

Virtual World Order – The Economics and Organization of Virtual Pirates

Carl David Mildenerger – cd@mildenerger.ch

Abstract. This paper investigates how order may emerge in anarchy using a novel empirical approach. It analyzes the predatory and productive interactions of 400,000 users of a virtual world. Virtual worlds are computer-created environments that visually mimic physical spaces, where people interact with each other and with virtual objects in manifold ways. Notably, the paper examines the behavior of users acting as virtual pirates. The paper finds that even in a largely anonymous and anarchic virtual world private rules of order mitigate the most destructive forms of conflict. This is true even though the virtual pirates are found to be conflict-loving rather than conflict-averse. Although the costs of conflict are dramatically reduced in virtual worlds, private rules that limit violence spontaneously emerge. An important part of the paper's contribution is methodological. The analysis of the problem of order in anarchy serves to exemplify the power and usefulness of the new approach.

1 Introduction

To overcome a war of each against all, two escape routes traditionally have offered hope (Brennan and Buchanan 1985). First, to strengthen our moral capacities to cooperate. Re-

duced to a bare minimum, this means relying on the idea that even adversaries always share some mutual interest, in that they strive to reduce the intensity of conflict. People might enjoy the instrumental benefits of conflict, but they still can be conceived of as fundamentally conflict-averse (Tullock 1972; Hirshleifer 1995; Skaperdas 2006). If nobody likes conflict in itself, there is a more peaceful Pareto-superior alternative to the natural distribution, which can be reached by mutual renunciation of conflict (Bush 1972).

Second, spontaneously evolving private rules of order may transform, again as a bare minimum, chaotic anarchy into ordered anarchy (e.g. Schelling 1960; Axelrod 1985). Such rules may emerge where they are least expected, e.g. among agents who engage in conflict for a living, like pirates or prison gangs (Leeson 2007; Leeson 2009a; Skarbek 2011; Skarbek 2010), or among warring hostiles (Leeson 2009b). Although such rules do not eliminate conflict, they regulate the form conflict can take.

The purpose of this paper is to examine the initial steps on both routes out of the Hobbesian jungle in a new environment: a virtual world. Complementing the picture on the possibility of ordered anarchy under adverse conditions, I analyze panel data on the behavior of users acting as virtual pirates and examine the rules they live by. Virtual worlds are computer-created environments that visually mimic complex physical spaces, where people can interact with each other and with virtual objects in manifold ways (Bainbridge 2007). They give rise to sophisticated governance systems and well-developed economies (e.g. Castronova 2001; Castronova 2008; Lastowka and Hunter 2004; Lessig 1999; Ludlow 2001; Mildenberger 2013a). Thanks to collaboration with the developer of a virtual world, the empirical part builds on the logged server data of this virtual world's 400,000 users in January 2011.

I find that virtual pirates regulate how they engage in conflict with private rules designed to eliminate specific kinds of conflict that are not economically viable. This instance of

private order is remarkable, because virtual worlds present a particularly tough environment for spontaneous order to emerge. Virtual pirates are like real pirates or inmates in that they equanimously resort to violence for a living. But first, unlike their real-world counterparts who ultimately can be thought of as conflict-averse (Leeson 2010; Leeson 2007), virtual pirates are found to be *conflict-loving*. In deriving utility from conflict and fighting parties whom they have long-standing hostilities with, virtual pirates are similar to hooligans – a tough real-world case for emergent order (Leeson, Smith, and Snow 2012). In addition, virtual pirates operate in an environment in which the *costs of conflict are dramatically reduced*. For example, unlike hooligans virtual pirates are not potentially subject to legal penalties, nor are they ever bodily harmed.

Still, virtual pirates abide by rules that substitute mutually beneficial exchange for destructive conflict. Although these rules are effective within pirate gangs, attempts to extend their scope to the entire virtual world have failed. Virtual piracy has substantial economic and political consequences. Pirates are responsible for keeping a large region of the virtual world in a state of anarchy.

