

# **Characteristics of Online Gaming Market Structures: Evidence from Steam's Online Gaming Marketplace**

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## **Abstract**

This paper proposes an explanation and survey of structures in online marketplaces for virtual tradeable items, chiefly, Steam, a product of Valve Corporation. As the process of trading virtual items online through primary and secondary markets becomes increasingly interactive, this social interaction can become more volatile and deceptive. Successful trading in such markets requires a working understanding of an item's value, interaction with other users, and access to information that determine value for items. The consequences of such market structures could be conducive to artificial pricing and uncharacteristic market behavior divergent from real-world scenarios. In this paper I primarily focus on identifying the dynamics of a dominant online gaming platform: Steam. This paper's ambition is to serve as the basis for contrasting a market environment conducive to irrational and uncharacteristic market behavior in online marketplaces with neoclassical characteristics of perfectly competitive markets.

**Keywords: Prices, Trading, Microtransactions**

## **1. Introduction**

In 2015, The Steam online gaming marketplace, a product of Valve Corporation, was worth a total of \$3.5 billion dollars (Medium<sup>1</sup>). It is a large online marketplace in which certain games that offer their own in-game purchasable items can be bought by users and sold in the Steam market. The Steam marketplace offers thousands of purchasable items that range from \$.01 cent to \$1,851.00. In any given moment, a user can collect any purchasable item and then sell it in the marketplace at a current market price. Sellers looking for these items have the opportunity to bid on the item and receive it when the item adjusts to a requested price, or they can choose to purchase the item already listed on the market. This is similar to Ebay's "buy it now." Because of this price-bidding system is akin to a real-time auction, the Steam market is consistent with neoclassical economic theory that suggests that prices (in other words, scarcity) are the largest determinant of the amount sold and the amount bought of a product. Bidding on an item in the Steam marketplace works as a matching system. A user places a bid for an item that is currently not available and Steam "matches" that requested price with a requested item once it becomes available in a certain quantity and moves the next person up in a queue for the next price requested once another item becomes available at the next requested price. Steam then takes a percentage of the final sale price of the item as a transaction fee, thus affecting the final listing price. Transaction fees are therefore advanced to users as a cost of trading in the marketplace. This higher cost of acquisition is known as friction.

Given the nature of competition in this market (several sellers of any particular item at any particular time), users continually undercut each other and can capitalize on user traffic. Users know that by virtue of the volume of trades,

they are likely to have their item sold at a competitive price. Neoclassical economic theory would suggest that the supplier's (sellers of a particular weapon "skin") incentives to respond to orders would drive economic profit in this market to zero. Alternatively, any attempt to monopolize a certain weapon skin is not likely to succeed, as the monopoly price is not durable due to the eventual volume of any given weapon skin. This is an area in which the Steam marketplace deviates from conventional marketplaces in a few ways. First, maintaining the assumption that information asymmetry is absent, users will choose to price their item at some arbitrary percentage over the "equilibrium" price. This would be known as a markup as a direct result of higher acquisition costs. "Float value," "StatTrak," and transaction fees create the basis for pricing items over (or under) "equilibrium" price.

The Steam marketplace serves as an online community market that mirrors traditional marketplaces in some ways – modeling Amazon or Ebay in some respects. It connects thousands of buyers with other anonymous sellers who price their items on a variety of reasons such as expectations and the number of items in circulation. All items at one point or another reach a stable equilibrium price. It also diverges from real-world marketplaces in the respect that at its core, initial value for items may be artificially created by Valve (owners of Steam) by the amount that is released for sale. The amount of any item on the marketplace is created arbitrarily. Game developers create many different design patterns ("skins") for in game weapons and bundle them into prize crates. The Steam marketplace is also consistent with real-world markets in some respects. For example, the amount of these weapon crates that are created for any given occasion – scarcity – would partially determine the price of the crate.

Second, the Steam online market deviates from real-life markets in the sense that the price of complimentary goods – keys and crates – do not coincide with the price of aforementioned weapon skins. Neoclassical theory would suggest (generally) that the prices of complimentary goods would raise commensurately with a raise in the price of the good in question. Weapon keys and crates are another useful factor of prices of weapon skins<sup>2</sup>. Users can buy newly issued keys (that open crates) for an average price above some "equilibrium" or "resting price," which would be the markup. Transactions at this price take place within the first few days of newly released keys and crates. Prices of crates remain relatively low compared to keys over time. Both prices of keys and crates stabilize after a certain amount of time. Users purchase keys and crates to obtain newly issued weapons skins. Once opening a weapon skin, which ranges from common to rare, a user may then choose to sell or trade that item opened into the Steam market or a third-party market for a lower price like OP Skins (OPskins.com). OP Skins is a third-party market in which users can legally sell their Valve items to other users because the intermediary is still Steam (used for "trading bots"). Users trading in OP Skins may choose to sell their skins to the website for real currency (instead of inflexible Steam wallet funds) and may have the money transferred to their bank account. Items in this market are cheaper on average than Steam marketplace. This is due to the fact that these third-party sites may take a percentage of the transfer into a bank account, but it is not as sizeable as the Steam transaction fee. OP Skins is one of the few sites that allows user to make this transaction, so a trade-off is that the average prices of skins in that third-party market are relatively cheaper.

