

EVE Online: The Worlds of Wealth and War

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ABSTRACT

This article explores the distribution of player owned wealth in *EVE Online*. I apply standardized methods such as the Gini Coefficient, a statistical dispersion intended to represent the wealth distribution of a nation's residents, to explore *EVE Online*'s wealth distribution. I also explore the relationship between a players' time in game, and their wealth. Using these methods, I find that *EVE Online*'s wealth is highly concentrated, more so than the real-world economy. Additionally, I cast doubt on *EVE Online* having a first-mover advantage. Those players who started first have not gained a lasting competitive advantage by gaining control of resources. Instead, wealth is strongly correlated with a player's time in game.

KEYWORDS

EVE Online, Virtual Economy, Economy, Inequality

INTRODUCTION

EVE Online (CCP Games 2003) is a massively-multiplayer online game (MMO), based in a science fiction universe. Players of *EVE Online* can engage in a wide variety of gameplay. They can explore space, finding rare and powerful treasures. They can ally themselves with powerful NPC factions and undertake tasks for them, to be rewarded with faction specific ships and modules. The selfsame players use said spaceships to wage war, claim territory and progress by means of empire building. Even those players who do not take part in player-vs-player combat compete with each other through economic and manufacturing struggles, as well as other forms of social competition such as propaganda and "war-lording" (cf. Milik 2017).

The EVE Economy

A key defining feature of *EVE Online* is its player-driven economy (Farrell 2015). All of the activities listed above require items, such as ships and modules, to undertake. These items are most often produced by player effort. The majority of items are created by players in a multi-stage process involving the gathering of raw resources, refining those resources, producing intermediate goods and then finally producing the finished product (Carter et al 2016). There are exceptions to this however, as some items are 'produced' by Non-Player-Characters (NPCs). These NPC-Produced items are rewarded to the player by successfully completing tasks.

As such, all items in *EVE Online* can be said to be 'created' by players. Either produced by players directly (mined, refined and manufactured) or 'produced' by players' work being rewarded by an NPC.

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The creators of *EVE Online*, CCP Games, have stated that "We try to follow the philosophy of laissez-faire...the market succeeds without interference" (Seiler 2008) in a manner akin to what Malaby (2009) terms the 'technoliberal,' wherein a virtual world's architects create systems that are intended to 'self-moderate' with little to no interference from their creators, thereby enabling 'greater user freedom'. There are very few limitations on trade, production, distribution or pricing. These factors are guided by market forces. As such, it can be said that *EVE Online* has an open, market-based economy (Taylor et al 2015).

Interstellar Credits (ISK) are the primary form of money used in *EVE Online*. Akin to Gold from *World of Warcraft* (Blizzard Entertainment 2004), the primary method for ISK to enter the economy of *EVE Online* is for players to complete tasks for NPCs. These tasks can vary, and may involve rescuing or recovering an item; destroying an enemy faction's NPC ships or space station. For successful completion of these tasks, the player is then rewarded with ISK.

These three factors: A player driven item creation; an open, market-based economy; and player driven money creation; form a complex, robust and interconnected economy.

Wealth

Wealth inequality and its rise in western economies (Saez Zucman 2016) is a contentious and relevant topic to broader social discourse. It is also a relevant topic in the virtual world of *EVE Online*. So much so that CCP Games recently spoke to its significance at the player event, EVE Vegas (Hooper 2019).

Wealth in *EVE Online* is a significant indicator of progression. Character progression, generally, does not provide direct combat power. Instead, character progression provides the ability to pilot bigger, more powerful spaceships, and increase their efficiency. However, without the ship, the character has no combat power. While character progression is important, it can happen without the player being logged into the game (Carter et al 2016). Additionally, it is possible to purchase character progression from others with enough wealth. As such, wealth could be considered a more accurate indicator of progression in *EVE Online*.

This paper will explore the distribution of wealth in *EVE Online*. One method used is the Gini Index, which is a statistical dispersion used to represent inequality within a group of people (Gini 1921).

This paper will analyze the existence of first-mover advantage in *EVE Online*. The principle of this theoretical concept is that the market participant who is the first entrant into a given market gains a competitive advantage through the control of resources (Grant 2003). Given that a number of the veteran players of *EVE Online* have had a 16 year first-mover advantage compared to new players, have those players been able to capitalize on that advantage? This analysis asks whether the first-mover advantage within *EVE Online* grants veteran players a significant economic edge within the virtual world.