Given the novel approach, the methodological contribution of this paper is as important as the theoretical. Before exemplifying the approach, I shall discuss its advantages and limitations (Section 2), as well as sketch the political and economic environment of the chosen virtual world (Section 3). Section 4 establishes that virtual pirates are conflict-loving. Section 5 examines the rules virtual pirates live by. Section 6 concludes.

2 Virtual worlds

“Virtual world” is a catchall term for computer-generated environments that exist independently of the user. They are complex both with respect to visual representation and the social dynamics they feature. Users interact by text- or voice-chat, or by controlling their

characters, i.e. their virtual alter egos. Communities of thousands of users evolve in and around virtual worlds.

Virtual-worlds research combines the control of laboratories and the ecological validity of fieldwork (Fiedler and Haruvy 2009). In virtual worlds we can observe everything a user does. The rich data available allows us to zoom in on the phenomenon of interest, controlling for spurious factors, thus raising construct validity to levels usually only seen in experiments. Ecological validity is high as users do not fulfill given tasks but act in a natural habitat. As the virtual world examined is a comparably old one, current events even have a historical context from things that happened years ago (Xander Pheona 2015). A major advantage virtual worlds have over laboratory experiments instituting anarchic settings in particular (e.g. Duffy and Kim 2005; Powell and Wilson 2008; Smith, Skarbek, and Wilson 2012), is that experiments often are not complex enough to produce a situation resembling a true state-of-nature situation (Abbink 2012).

With respect to research on conflict, virtual-worlds research is ethically preferable as it protects human subjects. Neither the researcher nor the subjects endanger themselves. Furthermore, the researcher does not have to engage in the morally questionable practice of incentivizing subjects to fight each other.

Analyzing conflict on the basis of logged server data overcomes the notorious lack of objective evidence due to the chaotic and obscure nature of real-world anarchies. Social desirability bias (in the perpetrator's self reports) is absent, as are reports trying to camouflage feelings of anxiety or embarrassment on the victim's side (Baumeister and Vohs 2005). Propaganda and manipulated statistics do not come into play, nor do historical records written by the winner.

The main limitation of virtual-worlds research lies in its external validity. Notably, one might be worried that virtual world data overstates the prevalence of conflict for various

reasons. But note that in this paper, virtual worlds are studied as an extreme rather than as a representative case (Yin 2014). The goal is not to straightforwardly generalize to other cases or populations, but to complement the literature with a particularly tough case. Thus, external validity is not the main worry. Still, some remarks about threats to external validity for virtual-worlds research are in order.

First, one might worry about selection bias. For the virtual world examined 95.7 per cent of the users are male. This is a high quota, even compared to the average for other virtual worlds of around 85 per cent (Yee 2006). As it is known that young males are the social group most prone to violence, their presence sometimes being described as a necessary condition for civil wars (Laitin 1995), virtual worlds are a tough but highly relevant case for emergent order. The examined virtual world features a smooth age distribution from 12 to 75 years (average age: 31). The users' nationalities are diverse, with the top three being the US (36 per cent), the UK (11 per cent), and Germany (9 per cent). Yee (2006) finds that across virtual worlds, the biggest share of users (around 50 per cent) is full-time employed, with the second largest group being full-time students (around 20 per cent).

As a second threat, anonymity – among subjects and between researcher and subject – is known to raise the potential for violent behavior (e.g. Hoffman et al. 1994; Zimbardo 2005). Given that anonymity increases the importance of local group norms (McKenna and Bargh 2000), and in light of these group norms stressing the need for cunning, caution, mistrust and the legitimacy of violence in the examined virtual world (Mildenberger 2013b), we can expect interactions to be particularly conflict-prone. In general, the fact that in virtual worlds users face more than pure text messages when interacting reduces anonymity (Messinger et al. 2008). However, in the virtual world examined this effect is most likely offset by the fact that users are not predominantly controlling the bodily actions of a per-

son, but are stirring a space ship from a third person perspective. Note that although users are anonymous online as regards their offline lives, they are not anonymous *within* the virtual community as their characters acquire an online reputation.

