for the video game industry, in which the reputation of the developer can play a large role in the success of a game. EA has a poor reputation amongst gamers (as mentioned earlier, they're been voted the worst company in America two years consecutively), and as a result their game launches are greeted with extreme criticism and repercussions

that other games don't typically face. Players have harshly and consistently criticized their recent launch of SimCity for its use of DRM requiring a constant Internet connection (Kohler, 2013). This criticism was so severe the game's average user rating on Metacritic, a website that aggregates ratings from all over the internet, is a shockingly low 1.9/10, despite the fact that it was reasonably well received by critics. EA is not the only company to use this type of DRM, but they certainly suffered the worst repercussions, largely due to their reputation.

I have chosen to focus on mid-core/hard-core multiplayer PC games for many of these reasons. These types of games have passionate, dedicated fan bases willing to spend money on things they consider worthwhile, and generally have enough of a competitive scene that pay-to-win is a non-option. They are thus ideally suited to examining ways in which value creation can occur in a compelling enough way that people spend money they do not have to, without feeling disadvantaged if they don't. This key duality of providing incentive without pressure is difficult to create, not to mention economically counterintuitive. However, if psychological understanding and support can be built, the outcome of perfect competition is economically ideal. Plus, all the players are satisfied no matter what they pay, helping ensure the continued existence (and hopefully growth) of a robust player base and stable economy. The credit for this is owed to the well designed economy and wealth of items available – there is simply so much quality content available (much of it crowd-sourced through the Steam Workshop) that there is a satisfying hat to fit any budget, though the most enticing ones remain salient but out of reach unless one sinks some money into the game's economy. This potent psychological

mixture of enjoyment and entertainment, when coupled with a compelling game, is extremely effective at turning players into paying customers.

Once a game has moved to F2P, the most important goal from a monetization standpoint is to increase participation rate. The more people paying, no matter how little they spend, the better. Also, people who spend money once are far more likely to be willing to spend again in the future – similar to the ‘foot in the door’ and ‘slippery slope’ phenomenon. The ‘foot in the door technique’ has long been researched as a key concept in marketing (Freedman, 1966 ; Pliner, 1974). Its popularity and significance come from its ability to reliably sway a person’s propensity to do something without being in any way coercive about it. Numerous studies have demonstrated that people are far more likely to grant a large favor if it has been preceded by a small favor. This phenomenon also translates into the digital/online world, as digital interactions find similar results (Guéguen 2002). Once a person has broken the initial barrier in any sense, they are more likely to cross the line again. Similarly, one might expect that a person who has spent some money on the game will be more susceptible to purchasing new items as they are released into the game.

To explore how one might maximize participation, I examined what effect certain economic environmental elements have on a player’s willingness to become a participant in the economy of a game. The participants’ willingness to participate in the economy of TF2 was assessed after a session of playing TF2, in a variety of distinct environments.

The control group simply played the game on a server without any items indicating economic participation – everything was completely stock, just the game as it originally looked when it was first released in 2007 before any items or other parts of the economy had been added to the game. From there, additional classes of items were added to certain servers.

The first class of items contained those available to players either for purchase or through enough persistence. These weapons can be unlocked if certain achievements are met (certain number of kills or assists with a given weapon or class) or can be found through luck via random drops, which all players, F2P or paying, get at the same rate as they play. These items can also be melted down into base components (metal), which can be recombined in certain ratios and configurations to create new free-tier items.

The next tier of items is almost exclusively available to paying customers, most notably strange weapons and unusual hats, which only drop from crates when they are opened with a Mann Co. Supply Crate Key, available exclusively from Valve (or another player who purchased the key from Valve but wants to trade it instead of using it to open a crate). These weapons are functionally identical to their non-strange counterparts: they simply record the number of kills or other important and relevant statistic while the weapon is in use. For more details on Stranges and Unusuals, refer to the attached material (which all participants viewed prior to their playtest) detailing different item types and their economic role.

We know from a variety of psychological and behavioral economic studies that saliency – the ready visual and mental availability of certain items or conditions

- can have a significant effect on decisions of all sorts, including purchases. This is particularly true when the mediating factor is dopamine, which tends to emphasize and drive the desire for things that are salient (Berridge, 2004). Video games are played effectively to deliver a steady supply of dopamine to the player, meaning that they create an effective situation in which to be making certain rewards for economic participation salient to players.

This also often manifests itself as availability bias – people’s decisions are often influenced by how readily a certain outcome springs to mind rather than an accurate rational calculation (Tversky & Kahneman, 1973). Lottery tickets are excellent examples of this – because the winning scenario come so readily and vividly to mind, people are willing to buy lottery tickets despite the rational knowledge that the expected value of that gamble is effectively zero (certainly less than the cost of a ticket). Despite the ‘irrationality’ of buying lottery tickets, people do because the expected utility of the gamble is positive for them despite the expected value being negative, since income and utility are not the same, and utility changes due to risk and other factors (Kahneman & Tversky, 1979). People are less likely to make more risky decisions, so the job of the game developer in this sense is to ensure that the ‘gamble’ of spending money on the game entails as little risk as possible. Developers can decrease the perceived risk by having a good reputation (trust, as mentioned earlier, is a key part of establishing and maintaining an in-game economy), as well as by creating the gambles such that even a ‘loss’ feels like a gain. Unlike a real lottery, losing players get a consolation prize in TF2 when they ‘gamble’ on unlocking a crate. Even if they don’t get an unusual hat, they still get a



strange weapon, can of paint to change to color of an existing item in their inventory, or some other lesser cosmetic reward that players still consider a gain, even if it is a small one. This helps ensure that the expected utility of the gamble is high, even if the lesser items are not worth a significant amount of money and the expected value of the gamble is still negative.