METHODS

Data was collected from *EVE Online*'s Tranquility server on the 26th of July, 2020, through proprietary tools available to the author as an employee of CCP Games. A sample of the data collected can be seen in Table 1.

Player ID	Character Count	Logon Minutes	First Character Create Date	Total ISK	Total Items Value	Total Items Count	Total Wealth
1091490	1	102	2017-11-25	4808	22301	273	27109
5487305	2	645	2014-11-25	1153655	1914754	88645	3068409
291243	1	42	2016-11-16	5000	8547	6	13547

Table 1: A sample of the data collected.

Players

EVE Online can be considered to have several layers of ‘ownership’. A Character is the players representative in the universe of *EVE Online*. It is a character that pilots ships, purchases goods from the market, completes tasks, etc. A character belongs to a user account. Each user account can have up to 3 characters, of which only one can be played at a time.

A player, or real-life person, may own several user accounts, and in fact are encouraged by CCP Games to do so. It provides advantages to the player as it allows them to parallelize operations such as manufacturing. However, the concept of a player is not a game concept and is not strictly defined or enforced. As such, a method to determine players was created; All user accounts with the same email address are considered to be owned by a single player. Those user accounts that did not specify a valid email address¹ are all considered as separate players.

For each player, all characters owned by that player are collated, excluding any banned characters and user accounts. All CCP Games Employee accounts are also excluded as they are used for events or testing and can have items that were created outside normal economy processes. Nor do those items usually enter the general player economy.

For each player, some other basic information was collected:

- The date their first character was created.
- The total logon minutes.
- The number of characters that player has had (including deleted characters).

The dataset was divided into two cohorts:

- All Players: All players who have ever played *EVE Online*.
- Activated Players: Players who have 20 hours (1,200 minutes) or more logged on time.

Wealth is split up into two primary categories:

Money

ISK is stored in a character or corporation wallet. A table was created showing the amount of ISK owned by each owner (character or corporation).

It is important to acknowledge that players can have negative wallet balances. This is by no means the norm and only happens via intervention on the part of Game Masters (GM) removing more money than a character has due to that character being involved

in Real Money Trading (RMT). As such, 0.045486% (n= 4,346) of all players in this dataset have a negative total wealth.

Items

The inventory system of *EVE Online* works on a system of ‘types’. Example types include (but are not limited to):

- Rifter: A spaceship.
- 1MN Afterburner I: A module, when fitted to a ship (such as a Rifter) can increase the speed of the ship when the module is activated.
- Astrahus: A space station, it can be deployed by a player owned ship to create a safe base to operate from.

Each Rifter that exists in *EVE Online* is equivalent to all other Rifters. As such all Rifters have the same value. This is true for all types in *EVE Online*². As such, all types³ belonging to an owner were summed, resulting in an aggregate table with the count of each type owned by each owner.

The value of each type was then determined. It was determined using the following methodology:

1. If the type had ever been traded on *EVE Online*’s Market, the 30-day moving average of the market price for that item as of 26st of July, 2020.
2. If the type is manufacturable by a player, the sum of the market value of the inputs required to manufacture the item is used⁴.
3. If all other methods failed, the item was given a value of 0.

The total number of items the player owned was also collected.

Corporations

Corporations are permanent groupings of characters. They are analogous to guilds in other games such as *World of Warcraft* (Carter et al 2016). Corporations are required for some game functions, such as claiming space or deploying more advanced structures. Corporations therefore can own items and have their own wallets. However, the items and ISK owned by corporations are not available to all members of the corporation. Instead only those who are granted the appropriate permissions by the corporation CEO have access to corporation owned items and ISK.

While I will look at the total value of wealth held in corporations and the distribution of that wealth, this paper does not assign the value of that wealth to any specific player.

Wealth Deciles

For the calculation of wealth deciles, players were ranked according to their total wealth. They were then separated into 10 evenly sized bins. To calculate wealth distribution, the sum of all wealth owned by that bin was divided by the total wealth of the cohort.

Lorenze Curve

Graphs containing a Lorenz curve were generated by ranking the players according to their total wealth. They were then separated into 100 evenly sized bins and the wealth in each bin was summed. A cumulative sum operation was then performed. The percentage of total wealth of each bin cumulative sum then calculated. The resultant data was plotted using Plotly (Plotly 2015).