## 2. Methodology

The research design of this study was observational. This paper serves to identify measurable areas in the online trading ecosystem that are conducive to unconventional market behavior as well as establish a structural understanding of such markets. The variables examined in this study included keys, crates, stickers, StatTrak classification, float value, and scarcity ("rareness") of the weapon skin. Market trends from Steam and OP Skins are cataloged as indicators for participant's behaviors as well as transaction patterns in the Steam marketplace. The researcher analyzed indicators within these types of markets, which further indicated that the study was striving for a correlation between unique transaction patterns (e.g. behavior) and structure in an online gaming marketplace.

### 2.1 Reports and Publications

There is a rich literature examining the components of private value and common value that comprise the pricing of items in auctions<sup>8,9</sup>. However, there does not exist a healthy body of data or research to support the foundations of such market structures. Since common value is a significant indicator of prices, it helps us to identify perceived rareness of a weapon skin. Common Value is an important aspect of these prices because anybody who purchases a weapon skin from the marketplace may choose to resell the skin later – effectively losing money due to competition and Steam's transaction fee.

Alternatively, the private value of a weapon skin is another important indicator of prices in the marketplace. Each person bidding on a weapon skin (or choosing from current weapon listings) has some understanding of how much they value that particular item. But it is private information for the user<sup>10</sup> and in practice, a user's value for that item is not affected by learning any new information about other bidders – because they can choose from listings or switch to a third-party market for the same skin.

## 2.2 Limitations

Limitations of this study primarily involve data collection. Data captured from the Steam market and other third-party marketplaces is extremely limited<sup>3</sup>. Despite the availability of historical sales of items amongst analysis websites that track it, trends observed for this study have limited theoretical underpinnings and do not entirely explain *why* certain trends occur in these markets. The data does also not capture phenomena such as how to properly measure wealth by a user's "skins" library. There is no consensus among users across any game with virtual tradeable items as to what could properly and accurately measure wealth in-game. Limitations of the variables in consideration for market review serve as a good foundation for future research.

## 3. Market Overview

Generally, in a marketplace, when the price for any given good increases, there are two responses from consumers that quantify the effect of that price change – the substitution and income effects. In the online marketplace for tradeable items, the laws and behaviors governing activity are inconsistent with conventional markets in several respects, the first of which is with regard to items that are concrete – items that are physically felt and can be utilized at the point of purchase. In the online gaming marketplace(s), the items that are created are not concrete. They cannot be physically held (other than by a virtual character), they are not created by any labor besides in the computer code, and they do not serve a unique purpose or utilized in any particular way that a default weapon skin would not already be useful. There's no supplier of inputs, no input costs, and almost no costs involved that is unique to producing an online tradeable item (other than labor—the programmer). An artist creates a weapon skin design to be put up for display and voted on in the community gallery, weapon skins are essentially created from nothing. Although the popularity of unreleased weapon skins in the community gallery are enough to command the attention of the programmers to signal that there is demand, weapon skins are picked by Valve to be put into the game with no identifiable criteria. Until there are enough people who have gotten the random item from opening a case to start competing in the marketplace and driving down prices for newly issued skins (one aspect that functions as a traditional marketplace would), a user has to rely on the fact that a purchase of that corresponding weapon case will yield a desired item. In a conventional marketplace like the grocery store, a consumer signals with their dollars their willingness to pay by virtue of the purchase price. In the Steam online marketplace, behaviors, willingness to pay, and demand are, in many ways, divergent of such measurable phenomena.