Appropriately, the type of items that are most salient all remind players of the rewards of buying keys (strange weapons are visible when their owner kills you with it, unusual hats with particle effects that catch the eye, etc.). This is appropriate because keys are a lottery system in and of themselves. Keys offer players a 1% chance to get something extremely rare, generally worth between \$30-\$3,000 depending on its popularity (fickle crowd opinion) and rarity (general rules of supply and demand). The added bonus is that even if you 'lose' when you open a crate with a key you still get an attractive cosmetic item, even if it isn't especially valuable. Because of this, theoretically people should be more interested in participating in the in-game economy after playing on a server in which all the items are readily visible and therefore fresh in their mind.

Willingness to participate in the economy was measured by offering participants payment immediately after they had completed their play session in the form of either \$2 or one unit of in game pseudo-currency called a 'Mann Co. Supply Crate Key'. Keys cost \$2.49 if bought directly from Valve, but cost about \$2.21 in the steam marketplace (users selling to other users) at the time the data collection was set in motion. By the end of data collection the price on the marketplace jumped to around \$2.42. Since by default the artificial 'currency' is less liquid (fewer uses)

than its equivalent face value in cash, it followed that the cash offer would need to be lower than the face value of the key in order to try to catch people at an ambivalence point – hence the \$2/1-key ratio.

My hope is that a better understanding of which types of items increase the participation rate, when salient and present in the environment, will yield insights into which qualities of video game economies contribute significantly to stability and revenue – most such economies are so young that long-term stability has not been satisfactorily demonstrated or studied. The handbook on how to effectively monetize these games is just now starting to be written, and my goal is to contribute to that effort as much as I can. It also has profound implications for the potential success of a similar monetization model to other digital goods.

## **Methodology**

### Sample:

The subject population was drawn from current adult (18+) TF2 players who:

- Are at least mildly experienced at TF2: at least 10 hours played and are generally familiar with the game.
- Have an account older than 1 month. This was primarily so people didn't create duplicate accounts to scam the study and get compensated multiple times.
- Are not participants in the TF2 microtransaction economy (i.e. had never purchased anything from the Mann. Co. Store or the TF2 Marketplace.). This meant mostly players with Free-to-Play accounts, although it also included some players with premium accounts (currently only given to players who

spend money at the Mann Co. Store) due to their purchasing the game before it went F2P, but who still haven't spent any money on the cosmetic economy.

This restriction exists because I am examining the conversion from F2P player to paying customer, and such a sample restriction focuses the study on the critical factor of successful F2P monetization that I am interested in.

- Are not participants in the grey market or heavily experienced in the trading scene (someone who frequently makes trades, often using PayPal in exchange for a trade to pay for high-value items without technically being a paying customer from Valve's eyes). I allowed participants who had traded a little bit: it is possible to get a decent collection of common cosmetic items (normally requiring the purchase of keys) just by trading the random free drops that all players get. People also sometimes get items in TF2 as perks for buying other games on steam (the economy is all interconnected) and these items sometimes become somewhat valuable and can be used to trade for some mid-range items without spending money on TF2 itself. Mild economic participation, due to the free random drop system, is not necessarily a sign of actually purchasing anything or in any way being a paying customer in the eyes of Valve, so they are still unconverted from a monetization standpoint.

Participants were recruited on campus, as well as through a variety of online tools. I posted information about my study and solicited participants on several gaming- or TF2-related forums and message boards. I used the pre-survey to examine the TF2 accounts of interested participants and ensured they met the

criteria before participation. After playing, each participant was offered either \$2 via PayPal/cash or one Mann Co. Supply Crate Key as compensation for participating in my study. This dichotomous choice serves as my primary dependent variable, acting as a proxy for willingness to participate in the virtual economy. I had 184 total people interested enough to take the initial survey, but that was whittled down to 141 useable participants, of whom 101 completed the post-playtest survey, leaving me ultimately with 92 usable data points (a few were lost due to incomplete surveys, etc.).

#### Procedure:

All potential participants were asked to fill out a very short survey initially, which I used to confirm that they were eligible participants. I asked those who were eligible to review some material on the TF2 economy and item types (materials attached), and then randomly assigned them to 4 different conditions, each of which was a different TF2 server. I created three of these servers; the fourth condition was an assignment to a public server (I created a list of several to choose from that I hand picked in case one was full or empty). Each of the three I created had Artificial Intelligence computer-controlled 'bots' filling the empty slots. These bots acted and appeared for all intents and purposes very similar to real players, although perhaps a bit more polite and predictable. The inclusion of a public server condition is an attempt to help bridge that gap between bots and players to some degree. More specifically, the servers were configured as such:

- Control server: Bots and players were only able to use the exact 'vanilla' set of items that were available when the game was first released. No

unlockable or cosmetic content of any sort was present on bots, and the server actively blocked them so that human players were also restricted to stock weapons and items: they were unable to use cosmetic items, strange weapons, unlockable weapons, unusual hats, etc. These servers looked like TF2 as it was originally released in 2007.

- Medium exposure condition: Bot loadouts included some cosmetic and unlockable items, but only those commonly available even to F2P players. No rare or valuable items such as strange weapons or unusual hats were present on bots, although I was unable to block those that could potentially be worn by participants – however, since they are all F2P players they are unlikely to have too many, if any, of these.
- High exposure condition: Bot loadouts contained some free-tier items, but consisted primarily of paid-player-only content: rare or valuable unusual hats and items like strange weapons.
- Public servers: were hand picked to resemble the high-exposure condition, and hopefully created similar saliency of top-tier cosmetic items. The survey questions regarding number of strange weapons and unusual hats seen serve as an attempt to verify this statistically.