Thirdly, virtual worlds are low-stakes environments – and low stakes are known to reduce economic motivations (e.g. Slonim and Roth 1998). Although there is an exchange rate between real and virtual currency, and although virtual currencies provide analogous economic incentives, users typically handle only small absolute amounts of money in virtual worlds (Castronova 2001; Castronova 2008; Fiedler and Haruvy 2009). That the costs, say, of destroying virtual objects are low in real-world terms is one factor that contributes to the overall low costs of conflict. However, this also means that the opportunity costs of prosocial behavior are low. For the examined virtual world it has been found that users exhibit higher levels of altruism online than real-world subjects (Mildenberger 2013b).

With respect to stakes, virtual worlds are a paradigm case of experimental realism in contrast to mundane realism (Aronson and Carlsmith 1968). Users are deeply immersed and take the comparably low economic incentives very seriously while logged in. How invested users are is shown by the fact that the average user of the examined virtual world spends 17 hours per week online, for a period of two years (Guðmundsson 2009). When a user devotes 17 hours per week – over a period of two years, paying a monthly subscription fee – we can be sure that he *does* care about how well he performs relative to the incentives and payoffs present in the virtual world, and in comparison to others. Given the immense opportunity costs of the *real* temporal investment, it would be presumptuous and un-economical to assume that users are “just playing around” in virtual worlds.

The fourth threat is that online behavior might have little in common with offline behavior. It is likely that users take virtual conflict less seriously than real conflict, and thus engage more readily in it. For instance, there are neither legal penalties nor bodily harm

associated to virtual fighting. Still, Slater et al. (2006) find that our natural inhibition to harm others transfers to online interactions. We cannot harm a character without this triggering unpleasant stress reactions.¹ Whitty et al. (2011) find that we shy at breaking real-world taboos (like rape) in virtual worlds.

A lot of evidence supports the idea that a person's online behavior is not substantially different from her offline behavior. There are strong correlations between real-world personality traits and behavior in virtual worlds (e.g. Peng, Liu, and Mou 2008; Worth and Book 2014; Yee et al. 2011). People who are prone to help others in real life are also prone to do so online. Aas et al. (2010) find that if users complete personality questionnaires for themselves and their characters, there are no significant differences between the two. Even unconscious behavioral regularities, e.g. that male-male dyads choose a higher interpersonal distance than female-female dyads, transfer to virtual worlds (Yee et al. 2007). If there are behavioral differences, some of them come down to us being *more* ourselves online (Bargh, McKenna, and Fitzsimons 2002; McKenna and Bargh 2000). Or to virtual environments eliciting latent character traits, like everyday sadism, that also show up in similarly anonymous or institutionally weak settings in the real world (Buckels, Jones, and Paulhus 2013; Buckels, Trapnell, and Paulhus 2014).

Note that in comparison to other methods virtual-worlds research minimizes biases affecting reliability. Virtual-worlds research features a high degree of inter-observer consistency. As the software automatically gathers the observational data, every researcher is confronted with the same data. As subjects in virtual worlds are in their natural habitat and

¹ There is anecdotal evidence of such effects in the virtual world examined. A developer describes his first virtual kill as follows (Hreiðarsson, personal communication, 2010). "I remember when I killed another guy [online] for the first time. I sat there with my hands shaking asking myself: 'What have I done? What have I done?' My hair standing, I was cold, it was horrible. I was thinking I am really a bad person."

unaware of being observed, they are not prone to testing biases of any kind. For the same reasons, reactivity effects play no role. Finally, observer effects are excluded. As the researcher uses already existing data, his personal characteristics cannot influence its reliability.

3 EVE Online

This paper examines the virtual world of “EVE Online” (EVE). EVE was published by *CCP Games* in May 2003. It is a science-fiction themed world. Users navigate a space ship through a vast, three-dimensional universe. The main task is to compete in economic and military ways. Whatever goals you set yourself, you have to earn money to achieve them. You can do so either by violent appropriation or by productive means. In January 2011, EVE had around 400,000 users and an average of around 30,000 concurrent users logged in at any time of the day.