Relationship Evaluation

When examining the relationship between two variables, for example player logon minutes and player wealth, the following procedure was used. All values less than 0 were excluded. All values were then shifted by +1 and finally a log transformation was performed. Trend lines were calculated using linear regression, R-squared and p-values found. The dataset was plotted on a scatter plot and the trend line added.

RESULTS

Player and Corporation Wealth

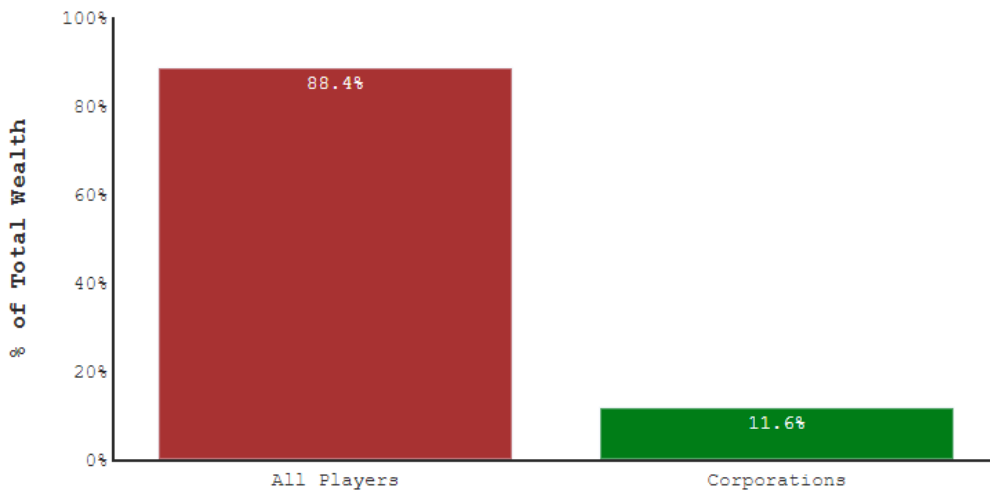


Figure 1: Proportion of wealth belonging to All Players vs Corporations (*EVE Online* 2020-07-26)

Figure 1 shows that players hold most of the wealth in the universe of *EVE Online*, with 15.8 Quadrillion (15,846,803,949,437,939) in assets and items. Corporations on the other hand, hold 2 Quadrillion (2,072,741,955,796,197) in assets and items.

Item and Money Wealth

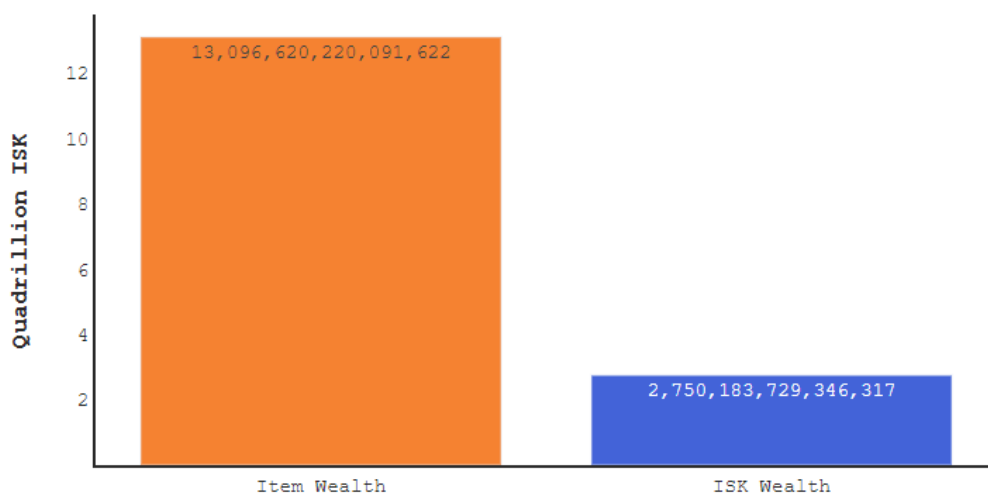


Figure 2: Item and ISK wealth owned by all players (*EVE Online* 2020-07-26)

As seen in figure 2, player wealth is highly concentrated in items with 82.65% (13,096,620,220,091,622 ISK) of all player wealth being in items. This means the average item is worth 754.009 ISK. 17.35% (2,750,183,729,346,317) is made up of ISK.