The last condition was intended to allow me to examine the magnitude of the effect not only of the different item types, but also of said items in the hands of AI-controlled bots vs. in the hands of real people. Participants were asked to play for at least 30 minutes, although they were welcome and invited to play longer and often

chose to. I then asked them to take a follow-up questionnaire, after which they were done (aside from compensation).

After the study had started, to address the fact that a strong majority of the participants across all conditions were selecting the key, I sent out a follow-up survey to participants. It asked them their average number of hours played per day since the study, whether they had spent any money on microtransactions since the study (if so, how much), and self-rated likelihood of playing TF2 regularly in the future, trading with other players, and making microtransaction purchases.

#### Statistical Methodology:

The first statistical test was a 2x4 chi-squared on my hypothesis that some or all of the non-control conditions will show an overall higher propensity to accept the Mann Co. Supply Crate Key as payment. I also ran an ANOVA still using propensity to take the key as the DV and the server conditions as IVs. Then, I ran a regression attempting to delve into greater detail. The final form looks like this:

$$\text{WTP} = \alpha + \beta_1 * \text{vanilla} + \beta_2 * \text{medium\_exposure} + \beta_3 * \text{high\_exposure} + \beta_5 * \text{experience} + \beta_6 * \text{microtrans\_expenditure}$$

The independent variable in this case is WTP (willingness to participate), a dummy variable based on their acceptance of the Mann Co. Key as compensation or not. The playtest condition variables (vanilla, medium-, and high-exposure) are a series of dummy variables, one for each server condition, except the public server

condition, omitted because it should serve a similar purpose to the high-exposure condition and for multicollinearity reasons.

The 'experience' variable was the overall self-rated gaming experience level. This was by far the most useful of the possible measure, as it was the only one coming near any sort of significance and it captures the broadest/most accurate representation of gaming experience level. Other variables gathered and examined, but not ultimately used in the regression include weekly average hours played, total TF2 hours played, etc. This was of interest for a number of reasons: given statistical significance it could have had implications for the pace at which the economy should introduce players so as to get them interested, such as the speed of the random drop rate in TF2. For example, if players with much experience demonstrate an unwillingness to take keys, perhaps they have to be convinced within a certain number of hours of playing the game.

The 'expenditure' variable was the participants' self-rated frequency of spending money on video games via microtransactions, as this had the most specific bearing on my interest in customers converting from F2P to paying for microtransactions. Other similarly oriented data not used in the final regression included number of games owned, money spent annually on games, self-rated likelihood to spend money through various other channels besides microtransactions, and overall frequency of video game expenditure. This is of interest to help determine whether previous demonstration of willingness to spend money via microtransactions would be indicative of propensity to take the key.

From there, I spent time trying different permutations of regressions and including different other variables, but none of the other data yielded anything closer to statistical significance or more relevant for the WTP dependent variable, so their output is not included here. The only other variable that is potentially useful as a dependent variable is the self-rated enjoyment of the experimental play-session. I ran the following regression to examine how much the server condition influenced enjoyment:

$$\text{Enjoyment} = \alpha + \beta_1 * \text{vanilla} + \beta_2 * \text{medium\_exposure} + \beta_3 * \text{high\_exposure}$$

For the follow-up survey, I ran four different ANOVAs using as DVs: the self-rated future likelihood of playing TF2, trading with people, and making purchases in the Mann Co. Store, as well as the average number of hours of TF2 played per day since participating in the study. All of these used the server assignment of the participant as the IV.

## **Results**

Over the entire sample, 77% (71 out of 92) of participants chose the key, while 23% (21 participants) chose the cash/PayPal option (Table 5). The average self-rated overall experience was 2.1 (on a scale of 1-3), and the average frequency of expenditure on microtransactions was 1.1 (on a scale of 0 to 7) (Table 4). There were 30 participants in the vanilla server condition, of which 80% (24 people) took



the key. There were 24 participants in the medium-exposure server condition, of which 71% (17 people) took the key. There were 18 participants in the high-exposure server condition, of which 72% (13 people) took the key. There were 20 participants in the public server condition, of which 80% (16 people) took the key (Table 5).

To test the primary hypothesis that the server condition would influence propensity to accept the key as payment, a chi-square test of independence was performed to examine the relation between WTP and each server condition variable. The relation between each these variables and WTP was not significant (Table 1):  $X^2(3, N = 92) = 0.9326, P = 0.818$ . A two-way analysis of variance was performed as well, but yielded no statistically significant interactions either. The effects of the vanilla server [ $F(1, 92) = 0.00, P = 1.0$ ], the medium-exposure server [ $F(1, 92) = 0.49, P = 0.487$ ], and the high-exposure server [ $F(1, 92) = 0.30, P = 0.583$ ] were non significant.

There were also no statistically significant effects found from the initial regression (Table 2), nor from any number of similar permutations. The vanilla server condition (coefficient = 0.005,  $P = 0.968$ ) did not have a significant effect, nor did medium-exposure (coefficient = -0.114,  $P = 0.392$ ) or high exposure (coefficient = -0.059,  $P = 0.678$ ). The experience variable, self-rated overall level of game experience (coefficient = 0.095,  $P = 0.172$ ) is the closest variable to statistical significance in the WTP regression, but still falls well outside the range of statistical significance for any normally accepted research. It has a coefficient of around 0.1, meaning were it to be significant a jump up my scale of gamer experience (not a

gamer, casual, mid-core, hard-core) makes a person about 10% more likely to accept the key. The microtransaction expenditure variable (coefficient = 0.028,  $P = 0.488$ ) was also outside the range of significance. I tried a variety of additional regressions using alternative measures for expenditure and experience, but none of them yielded anything superior to these measures in terms of significance.