EVE features an almost completely user-run economy. It possesses its own currency, ISK (“InterStellarKredit”). The exchange rate between ISK and EUR in January 2011 was about 1 EUR = 19.5m ISK (Mildenberger 2013b). EVE’s economy is stable, with only mild inflation and deflation (Guðmundsson 2009; Guðmundsson 2010). More than 1m individual trades are effected on EVE’s markets on a daily basis. EVE’s money supply M1 of 445 trillion ISK (23m EUR) may serve as a benchmark for the size of the economy.

EVE’s political environment is tripartite. *High security space* (hisec) resembles a night watchman state. A computer-controlled police actively enforces a basic set of property rights. In *low security space* (lowsec) laws are only passively enforced. In *null security space* (nullsec) full-blooded anarchy reigns. For example, if you destroy the ship of a fellow user in hisec, police forces punish this offense by destroying your ship in return. Additionally, your character’s *security standing* is lowered. If a character’s security standing gets too low, he

is no longer allowed to enter hisec. For the same offense in lowsec, the security standing decrease is the only punishment. In nullsec there are no state-enforced legal rules whatsoever.

The effects of this governance system are manifest. Although more than half of the characters “live” in hisec, more than half of around 320,000 “kills” that happened in EVE in January 2011 took place in nullsec (Figure 1). A *kill* is the destruction of another user’s space ship.

<INSERT FIGURE 1 HERE>

Conflict in EVE takes on two main forms. First, there is *large scale warfare for territory* between formal groups of users called “corporations” or “alliances”. It takes place in nullsec, for nullsec is the only region where users can officially claim territory. Nullsec also features the most resource-rich solar systems. Nullsec is vast but possesses little infrastructure, so it takes the cooperation of a considerable number of users to control territory and to economically profit from it. These user alliances are characterized by a straightforward form of division of labor. Whereas *industrialists* specialize in resource mining, manufacturing, and transport, *warriors* secure the borders and protect the economic operations.

The other main form of conflict is *piracy*. Living as a pirate is a distinct lifestyle. It mainly involves roaming around attacking ships in order to destroy and pillage them. Pirates live off whatever their victims produce and transport. Piracy is mostly executed by individuals or small groups. There are regions where piracy is particularly predominant, namely along the trade routes leading from nullsec to the trade-hubs in hisec. Piracy is the reason why lowsec is conflict-ridden.

4 Virtual piracy

The purpose of this section is to show that, over and above virtual worlds featuring dramatically reduced costs of conflict, they are inhabited by people for whom non-consensual fighting is a source of utility. EVE's pirates are conflict-loving in that they willingly sacrifice monetary considerations for the opportunity to fight other users.

4.1 Data

This part essentially draws on three files made available by *CCP Games*. The first contains information on all kills that happened in January 2011 (Table 1).

<INSERT TABLE 1 HERE>

The second contains information on attributes of all characters in EVE (Table 2).

<INSERT TABLE 2 HERE>

The third contains all the characters' financial transactions in January 2011 (Table 3).

<INSERT TABLE 3 HERE>

Taking these three files together, we can develop an encompassing picture of piracy in EVE.

4.2 Political and macroeconomic effects

In January 2011, 56,236 pirate kills occurred. 5.4 per cent of EVE's active population fell prey to a pirate kill. Pirates were responsible for every fifth kill.

The pirate's main source of income is loot. The total value of loot captured by the around 18,000 pirates amounted to 663 billion ISK (33,000 EUR). Every time a ship is destroyed, only a fraction of the items the victim carried are actually dropped and can be looted. Therefore, the victims lost significantly more than the pirates earned, namely 1.26 trillion ISK worth of cargo (65,000 EUR). Adding the value of the victims' ships and the occasional ship loss by a pirate, we find that overall piracy destroyed virtual capital worth 3.1 trillion ISK (160,000 EUR) in January 2011; 7 per cent of EVE's M1.