All Player Wealth Distribution

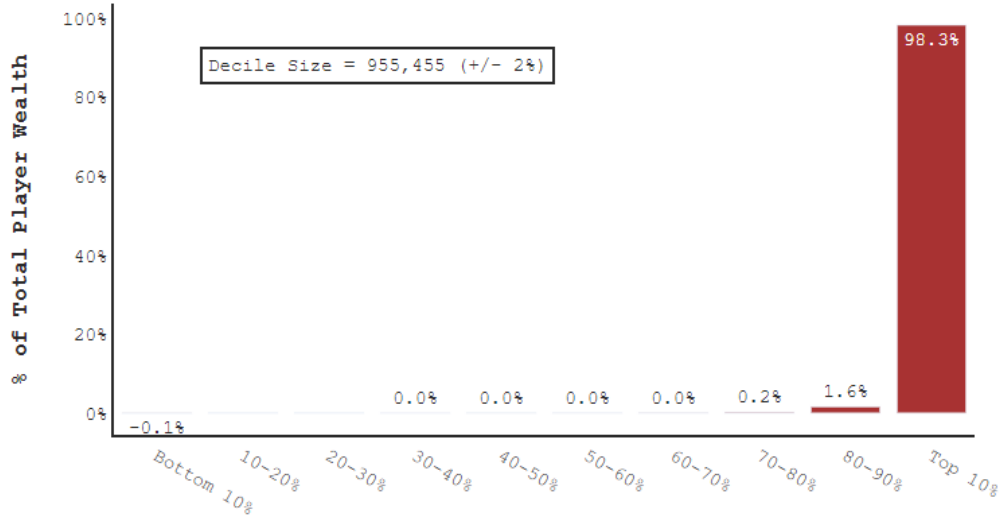


Figure 3: Percentage of Wealth Owned by Decile – All Players (EVE Online 2020-07-26)

For the all players cohort (figure 3), wealth is highly concentrated in the top decile at 98.26% or 15.6 Quadrillion ISK. While the bottom decile has -0.05% of the wealth or -8.485 Trillion ISK.

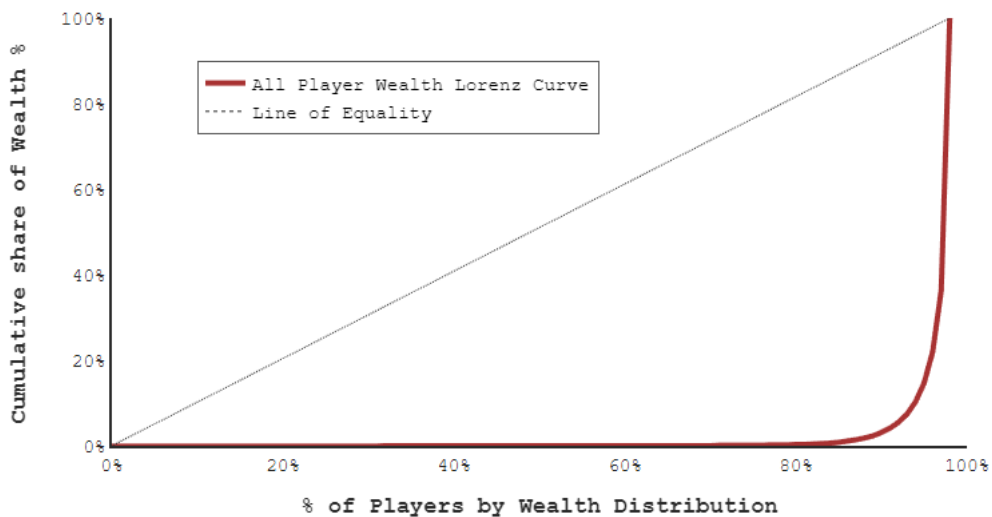


Figure 4: Lorenz Curve for Player Wealth – All Players (EVE Online 2020-07-26)

When plotting the wealth distribution of the all player cohort using a Lorenz Curve (figure 4), we can see just how concentrated the wealth is in the top few percent. The all player cohort has a Gini Coefficient of 0.97, where 0 is perfect equality and 1 is perfect inequality.