The follow-up survey population (Table 6) had an average self-rated likelihood of playing TF2 in the future was 5.87 (std. dev. = 1.56) on a scale of 1-7. On the same scale, the mean self-rated likelihood of trading with other players was 4.6 (std. dev. = 1.9) and mean self-rated likelihood of making microtransaction purchases was 2.18 (std. dev. = 1.39). The average hours per day played since the study was 1.7 (std. dev. = 2.68).

For the follow-up survey analysis, a two-way analysis of variance (Table 7) using self-rated likelihood of trading in the future as the DV and using server condition as the IV was non-significant,  $F(3, 54) = 1.83, P = 0.15$ . The same ANOVA run with self-rated likelihood of future microtransaction purchases was also non-significant,  $F(3, 54) = 0.82, P = 0.49$ . The ANOVA using self-rated likelihood to continue playing TF2 was non-significant,  $F(3, 54) = 1.80, P = 0.16$ . The ANOVA using average hours of TF2 played since the survey was also non-significant,  $F(3, 54) = 1.15, P = 0.34$ . Out of 54 respondents, 53 said they had not made any microtransaction purchases since participating and 1 person said they had; this data was not used in any further analysis (Table 8).

Unfortunately, this lack of significance on the initial regression left little in the way of useful follow-up using this data set. Cross-effects between particular

server conditions and the other variables are inconclusive, and none of the other variables served as a worthwhile or significant dependent variable from a monetization standpoint. However, the enjoyableness regression yielded some significant results. The medium-exposure condition fell well outside significance (coefficient = -0.192, P = 0.314), but vanilla (coefficient = -0.333, P = 0.068) and high-exposure (coefficient = -0.511, P = 0.014) were both significant and strongly negatively correlated (Table 3). Again, the public server condition was excluded for the same reasons mentioned before.

### **Discussion**

The initial hypothesis, that assigned server condition would influence propensity to accept the key as payment, was not supported. It is difficult to draw any concrete implications or make any strong claims about the effects of ambient items on the participants' willingness to participate in the in-game economy. Several other variables came somewhat close to statistical significance in some cases, but are also too far off to draw any useful or defensible conclusions.

This lack of satisfactory statistical significance may be due to a variety of reasons. However, there is one key factor: the overall propensity to take the key was too high to allow for a suitable sample. Participants took the key as a payment option about 77% of the time overall, indicating that the ratio was not quite correct for my intended purposes. It is interesting to note this trend despite the fact that the sample was specifically limited to people who had never purchased a key before, despite the perpetual opportunity to do so. This is an example of traditional economic expectations breaking down to some degree and we can see the influence

of psychological factors such as the framing effect, which asserts that people react different to an option when it is framed as a loss as compared with when it is framed as a gain (Plous, 1993).

Because the data set was not especially large, this meant that the number of people taking the cash/PayPal option in each condition was too small to achieve statistical significance in any of the cases. This is most likely because the ratio I set between the two choices (\$2:1 key) did not fall close enough to the average participant's ambivalence point. The actual price of a key is \$2.49 from the Mann Co. Store, and keys had been hanging at an equilibrium price of around \$2.20-\$2.30 in the Steam Marketplace since its (relatively recent) inception. More recently (around April 9<sup>th</sup>) the equilibrium price rose to about \$2.42, coming very close to the Valve price as one might expect in the long run. Instead of setting the cash offering near this, I put it lower (at \$2) for a number of reasons, primarily liquidity. Additionally, keys on the grey market traded for PayPal funds generally sold for \$1.40-\$1.75. Although some of this price gap is explained by increased risk of being ripped off (i.e. not being traded your item after paying them, or not being paid after trading them your item), it also suggested to me that liquidity was still quite valuable, as liquidating keys into real money seemed to be possible only at a fairly steep price. Since the typical PayPal cost of a key was below \$2, I figured that \$2 was a reasonable price to balance out the key and even worried that nobody would take it.

My offering of cash/PayPal should, in hindsight, have been closer to the market price of keys rather than their grey market price. I expected that the

liquidity of cash would be enough of a factor that, were the cash offering effectively equivalent to the value of the key, the key would never be chosen because of its strict inferiority from a liquidity perspective. I did not properly anticipate having the opposite problem, and/or I overcorrected for the problem I was expecting to have. I perhaps should have done some preliminary tests offering people the dichotomous choice at varying dollars/key ratios to determine ambivalence points, although gathering a sufficiently large data set specifically to establish that would have taken almost as much time/resources as the study itself took. I considered changing the price mid-study, but at the point where the problem became apparent it was too late to make such a change without risking fracturing the data into unusably disparate chunks, thereby doing more harm than good. It seemed sounder methodologically to stick it out with the same ratio, gather the best data possible, and hope for the best.

Another potential issue was self-selection bias. It is possible that, despite the increased economic appeal due to liquidity, the key was generally a much more appealing option for some non-economic reason because of who chose to take the study. By this I mean that perhaps people who would have taken the \$2 would have been more likely to ignore the study, while people knowing they are interested in a key might participate because they see a way to get a free key. The key represents a specific object they desire at some level, and they might be inclined to follow that gut desire, whereas the people taking the money might have made a more economic-minded calculation about whether the \$2 was worth their time.