This economic effect is not the result of the pirates' efficiency but of the prevalence of piracy. Figure 2 gives the frequency distribution of the amount of loot made. Most of the time, no loot at all is gained.² The median loot value is at 954,318 ISK compared to the mean at 11.8m ISK. Given this data, one might assume that piracy pays off, but only for the most skilled. If this were the case, one should expect only a small number of pirates looting more than the median value. However, 91 per cent of pirates were able to score an above-median-kill at least once.

<INSERT FIGURE 2 HERE>

A theoretical average hourly wage for piracy can be calculated. In January 2011, it amounted to 492,465 ISK (0.03 EUR). Compare this to the hourly wages of mining asteroids or trading (from 10m to 250m ISK for a decently experienced user) (Guðmundsson, personal

² It is possible to identify worthwhile targets beforehand.

communication, 2010).³ This meager pay is common knowledge. As one user puts it, “if someone got into piracy with the idea that they’re gonna get infinitely rich from it, they’re not in the right profession.” (cit. in Mildenerger 2013a).

Mind that the political effects of piracy are dramatic. The entire region of lowsec is a no-go-area hardly suitable for productive purposes. The smallest fraction of users are choosing to live here. At the time of data collection, the developers had already recognized this problem (Guðmundsson, personal communication, 2010). Their dissatisfaction with the status of lowsec has since lead to multiple changes in regulation (e.g. CCP Games 2012; CCP Games 2013).

4.3 Individual effects

In this section, I use panel data to explore the relationship between the choice to act as a pirate and the character’s wealth development. I contend that acting as a pirate leads to a lower growth rate of that character’s online wealth. I show that virtual pirates are not motivated by the short- or long-term material benefits of conflict.

4.3.1 Data

As a proxy for the character’s wealth I use his mean daily cash holdings (in millions of ISK). This does not capture the character’s entire wealth, for which there is no data. Yet, it is to be expected that cash holdings strongly correlate with overall wealth. There is comparative data available as to how a character’s cash holdings develop over time. Figure 3 shows the average holdings as a function of the total login minutes for all characters in EVE.

³ Guðmundsson is *CCP Games*’ chief economist for EVE.

<INSERT FIGURE 3 HERE>

This benchmark provides us with a clear expectation of how wealth should develop. One month of play, on average, translates into 4440 login minutes. In the course of January, a character may advance from the first to the fourth category in Figure 3, or from the fifth to the sixth. Thus, we should also expect an upward trend of a character’s cash holdings in the course of January.

I work with a random sample of characters, but exclusively from the group of characters that fell into the category between 50,000 and 100,000 login minutes. This is because a character’s ability to make money is influenced by his experience level. Also, this excludes new users who have not yet fully understood EVE. We can be confident that users with at least 50,000 login minutes – an equivalent of 347 days since the first login – understand the game mechanics, and notably know how to make money. This also precludes misperceptions about the negative-sum nature of conflict in EVE from blurring the picture.

I use the following classification of characters. If a character has not participated in any kill throughout January, I consider him a *civilian*. Civilians serve as a benchmark as to how much money one can make by purely productive means. If a character killed at least once, he is classified either as a *pirate* or as a *warrior*. I consider those characters pirates who *exclusively participated in lowsec kills*.⁴ If a character has (also) participated in kills that did not take place in lowsec, I consider him a *warrior*.⁵ I create dummy variables accordingly.

⁴ I exclude lowsec kills which are the result of in-group practice fights, kills from known “thunderdome” systems to which users fly when they seek recreational fighting, and kills related to EVE’s *factional warfare* system (cf. EVE University 2015).

⁵ The data analysis reveals that the number of users who engaged in both lowsec and extra-lowsec violence is very small.