Activated Player Wealth Distribution

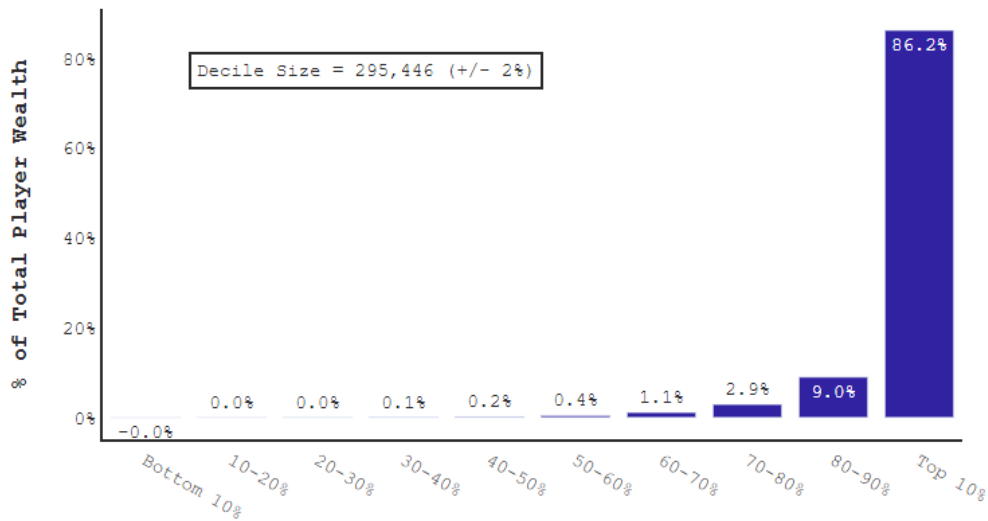


Figure 5: Percentage of Wealth Owned by Decile – Activated Players (*EVE Online* 2020-07-26)

When only looking at activated players cohort (figure 5), the distribution is less extreme. The top decile has 85.34% (13.4 Quadrillion ISK) of the total wealth of the cohort. The second top decile has 9.41% (1.48 Quadrillion ISK). While the bottom Cohort has -0.04% (6.4 Trillion ISK).

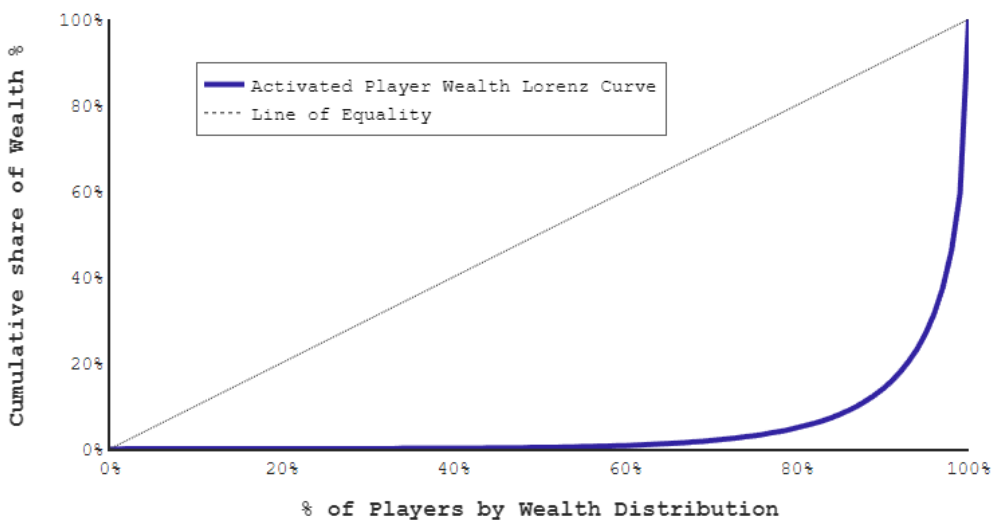


Figure 6: Lorenz Curve for Player Wealth – Activated Players (*EVE Online* 2020-07-26)

The activated player cohort has a wider distribution of wealth (figure 6) when compared to the all player cohort (figure 4). However, wealth is still largely concentrated in the top 10-20%. The Gini Coefficient for Activated Players of 0.90, where 0 is perfect equality and 1 is perfect inequality.