This may be partly due to the framing effect in that the way the option is presented in the study is different from previous presentation of keys. People will be more risk averse if items are presented as a loss than as a gain (Tversky & Kahneman, 1981). In the study, the novelty of having a new experience (having a key) is being directly compared with the comparatively familiar option of gaining \$2. Both are seen as gains, so the subject is free (psychologically) to choose the more interesting one as there is very little risk perceived. This is in contrast to the Mann Co. Store or the grey market, which frames the decision to buy a key as gaining the new experience at a cost. The opportunity cost of losing the \$2 in the study is very different psychologically from the 'actual' cost of losing roughly the same amount of money to purchase a key. The key is now seen as a purchase with inherent risk (owning a key might not be worth the \$2.49 paid) as opposed to a no-risk gain (because the \$2 lost opportunity cost is not salient as part of the risk). As such, participants were likely much more willing to accept the key as a reward than they are to purchase one of their own accord. This is supported by the follow-up survey, which indicated that only 1 participant had purchased anything from the Mann Co. Store since participating in the study (Table 8), and generally rated themselves as 'very unlikely' to do so in the future (Table 6).

A way to test this might be to set the dollars compensation option equal to the price of a key (i.e. \$2.49). That way, theoretically, we can see which effect is stronger: the increased liquidity or some sort of inherent bias among participants towards the key. This would also test the assumption about liquidity causing the cash to always trump the key. In that situation if the key was taken at all it would

undermine the assumption, and if it was selected at anywhere near the rate it was chosen in this study it would suggest that economics plays a surprisingly small role in the decision about keys/dollars that I present with my study.

I tried my best to eliminate this issue of self-selection bias by not mentioning that a key was an option to anyone before they had taken the study. However, my description mentioned 'multiple payment options' (for the sake of not being deceptive, although this likely would have been fine to leave out in hindsight) and many people were able to guess that the 'other option' was at least an in-game item of some sort, most of them guessed keys since that's the logical choice around that price point. Additionally, once some participants had been a part of it, they fairly regularly came back and commented on forum posts/etc., sometimes mentioning keys or other compensation details. Incoming participants, had they browsed the comments, would have been able to effectively confirm for themselves that a key was an option. This type of checking the other users' feedback comments is highly prevalent in online situations, and for those especially interested in a key specifically but unsure whether I'm offering them, checking the comments would be a very likely first move.

While the initial question was not answered, some information can be gleaned. The significant effects (Table 3) of the vanilla server and high-exposure conditions on the self-rated enjoyment of the play session are potentially worth discussing further. The vanilla server being less enjoyable indicates that the microtransaction economy, on the whole, adds positively to the TF2 experience. Players restricted back to only the original items enjoyed the experience

significantly less than those in other conditions, meaning that the items' presence did influence how enjoyable the game was. However, this comes into conflict to some degree with the high-exposure coefficient. Thought it might be interpreted that this in fact means the direct opposite of what I just concluded, I believe there are explanatory circumstances here: the strong negative coefficient on the high-exposure condition is likely due the server having a higher visual lag than the others. Because of how the plugin to generate unusual hats and strange weapons works, more resources were required/used on that server than the others. I tested all off the servers and attempted to reduce lag on the high-exposure server, but the extra fancy items took their toll still and kept the server's lag a bit higher, likely leading to a less enjoyable experience. It was definitely noticeable, although not severe. That being said, lag in games is a serious detriment to the experience and can hamstring a player, especially in online multiplayer games like TF2 where reflexes are very important to a player's success (and therefore presumably enjoyment). Latency (delay between the server hosting the game and the player's computer) over 50-60 milliseconds is 'lousy' for most players, anything over 120-150ms+ is borderline unplayable. It is possible that people found the high-tier items to be a turn-off, but this would likely have been accompanied by a positive coefficient on the vanilla server and a negative, significant effect of some sort seen on the medium exposure condition.

In the interest of fleshing out the data set and attempting to gain another channel through which to investigate whether the server condition has had an effect, I have sent out a follow-up survey to all participants who fully completed all



parts of the study. This questionnaire (attached, see appendix) asks participants for their average daily hours of TF2 played since participating, whether they have spent any money on microtransactions since they participated, and if so how much. It also asks them to rate their own likelihood of regularly playing TF2 in the future, making microtransaction purchases, and trading with other players.

Potentially fruitful areas for future research expanding on this study are plentiful. Needless to say, the first step could be to repeat the study with methodological revisions to address issues discussed above. This would allow experimenters to collect a more statistically useful data set and likely yield clearer results. The scope of the examination could also be broadened to gather more information about the type of gamer the participant is. The variables that came closest to significance tended to be those reflective of the participant's qualities as a gamer. More than the items themselves, the very nature of the particular players that TF2 attracts seems to determine their propensity to participate in the microtransaction economy. As such, TF2 seems somehow especially good at attracting such customers, explaining their very high conversion rate to paying customers. TF2 also has something of a reputation in the gaming world as being a game 'full of whales,' i.e. full of players who are likely to convert to paying customers and contribute significant amounts of money to a game's economy over their duration as a player. In that vein, the study could be altered such that server conditions other than the item loadouts were varied to investigate what about the game attracts and holds the attention of these particular types of players.

Alternatively, the sample itself could be more finely tuned to restrict it to a specific type of player.