A second way that the Steam online marketplace is different from a (real-life) market scenario lies in the fact that a user needs five dollars to open Steam account. This is an additional cost advanced to consumers. There are price constraints before even participating in this market. Once a user has successfully added money to allow them access to the market, they may buy, sell, and trade weapon skins. A user may also choose to purchase keys and crates – the primary mechanism by which new weapon skins are injected into the market. This method of injecting new skins also serves as good explanation of how the initial value of a weapon skin is higher on launch because there isn't enough competition (i.e. listings) in the marketplace to drive down the price of that particular weapon skin. Keys have a relatively constant market price across primary and third-party marketplaces. They also happen to serve as currency largely due to their stability over the short term and long term. Even as the average price of new keys is higher than that of other (older) keys, the difference is negligible due to the volume of newly issued keys that are bought in such a short amount of time – which saturates the market and brings their price closer to the price of other keys. The foundation to keys can be used as currency and therefore are a measure of wealth in one's inventory. The incentive to be the only user to have the only newly issued weapon skin largely drives the volume of keys purchased, which is an adverse effect. The more newly issued keys and crates purchased by a user, the more opportunity a user has to receive a (random) item. If that random item received is a "covert" designated weapon (or other grade weapon which is dependent on if user has the only one of that weapon skin so far), a user may be the only one in the marketplace with

a listing for that weapon skin. They can therefore increase the price to what would be their “monopoly price.” Data observed from the primary Steam marketplace for *Counter Strike: Global Offensive* (commonly referred to as *CS: GO*) shows that a larger volume of keys and newly issued keys are bought at the time of a new crate launch. Secondly, the change in purchase volume directly affects the prices of other desired weapon skins in peculiar ways that are inconsistent with real life marketplace scenarios. The observations suggest that these prices are arbitrarily created by attitudes and actions regarding rareness, float value and wear of the weapon skins (explained in subsequent sections).

### 3.1 Stickers & StatTrak

Users may also buy stickers for weapon skins that range in value according to a certain event that corresponds with it. However, adding stickers to weapon skins adds no value to the weapon skin itself. There is a nostalgic aesthetic component to collecting and applying stickers. If a sticker is uniquely rare and placed on a weapon skin that may already be expensive, then the average time occupied on the market by that weapon skin is longer because that user may have the only combination of a particular sticker and weapon skin, like a monopoly. A user may eventually sell the item to a trader and also maintain a monopoly price on that weapon skin. Alternatively, if that particular weapon with those particular stickers are listed for too long, the monopolist in this scenario will have to lower his or her price if they wish to sell. This again is because adding stickers does not actually add any value to that skin. Stickers influence the way sellers interact in the market that are uncharacteristic of real-life markets due to the commitment to this perceived common value. Stickers can be seen as a traditional complementary good. However, the prices for stickers (or weapon skins) does not traditionally correspond with the other goods that it is designed to compliment. If the price of a sticker increases, decreases, or otherwise changes, the price of weapon skins does not change as a response. There is no strong causal relationship between the price of stickers and weapon skin prices.

“StatTrak” works similarly to stickers. It is a feature on a limited quantity of certain weapon skins and catalogs every “kill” in the game. “StatTrak” weapons are created arbitrarily just as non- “StatTrak” weapons are. Typically, “StatTrak” items are valued higher than their non- “StatTrak” counterpart of the same skin. This feature distorts prices for that skin because “StatTrak” adds nothing extra to give an opportunity for increased skill to the user, but its common value is generally higher than that of its non- “StatTrak” counterpart.

### 3.2 Weapon Exterior & Rareness

There are different weapon exteriors that carry different values in which correspond to their respective exterior (“skin”) and are color-coded as a designation of how common the item may be. In *Counter Strike: Global Offensive*, just as in other games with tradable items, there is a hierarchy in weapon skin rarity – all of which affect the value of the item in the primary marketplace and in trading. The weapon skin exteriors range from most common (“consumer grade,” denoted by a light white color) to exceedingly rare (which is denoted by gold). Additional exteriors include: “industrial grade,” denoted by a light blue, “mil-spec,” denoted by a darker blue, “restricted,” denoted by purple, “classified,” denoted by a pinkish-purple, and “covert,” denoted with red. Any item can be awarded to a player after (1) the completion of any online pick-up-game style match (what *Counter Strike: Global Offensive* refers to as matchmaking) or (2) while purchasing a key and unlocking a crate. If a user is purchasing a key to unlock a crate, they are more likely to get an item drop that is on the lower end of the rarity spectrum – like a consumer grade weapon skin, than an exceedingly rare weapon (such as a knife or anything designated with a gold color).