Relationship between Player Wealth and Logon Time

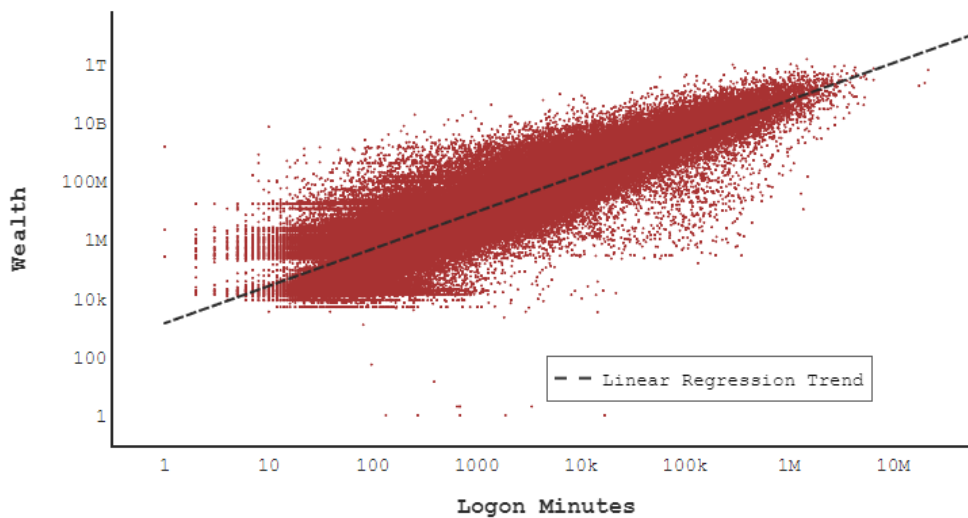


Figure 7: Relationship between Logon Minutes and Wealth for All Players (plot of random sample (n=200,000), axis log transformed) (*EVE Online* 2020-07-26)

When observing the all player cohort (figure 7), the linear regression line accurately describes the relationship between the independent variable (Logon Minutes) and the dependent variable (Wealth). The parameters of the linear regression model are statistically significant, and the model has a coefficient of determination of 0.799. The underlying relationship between the variables appears to be linear, in that as logon minutes increase, so does total wealth.

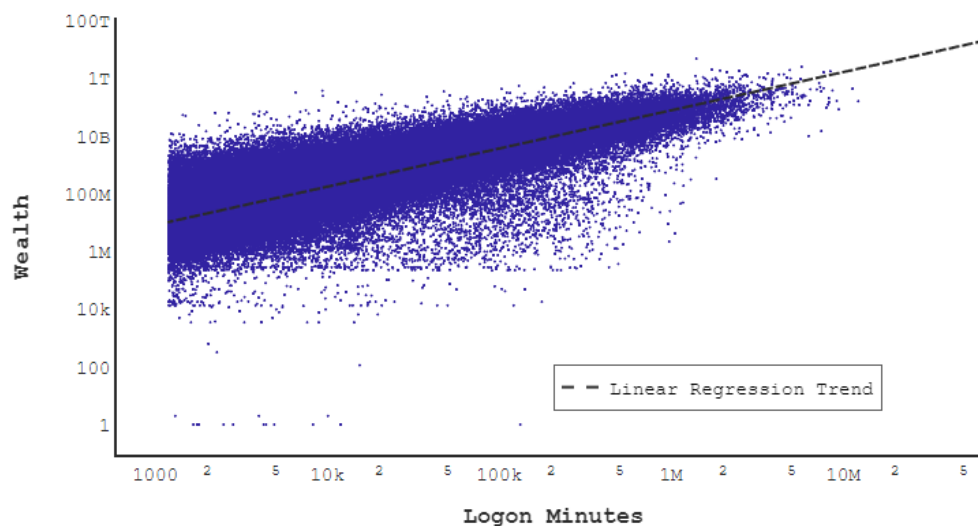


Figure 8: Relationship between Logon Minutes and Wealth for Activated Players (plot of random sample (n=200,000), axis log transformed) (*EVE Online* 2020-07-26)

For the activated player cohort (figure 8), the linear regression line continues to accurately describe the relationship between logon minutes and wealth. The parameters

of the linear regression model are statistically significant, and the model has a coefficient of determination of 0.688. The R^2 is weaker than that of the All Player cohort, but still moderately positive. The underlying relationship between the log-transformed variables appears to be linear.

For both player cohorts, there is strong evidence for a positive relationship between logon minutes and wealth.

Relationship between Player Age and Logon Time

Player age is defined by the number of days since the creation of the players first character.