From there, the next jump would be to translate this study to other games, either in something similar to its current form, one of the permutations discussed above, or something else more specifically tailored to the new game of focus. The most obvious candidate would be Dota 2, having a barter economy modeled and built upon/interconnected with TF2's economy. The player base is similar in many respects as well, lending it potentially well to investigations of player characteristics such as those discussed above. League of Legends fits a similar category, although its simpler economic model would necessitate more tweaks to the design of the study to make it relevant and useful. Moving beyond games primarily driven by mid-/hard-core gamers, this type of study could be applied to a wide variety of mobile and social games. As people tend to be wary of spending money on mobile games, F2P has become a dominant market trend in response. The monetization strategies of these games vary often quite slightly and in nuanced ways, potentially allowing for highly relevant comparisons of results from the same experiment on two or more games with similar but slightly different monetization strategies or player-base demographics.

Even more broadly, these ideas can, in principle, be translated pretty well into any industry that is currently undergoing a monetization shake-up at the hands of the digital age. There have been similar explosions of unconventional monetization in many other entertainment industries including music, movies and comedy, as well as ebooks, education, and other non-entertainment sectors. Video

games have come farther than any of these have so far in terms of diversity of monetization strategies, although other industries have been equally or more successful in terms of successful monetization using alternative strategies.

The iTunes store completely shifted the digital music industry and forced competitors at brick-and-mortar stores out of business in droves. More recently, services like Pandora, Spotify, Rhapsody, and others have disrupted this by offering streaming music for free, with options to pay money to remove limitations/advertising/etc. This latest trend seems to take a page from the exact same playbook as most freemium games today. Their success has been such that Apple is now in the process of playing catch-up as the iTunes store and digital downloads have begun to take a back seat. Netflix and Hulu have, to some degree, done the same thing with TV and movies, although those all still maintain subscription fees and have not yet developed any sort of free model, in large part because what you pay for in the subscription is the removal of classic TV experience issues like advertisements and limitations on when programs air. More and more universities are offering videos of lectures, course documents, and sometimes entire courses entirely online. This shift threatens to undermine the dominance of traditional universities and colleges, as many are starting to argue that the same experience can be created much more cost-effectively online, making the price tag of the college experience harder to justify.

The changes these industries are undergoing, while not identical to those occurring in the video game industry, have many threads in common with them. This shift towards cheap or free content, even if limited, can be seen in all of these

industries. This means that a study similar to this could be set up in any of these sectors allowing examination of why customers do or do not convert from free (or the cheapest option) into paying customers (or 'premium'/non-basic).

### **Conclusion**

The hypothesis that playtest condition would influence propensity to take a Mann Co. Supply Crate Key as compensation was not supported, primarily due to the fact that the vast majority of participants chose the key, leaving too few data points in the non-key conditions for there to be much hope of finding statistical significance with the data set being the size it was. While this is disappointingly inconclusive, the results seem to indicate that the few variables that did manage to come relatively near significance tended to be more indicative of the player's characteristics than anything related to the playtest itself.

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**Table 1: 2x4 Chi-Square Test**

Server Condition	\$2	Mann Co. Key	Total
Vanilla	6	24	30
Medium-Exposure	7	17	24
High-Exposure	5	13	18
Public	4	16	20
<b>Total</b>	<b>22</b>	<b>70</b>	<b>92</b>

$X^2 = 0.9326$ ,  $P = 0.818$

**Table 2: Regression Results, WTP (Key) Dependent Variable**

Variable	Coefficient (Standard Error)	P >  t
Vanilla	0.005 (0.126)	0.968
Medium Exposure	-0.114 (0.133)	0.392
High Exposure	-0.059 (0.142)	0.678
Overall Experience	0.095* (0.069)	0.172
Microtransaction Expenditure	0.028 (0.040)	0.488
R-Squared	0.036	
n	92	

\*Closest to statistical significance; none within accepted significance levels (90%)



**Table 3: Regression Results, Enjoyableness Dependent Variable**

Variable	Coefficient (Standard Error)	P >  t
Vanilla	-0.333* (0.180)	0.068
Medium Exposure	-0.192 (0.189)	0.314
High Exposure	-0.511** (0.203)	0.014
R-Squared	0.074	
n	92	

\*, \*\*, \*\*\* indicate significance at the 90%, 95%, and 99% level, respectively.

**Table 4: Summary Statistics for Post-Playtest Survey**

Variable	Obs.	Mean	Std. Dev.	Min	Max
WTP	92	0.761	0.429	0	1
Experience	92	2.098	0.680	1	3
Microtransaction Expenditure	92	1.076	1.160	0	5
Vanilla	92	0.326	0.471	0	1
Medium-Exposure	92	0.261	0.442	0	1
High-Exposure	92	0.196	0.399	0	1
Public	92	0.217	0.415	0	1

**Table 5: Distribution of WTP Responses by Server Condition**

Server Condition	PayPal/Cash Chosen	Key Chosen	Total
Vanilla	6	24	30
Medium-exposure	7	17	24
High-exposure	5	13	18
Public	4	16	20

**Table 6: Summary Statistics for Follow-up Survey**

<b>Variable</b>	<b>Obs.</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>Future TF2 play</b>	54	5.87	1.56	1	7
<b>Future Expenditure</b>	54	2.18	1.39	1	7
<b>Future Trading</b>	54	4.6	1.90	1	7
<b>Avg. Hours/Day</b>	54	1.7	2.68	0	14

**Table 7: Follow-up Survey ANOVA Results**

<b>Variable</b>	<b>SS</b>	<b>dF</b>	<b>Mean Sq.</b>	<b>F</b>	<b>P</b>
<b>Trade</b>	18.61	3	6.20	1.83	0.15
<b>Play</b>	11.36	3	3.79	1.80	0.16
<b>Purchase</b>	4.88	3	1.63	0.82	0.48
<b>Avg. Hrs/Day</b>	24.91	3	8.30	1.15	0.33

**Table 8: Distribution of 'Money Spent' item in Follow-up Survey**

<b>Variable</b>	<b>Yes</b>	<b>No</b>	<b>Total</b>
<b>transaction_since_survey</b>	1	53	54

# Nick Bordner Thesis (Pre-survey)

Thank you for your interest in participating in my thesis! Please fill in your name, email address, and steam profile link below and then read and reply to the consent form.