### 3.3 Float Value

Each weapon skin has a corresponding float value attached to it. Float value is a decimal number that ranges from 0 to 1 for most skins and provides the user with a number value for the weapon to communicate what condition the weapon skin is in. Since item price is dependent on the scratch and wear of the weapon skin (i.e., if your weapon skin has many scratches or not), float value is useful to establish some tangible metric of value to provide transparency in trading and give users an idea of how to price items. For example, if my “AWP | Lightning Strike” weapon skin has a float value of .065, that means you would calculate  $1 - .065 = 0.935$  – a 93.5% [exterior paint] coverage – indicating that the skin does not have much damage and would likely be priced higher in the Steam marketplace than that of the same weapon skin with a lower float value. Each weapon skin classification (factory new, minimal wear, field-tested, well-worn, and battle-scarred) has its own accompanying range of float value. For example, if a user has a minimal wear weapon skin, it can carry a float value of 0.07 to 0.15\*. However, this does not necessarily mean that all users are perfectly informed of their float value when posting their item in either first-party or third-party markets, nor does

this assume that users are accurately pricing their weapon skins in accordance with its own float value. Float value may increase the individual weapon skin's value, but this depends on (1) the type of weapon and (2) the weapon skin.

### 3.4 Currency

Besides the money that a user would put into their Steam wallet (or online wallet at any third-party platform) and any type of unique online currency that a third-party platform may use, other goods may be used in these online marketplaces as currency. Keys (and weapon skins themselves) are excellent examples of mediums that facilitate transactions other than money. Because keys are the only medium by which any weapon skin and/or newly released weapon skin are actually obtained, they can be used to trade for weapon skins. Keys have a relatively stable and consistent price of [price] over time with exception to the [time frame] that which new keys from a new crate are released by programmers into the market.

## 4. Data

Often times, almost as routinely as new items crates are injected into the market, the items that are rarer than others (i.e. an exceedingly rare item and a "consumer grade" item) defy general market behavior such that these items will be frequently priced lower than a more common item (of which is of higher supply but not necessarily of lower price). Because we need a mechanism by which prices are distinguishable and determined from one weapon skin to another, arbitrary weapon creation is an important component that explains what contributes to unconventional pricing behavior in both primary and third-party markets.

### 4.1 Microtransactions

An overarching issue by which other disparities in the market for skins arises includes the willingness to engage in microtransactions. The strategy of microtransactions appears to be discriminatory, efficient, and a reliable way to profit from a high frequency and volume of virtual item trading while marginal costs of producing these tradeable items remains consistently low. Microtransactions are a thriving practice that is showing to be more profitable than past strategies for pricing nonessential game items. Microtransactions are used as a proxy for price discrimination in which companies like Valve offer collectable "loot crates" and other tradeable items that are a non-essential aspect of purchasing in *Counter Strike: Global Offensive*. Historically, people have been hesitant to purchase non-essential items – tradeable or otherwise – that have a dollar amount attached to them. In this current version of the *Counter Strike* videogame series, items primarily come through market transactions. This means users can auction, trade, and price compete for reasonable prices for items. For other games, like *Candy Crush: Saga*, game companies provide a non-dollar amount with purchasable items. The reason they are able to exploit this and profit from its practice is purely psychological and sociological. If users can see that the purchase price for something in a game is "1400" gems instead of \$5.00, then it becomes much easier to spend because there is no immediate feeling of a real amount lost, especially when a bank card is already entered in the game for "convenience."

Understanding the economics of microtransactions helps us understand the price discrimination of videogame producers in online markets and how virtual items move through them. Within social context, people want "skins" in *Counter Strike: Global Offensive* because they look more interesting than default weapon skins and users want to show other players in the game which skins they have equipped. Users may also use them as trading or auction items later on in their career in game.

## 5. Alternative Explanations

An alternative explanation for disparities in transactions (and effectively transaction *costs*) is the rise of third-party markets (like OP Skins) along with the increasingly restrictive time constraints to trading in the Steam market (they're strict in an attempt to curtail scammers and to disincentivize the high frequency of trades along with "Steam Guard" requirements).

Third party markets work similarly to the Steam marketplace. They serve as a hub to connect buyers and sellers of various in-game tradable virtual items from different games – like "Player Unknowns: Battlegrounds" or "Team Fortress." Third-party markets also have different transaction costs and different trade-offs and benefits that the Steam

marketplace does not offer. For example, when a user lists their item in the Steam marketplace to be purchased from another user (perhaps through buy order or direct purchase), Steam takes a percentage of the sales of the item sold. At the very minimum, this “fee” would be two cents. Normally, there is a price threshold. If an item listed on the Steam marketplace is sold and it is sold past a certain price, Steam will take 15% (10% to the publisher and 5% to Valve – the creators of Steam). Minor transactions fees occur in third-party markets as well, but they are not as burdensome. Third-party markets offer “cash out” features, which effectively gives users more freedom to buy and, purchasing power, and a sense of confidence due to the fact that the price of their items (at least more proportionally) are recoverable and easily converted into a PayPal account or that website’s own version of currency. Finally, as a result of prices for tradeable items will be lower in third-party markets than on the Steam marketplace.