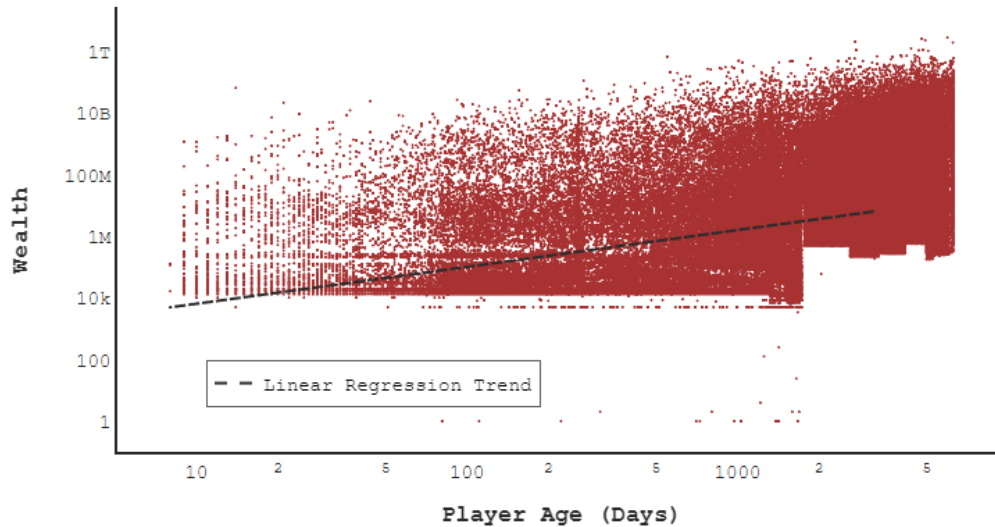


Figure 9: Relationship between Player Age (in days) and Wealth for All Players (plot of random sample (n=200,000), axis log transformed) (*EVE Online* 2020-07-26)

For the All Player cohort (figure 9), the linear regression line does not accurately describe the relationship between player age and wealth. The coefficient of determination ($R^2=0.150$) is small. However, the underlying relationship between the transformed variables appears not to be linear and the correlation coefficient is questionable.

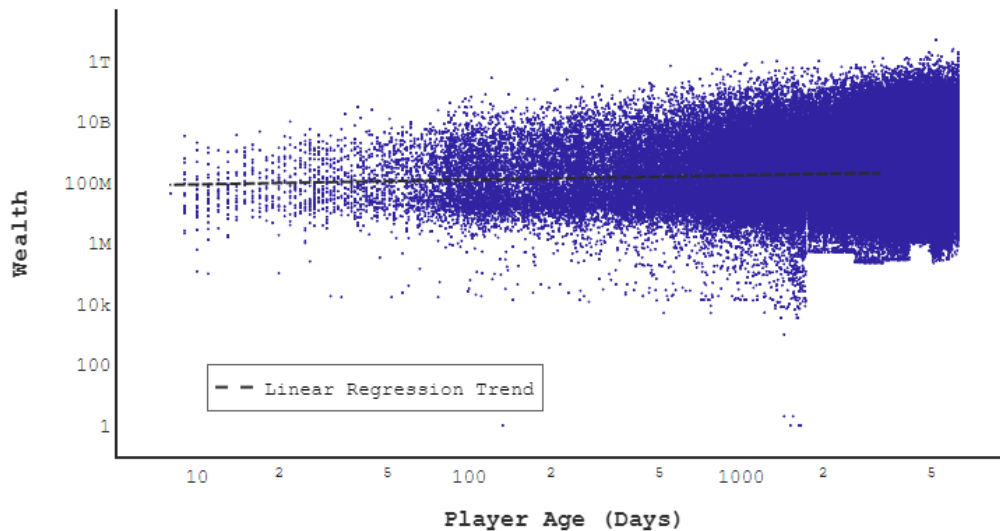


Figure 10: Relationship between Player Age (in days) and Wealth for Activated Players (plot of random sample (n=200,000), axis log transformed) (*EVE Online* 2020-07-26)

For the Activated Player cohort (figure 10), player age does not predict wealth ($R^2=0.002$). As such, there is no clear sign of higher player age leading to higher wealth values for that player.

For both player cohorts, there is no clear sign of player age leading to higher wealth.

DISCUSSION

Wealth Inequality

Wealth in *EVE Online* is highly concentrated. The world has a Gini Index of 88.5 (Credit Suisse 2019). The top decile hold an 81.7% share of the world’s wealth. This is less concentrated than *EVE Online*’s wealth when looking at both the All Player and Activated Player cohorts.

While the economy of *EVE Online* and that of the real-world have many parallels, such as a mostly open market, there are serious issues with directly comparing the two. For example, when a player goes inactive in *EVE Online*, their wealth is generally safe from interference or decay. It can be said that their wealth has been removed from the economy. It does not contribute to economic growth; it does not decay nor is it taxed. It sits in readiness for the player to return to the game.