Two subdivisions of the group of pirates are examined. The first distinguishes between pirate-characters of users who also possess additional characters on the same account, and pirate-characters that are the user's only character.⁶ The reasoning is that the latter pirates might have to be more economically minded as they cannot easily be cross-financed by the money other characters of the same user make. The proxy is imperfect in that, because of the anonymity of the data, I cannot tell whether a given user might not only have multiple characters on one account, but also a second account with yet more characters. To control for the number of accounts would be an important alternative specification. Users having more than one account could be conceived of as trading off higher monetary cost (for the additional subscription fee) for access to an alternative character who is more potent at cross-financing.⁷

The second subdivision distinguishes between pirates who are not members of dedicated pirate gangs, pirates who are members of "roaming" pirate gangs, and pirates who are members of "settled" pirate gangs that almost exclusively practice *gate-camping* (the shutting down of vital trade routes). This is because dedicated pirate groups can be expected to be more efficient than groups with diverse interests. Also, the practice of gate-camping is believed to be the most profitable pirate tactic. As a proxy, I use the kind of corporation the pirate is a member of. In EVE, those corporations which are not user- but computer-administered never are exclusively dedicated to piracy. Roaming pirate corporations have geographically disparate kills in January 2011; see e.g. "Havoc Violence and Chaos" (2011). Camping pirate corporations are those for which nearly all kills take place in one particular solar system of EVE; see e.g. "Cosmic Encounter" (2011).

⁶ One account holds up to three characters.

⁷ Only one character per account can increase his virtual skills and abilities at a time by training. Two characters on two distinct accounts can be trained simultaneously and thus be developed faster.

I control for the number of kills a character commits. It seems plausible that the more a character engages in conflict, the more substantial the effect on his wealth development will be. First, I control for a character's total number of kills in January 2011. Second, I control for the cumulative number of kills through January. The second measure is time-variant and thus can be integrated into a fixed effects model.

The measurement interval for the panel data is one day. Since playing time is expected to be highly correlated with the growth rate of online wealth, I control for the average login time per day of characters. There is no data available for individual days, but only a historical average for each character.

4.3.2 Empirical methodology

To test whether acting as a pirate affects the online growth of wealth, I estimate the following specification:

$$Balance_{i,t} = \beta_0 + \beta_1 Time + \beta_2 (Time \times Pirate_i) + \beta_3 (Time \times Warrior_i) + \beta_4 X_{i,t} + \alpha_i + \varepsilon_{i,t}$$

Where i indexes characters, t indexes days, $Balance$ is the proxy for the online wealth of the character (logarithm of the mean daily cash balance), T is time in days, $(Time \times Pirate_i)$ is an interaction term that allows to control for the growth of wealth of pirates, $(Time \times Warrior_i)$ is an interaction term that allows to control for the growth of wealth of warriors, X is a vector of controls, and α_i are character fixed effects.

My argument predicts that $\beta_1 > 0$ and that $\beta_2 < \beta_1$. This amounts to a significantly positive growth rate for civilians, whereas wealth increases at a significantly slower pace for pirates. If, in addition, $\beta_3 > \beta_2$ this would constitute evidence that it is the special kind of violence which pirates are opting for that hurts their ability to make money.

As a robustness check, I estimate cross-sectional specifications, and find that the estimations produce similar magnitudes of the effect. This has the further advantage that a cross-sectional model allows to control for time-invariant factors.

4.3.3 Results and discussion

The results are consistent with the argument presented above and are robust to the choice of specification and econometric methodology. In particular, the results hold in panel regressions with character fixed effects, in cross-character ordinary least squares (OLS) regressions, and in regressions featuring different kinds of control variables representing different alternative explanations.

In Table 4, I report the results from the fixed effects regression. As column (1) shows, the amount of cash a character holds is positively correlated with time. It increases at a rate of about 0.27 per cent per day. This growth rate almost doubles for civilians, if we control for whether a certain character is a civilian, pirate or warrior (column (2)). More importantly, regression (2) highlights that there is a significant difference in growth rates of online wealth between civilians and pirates. As the coefficient of the interaction term $Time \times Pirate$ reveals, the pirates' wealth increases at a significantly lower rate than that of civilians. In fact, the pirates growth rate (i.e. $\beta_1 - \beta_2$) only equals to 0.04 per cent per day.