A caveat to using other third-party markets is that usually, even a third-party market will require a user to sign in using their Steam log in credentials. This ensures that users who participate have a verified trade link to signal that users aren’t dealing with scam bots. Steam has strict time requirements as to when a user can trade their items and post them for sale. The benefit of these other online marketplaces is that they don’t have as strict trading requirements with respect to time. Some offer two-factor authentication for security, but none of them have Steam guard requirements (so long as a user’s account is permitted to trade Valve items and they don’t have a ban on their account).

A striking feature of trading online weapon skins was how easily a user could allocate skins (and effectively, funds) into their inventories in third-party markets and gambling sites. The ease by which users can move items is primarily attributed to Steam’s system of trading with automated “bots.” Users can sign in to a third-party site with their Steam log-in credentials and essentially trade with themselves because of these automated “bots.” However, there are trade-offs and costs associated with converting item skins to another currency in a third-party trading site and subsequently “cashing out.” When cashing out from a third-party site, the standardized mechanism for doing so is through PayPal. PayPal gives users an option to pay extra for an immediate funds transfer to a bank account or free if a user waits three to five business days. Users pay for skins in the Steam marketplace, but the prices they pay (and the costs associated with that transaction) are the variables that make that particular weapon skin valuable in *that* market. Someone who has stronger preferences for that weapon skin will value it more in Steam because the average prices are higher in that market.

Finally, money added to a user’s Steam wallet can only be used *in* Steam. It is non-transferrable and non-refundable. This implies that any funds added to the Steam wallet cannot be transferred into an online wallet (like PayPal) nor can it be “cashed out” into a bank account. To a certain magnitude, this disincentivizes users from making transactions in the Steam marketplace because their transaction costs are higher and *more* of their money that may be lost in trades is non-recoverable. The aspect of trading that resembles gambling has attracted attention and scrutiny from a legal standpoint<sup>4</sup>.

## 5.1 Steam and the Stock Market

There are similarities and differences that the Steam marketplace (and other marketplaces alike) share with real life markets – like the stock market. The Steam online marketplace is unique and different to the stock market such that the Steam market serves as both the primary and secondary market for newly issued weapon skins (it’s also different because there is no “investing” with the purchase of a weapon skin and effectively owning a proportion of Valve once a user purchases a weapon skin at any price). The Steam marketplace shares similarities with a real-life stock market in the sense that there are high volumes of trades every day and that prices in commodities (keys, weapon skins, stickers) experience daily fluctuations based on season (Steam).

## 6. Conclusion

Some aspects of the Steam online marketplace and other third-party marketplaces are similar to real marketplaces and some transactional behavior is consistent. However, it makes economic sense for a user to undercut competition (i.e., other users who post listings in the marketplace with some expectation of a transaction), which would otherwise drive economic profit to zero in a real-world market for a tangible good, the foundation of online marketplaces for virtual items is imperfect. This leads to a rise third-party markets that accommodate the demand of both items and services like “cashing out.” The consequences of these transactions and trades includes artificial price bubbles within a virtual market, and predatory market manipulation because of the incentive to make profit and because of willingness to pay

for the costs associated with the transactions (such as time spent to trade or actual money or foregoing more profit for convenience in 3<sup>rd</sup> parties).

Virtual tradeable items with their respective properties (i.e. float value, weapon exterior) coupled with the agency of microtransactions in the marketplace make up the bulk of the transactions in Steam marketplace and other third-party online marketplaces. The prices for these items are arbitrarily created and constantly fluctuating in both first-party and third-party online markets. Effectively, the foundation by which prices are created is inherently non-structural and it is not systematic. Thus, any behavior directly or indirectly related to transactions of such goods in online marketplaces or any action to pursue economic interests in such goods – that would otherwise seem conventional in a normal market – are largely irrational and contrary to conventional market behavior for most real-life goods and services.

Small scale policy changes could combat leakages in the Steam marketplace and prevent users leaving this marketplace in favor of third-party ones. This could be achieved by offering more of an incentive for users to participate in the Steam marketplace — such as lowering transaction costs. The first policy suggestion I propose is transferability of funds in a Steam account to third-party wallets (i.e. PayPal). Since Valve takes a percentage of every transaction, this policy change would effectively lower the opportunity cost of trading by the ability to recover their funds.

For reasons highlighted above, transactions in online marketplaces (Steam or otherwise) defy traditional market behavior and provide the conditions necessary for artificially high (or low) prices for commodities commonly traded these markets.

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