This is not the case for the ‘real’ world economy. It is rare for wealth to remain static, untouchable, entirely removed from the economy. Upon death, wealth is transferred to a person’s descendants or the state. Additionally, there are other significant differences between the ‘real’ economy and *EVE Online* economy. It has no fractional banking system nor government-backed credit. There is no unemployment in *EVE Online*, nor do characters die without food and houses.

When Vili Lehdonvirta (2010) asks “where does virtual space end and real world begin?” he reminds us that massively-multiplayer online games are not virtual versions of worlds separate from our own, rather that the real-world and virtual-world economic systems can be considered a continuum of each other.

The author cautions the reader from drawing direct parallels between *EVE Online* and the ‘real’ world economy. However, fundamentals do not change (Lehdonvirta and Castronova 2014), and we should take what lessons we can and apply them where appropriate.

Based on the results of this research, it is clear that there are several areas ripe for further investigation.

First-Mover Advantage

Within the game development industry, it is widely assumed and accepted as general knowledge that more established, that is veteran players, have a marked advantage over newer players. In short, online video games strongly favor the first-mover. The first-mover advantage is defined as gaining a competitive advantage through control of resources. However, the weak relationship between the player’s age (days since first character creation) and wealth, suggests that veteran players in *EVE Online* do not maintain their control of resources. This, in turn, strongly suggests that therefore the first-mover advantage does not hold true for *EVE Online*.

Instead, wealth is strongly correlated with the amount of time that the player has invested into the game. Of course, there is a connection between when the player starts playing, and the potential maximum logon minutes that player can have. However, the data disproves that starting earlier gives the player an advantage by exclusively control over resources.

Following the relationship between logon time and wealth for the Activated Player cohort, the median time to get to a median level of wealth, ~141 million ISK, is ~120 hours.

Data Collection Issues

Value

There are a number of classes of types that cannot be traded on the market, nor are they produced via manufacturing. As such, the methodology used to determine value gives these modules a value of 0 while in practice, these items are often quite valuable, sometimes garnering billions of ISK in person-to-person sales.

Additionally, some faction items (such as the Molok, a faction titan-class ship) are incredibly rare. They can be manufactured; however, their player value is determined by the rarity of the blueprints required to manufacture one. They are not generally traded on the market and are instead traded in direct player-to-player trades or contracts. The generally recognized player value for a Molok is ~350 Billion ISK (Zkillboard 2018). While the dataset used the build price, which was 61,383,661,536 ISK.

These deficiencies in determining the value of types results in player value being smaller than it should be. It follows, then, that when these values are accounted for, wealth inequality becomes even more exaggerated between deciles.

Additionally, there are other forms of money that exist in *EVE Online*, such as Loyalty Points that can be spent with NPC factions for rewards (ISK and Items). However, these Loyalty Points were not accounted for in this analysis.

Lastly, a character’s skill points can be extracted and sold for ISK. Therefore, the amount of skill points a character has is a store of wealth. This analysis does not account for this store of value.

Player Specification

The method used for associating characters with a player has some flaws. For one it relies on the player correctly entering and keeping up to date their email address on all their user accounts. Secondly it ignores user accounts that are shared by multiple players.

CONCLUSION

In this paper we have explored virtual world inequality. We have found that wealth in *EVE Online* is largely concentrated in the hands of a minority of players. While *EVE Onlines* economy systems are not commensurable with real-world economic systems it does raise questions about how it effects player behavior, especially in such a competitive game.

We also did not find any strong evidence of a first-mover advantage in *EVE Online*, instead wealth is highly correlated with logon minutes.

The effect of these findings warrants further research. How does wealth concentration and the considerable investment of time required to ‘catch-up’ effect new players behavior? What is the effect on the social systems of *EVE Online* of such wealth disparity?

ACKNOWLEDGEMENTS

This paper would not be possible without the support and guidance of Josh Rivers.

I am also grateful to CCP Games for their continued employment and support to engage in research projects like this.

ENDNOTES

¹ Very simplistically defined as having an ‘@’ symbol.

² Blueprint Copies (BPC) and Abyssal Modules are an exception to this. They are unique and each item contains unique information.

³ Blueprint Copies where not included in the sum of types for a player.

⁴ Ignoring any manufacturing rental costs, and with a 100% researched Blueprint (10% Mineral Efficiency)

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