You can find your steam profile link by going to <http://steamcommunity.com/> and clicking "[username]'s account" in the upper right corner, then selecting "View profile." Copy and paste your profile's url below. It should look something like this:

<http://steamcommunity.com/profiles/76561198026857790>

**\*1. Name:**

**\*2. Email address:**

**\*3. Steam profile link:**

## **Nick Bordner Thesis (Pre-survey)**

### **\*4. Participant Consent Form:**

#### **Purpose:**

**This study will investigate various interactions between player behavior and server conditions in Team Fortress 2. The study is to gather data for use in Nick Bordner's senior thesis in psychology and economics, overseen by Professors Shlomi Sher and Gary Smith.**

#### **Procedure:**

**If you agree to participate, you will be asked to do the following:**

- 1) Spend 5-10 minutes reviewing information pertaining to various types of items in TF2.**
- 2) Spend at least 30 minutes playing TF2 on the server to which you are assigned.**
- 3) Complete a short questionnaire (5-10 mins) in which you will answer questions about your gaming habits in general, as well as your experience during your play session for the study.**

#### **Benefits/Risks to Participants:**

**Participants will have a fun time, and they will get a warm fuzzy feeling from being productive and advancing the body of human knowledge while they play video games. There is no risk to participants beyond those inherent in playing video games.**

#### **Voluntary Nature of the Study:**

**The study is completely voluntary, and you may stop participating at any time without any questions asked.**

#### **Confidentiality:**

**I will use your name, steam profile, and email address only for compensation logistics and to validate that you fit the criteria for the study (free-to-play account, created at least 1 month ago, not an obvious duplicate account, etc.). Once your play session and compensation are complete, data is made anonymous for analysis. No identifying information is used in the analysis or in any sort of report or finding, and the data will only be accessible to those working directly on the thesis.**

#### **Contact:**

**You may contact me at any time with questions, concerns, or anything else pertaining to the study at [nicholas.bordner@pomona.edu](mailto:nicholas.bordner@pomona.edu) and I will respond as promptly as I can.**

# Nick Bordner Thesis (Pre-survey)

## Statement of Consent:

**I have read and understand the information above, I am at least 18 years old, and I consent to participate in this study.**

I agree

I disagree

## \*5. Age:

# Nick Bordner's Thesis (Post Survey)

**\* 1. Thank you very much for participating in my thesis, you're almost done. First off, compensation logistics:**

**Each participant may choose between either \$2 USD (sent via PayPal for online participants or cash for in-person) or 1 Mann Co. Supply Crate Key as compensation for participating.**

**For reference: Keys cost \$2.49 in the Mann Co. Store and ~\$2.20 in the Steam Marketplace (as of this writing). You can check key prices yourself here:**

**<http://steamcommunity.com/market/listings/440/Mann%20Co.%20Supply%20Crate%20Key>**

**Which compensation option would you like to receive?**

- \$2 USD sent via PayPal/Cash
- 1 Mann Co. Supply Crate Key

**2. What email address would you like your PayPal payment sent to? (skip if you were paid in cash)**

# Nick Bordner's Thesis (Post Survey)

## \*3. How would you describe your overall level of gaming experience?

- Not a gamer       Casual gamer       Mid-core gamer       Hard-core gamer

## \*4. Misc. Steam/TF2 information (total hours played and number of games owned are visible in your steam inventory screen):

Hours of TF2 played (lifetime):

Average hours of TF2 played per week (estimate):

Number of games owned on steam:

Time spent playing TF2 for this study (minutes):

## \*5. What types of games do you typically play? Check all that apply, or none if you are not a gamer.

- Mobile
- Puzzle
- Racing
- MOBA
- FPS
- Strategy
- Platformers
- Simulations
- Sports
- Social/Facebook
- Action/Adventure
- RPG
- None

Other (please specify)

## \*6. About how much money (USD) do you spend annually on video games (including up-front and in-game purchases)?



# Nick Bordner's Thesis (Post Survey)

## \*7. How often do you generally spend money on video games?

- Never
- Less than 1 time per year
- 1-5 times per year
- 6-10 times per year
- 10-20 times per year
- More than 20 times per year

## \*8. How frequently do you spend money on video games through each of the following channels? (if you do not spend money on video games, select N/A for each)

	1 - Very Rarely	2	3	4	5	6	7 - Very Frequently	N/A
Up-front cost of a game	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In-game microtransaction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DLC/Expansion Pack	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

## \*9. Compared to your past experience with TF2, how many strange weapons did you encounter in your TF2 session for this study?

- None
- Fewer than average
- About average
- More than average
- The most I've ever seen

## \*10. Compared to your past experience with TF2, how many unusual hats did you encounter in your TF2 session for this study?

- None
- Fewer than average
- About average
- More than average
- The most I've ever seen

## Nick Bordner's Thesis (Post Survey)

**\*11. Compared to your average TF2 play session, how enjoyable was the session you played for this study?**

Less enjoyable

About the same

More enjoyable

**\*12. Last step: please enter your participant ID number (emailed to you along with the server assignment):**

## Nick Bordner's Thesis (Post Survey)

Thank you, that's it! I'll contact you about compensation (either friend request on steam to trade a key or PayPal payment of \$2 to the email you specified) as soon as I can. It might take me a little while to get to it because I am handling all the compensation verification and logistics, but I promise you haven't been forgotten.



There are also a variety of weapons that can replace default class weapons

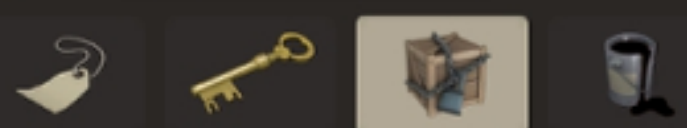





Some unlockable weapons received from achievements or random drops.

Most of these hats and replacement weapons are available to all players via random drops, crafting, unlocking achievements, etc. They show up in your inventory/character description with yellow borders/text, as seen above/below.



However, some cosmetically upgraded versions of these items exist that are almost exclusively available to paying customers (examples to follow). These items come only from crates, which must be opened using a Mann Co. Supply Crate Key.

<p>SHOW: TOOLS</p>  <p><b>MANN CO. SUPPLY CRATE</b></p> 	<p><b>MANN CO. SUPPLY CRATE</b></p> <p>You need a Mann Co. Supply Crate Key to open this. You can pick one up at the Mann Co. Store.</p> <p>This crate contains one of the items listed in its description. To unlock the crate and retrieve the item, you must use a Mann Co. Supply Crate Key, which can be purchased inside the Mann Co. Store. These crates contain one of the rarest and most valuable items in the game, so cross your fingers before you unlock them!</p> <p>The following tools can be used on this item: <b>Mann Co. Supply Crate Key</b>.</p>
<p>SHOW: TOOLS</p>  <p><b>MANN CO. SUPPLY CRATE KEY</b></p> 	<p><b>MANN CO. SUPPLY CRATE KEY</b> Level 5 Tool</p> <p>Used to open locked supply crates.</p> <p><i>This is a limited use item. Uses: 1</i></p> <p>This key can be used to open one Mann Co. Supply Crate. When opened, you will receive one of the items on the Supply Crate's item list.</p> <p>This item is a Tool. It can be applied to another item in your backpack, and is consumed in the process. Click the "Use With" button in the backpack to start the process of applying it.</p>

Crates drop frequently to all players (as you likely know), but keys are only available from Valve through their store (or trading with someone who has bought one there).

**Example 1: Strange weapons: identical to normal weapons except they track stats (kills, assists, ubers, etc.)**



**EPIC GRENADE LAUNCHER**



**HALE'S OWN STICKYBOMB LAUNCHER**

## **HALE'S OWN STICKYBOMB LAUNCHER**

Hale's Own Stickybomb Launcher - Kills: 50169

**THE PERSIAN PERSUADER**

Strange weapons have orange text/borders to indicate strange quality and they track stats, but are otherwise identical to normal items. Strange weapons gain a new 'rank' or title depending on how many kills/etc. it has tracked. They are the most commonly dropped items when crates are unboxed; different crates have different possible strange weapons it can drop (sometimes among other things).



**Example 2: Unusual hats: just like normal hats, but with moving particle effects surrounding them (flames, sunbeams, bubbles, ghosts, confetti, storm clouds, etc.)**



These are rarest, most expensive items in the game. They are dropped from crates at a rate of just 1%, leading to prices ranging from \$30 to \$3000+ Besides the particle effect, the only difference is that their names/borders are purple to indicate unusual quality.

While stranges and unusuals are the most notable, there are also other cosmetic upgrades available.



The screenshot shows a product page for a 'Level 100 Ring' in TF2. On the left, there is a 3D model of a diamond ring in an open blue box. Below the model is a row of six small character icons with a right-pointing arrow. At the bottom left is a grey button labeled '<< BACK' and at the bottom right is a green button labeled 'ADD TO CART'. The right side of the page has a dark background with white text. The title is 'SOMETHING SPECIAL FOR SOMEONE SPECIAL' in large, bold letters. Below it, the item name 'Level 100 Ring' is shown. Further down, it says 'Used by: All Classes' and 'Slot: None'. The price '\$99.99' is displayed in a large font. Below the price, there are three paragraphs of descriptive text. The first paragraph states that the ring cannot be traded but can be gifted. The second paragraph describes the social consequences of accepting or rejecting a proposal. The third paragraph mentions that the item includes a name tag and gift wrap. The final paragraph is a humorous note about the ring's value. A vertical scrollbar is visible on the right edge of the page.

**SOMETHING SPECIAL FOR SOMEONE SPECIAL**  
Level 100 Ring

Used by: All Classes  
Slot: None

**\$99.99**

This is a Ring. It cannot be directly traded, but it can be gifted to someone dear as a proposal.

The receiver has the option of accepting your proposal, announcing your joy to the entire TF2 universe, or rejecting you, leaving you a sad, lonely mercenary.

This item comes with a free name tag and gift wrap.

An eternal symbol of affection and commitment and approximately two months salary.

Gift wrap this and give it to someone dear, giving them the opportunity to accept your proposal and announce your happiness to the whole world.

<< BACK

ADD TO CART

Other items include paints to change item colors, name tags to change item descriptions, etc. There are even diamond rings that sell for \$100 apiece, as seen above.

Thanks for taking some time to look this over, enjoy your play session! PLEASE REMEMBER TO KEEP TRACK OF HOW LONG YOU PLAY.