<INSERT TABLE 4 HERE>

The hypothesis that $\beta_3 = \beta_1$ cannot be rejected. Although the warrior's wealth seems to increase at a lower rate than the civilians', this finding is not significant. However, an additional hypothesis test comparing β_2 and β_3 reveals, that the pirates' growth rate is also significantly lower than that of warriors ($F = 2.81, p = 0.0935$).

One factor that typically distinguishes pirates and warriors – and which might underlie the partly inconclusive results for warriors – is that assets owned by corporations as well as non-monetary forms of compensation are likely to play an important role for warriors. For example, whereas pirates typically are expected to be self-sufficient (e.g. Wu Han 2014), warriors are more prone to fly (and lose) ships owned by their alliance; one common way of spending the industrialists' income in an alliance is to finance military operations. In addition, many nullsec user alliances have ship replacement programs for ships lost in defending the territory or operations of an alliance (Dzeeta 2011). Such programs are rare among pirate corporations. However, the details of such institutional differences among corporations are not publically available. And their quantitative influence cannot be controlled for on the basis of the data on individual cash holdings used here.

In regressions (3) and (4), I break down the group of pirates to look at more specific interaction terms. Column (3) differentiates between those pirates which are the user's only character (*Time × Single Character Pirate*), and those which are not (*Time × Multiple Character Pirate*). Only the wealth of the latter grows significantly less than that of civilians. This might suggest that users see piracy as a recreational activity and a form of consumption – rather than as an income-earning profession. The multiple character users switch back and forth between generating and spending money.

Column (4) shows an alternative breakdown. It distinguishes between those pirates who are not members of dedicated pirate gangs (*Time × Non-Dedicated Pirate*), and for those who are between those whose corporations mostly roam around (*Time × Roaming Pirate*) and those whose corporations mainly engage in gate-camping (*Time × Camping Pirate*). Results are inconclusive. This might be because not all pirates in the sample could be clearly identi-

fied as belonging to either group.⁸ In addition, the lack of institutional data as to whether some pirate corporations might be practicing forms of non-monetary compensation hinders an even clearer or alternative subdivision of pirates.

In column (5), I include both time and cumulative kills over time. This allows me to evaluate whether what drives the difference in growth rates is that pirates and warriors, unlike civilians, kill. The costs associated to killing would then be a major factor in explaining the lower growth rate of wealth. It is important to include both time and the cumulative number of kills, since both variables are likely to be highly correlated. Thus, one can only compare their effects by including them simultaneously. As expected, results show that the coefficient for the cumulative number of kills is negative. Yet the variable does not significantly affect the growth of online wealth. Regression (6) features all factors discussed.

One main drawback of the fixed effects model is that we cannot control for time-invariant variables. However, a robust Hausman test as suggested by Cameron and Trivedi (2009, 261–2) reveals that a fixed effects model is indeed appropriate ($F = 16.56$, $p < 0.001$). A pooled or random effects regression would provide inconsistent estimates.

As a solution to this problem, and as a robustness check, I run OLS regressions for the median daily change in cash holdings (in per cent) for January 2011. As an alternative measure for the growth of wealth, this is less precise than the actual daily cash holdings. Yet, because it takes into account all individual daily changes, it still makes use of data for the entire month. This makes it a superior measure to, say, an overall growth rate calculated by using the values for January 1 and January 31. Table 5 reports the results from the OLS regressions.

⁸ The data on the geographic dispersal of kills based on which I categorize the pirate corporations is not available for all corporations.

<INSERT TABLE 5 HERE>

Regression (1) shows that whether a character is a civilian, pirate, or warrior, significantly influences the median daily change in cash holdings. The effects are quantitatively and qualitatively similar to those encountered in the fixed effect regressions. Notably, acting as a pirate significantly affects the median daily change negatively. In contrast to the findings in the fixed effects regression, acting as warrior also has significant but less dramatic negative effects on wealth development for some specifications tested.

Regressions (2) and (3) replicate the subdivision of pirates. As in the fixed effects model, column (2) shows that it is only multiple character pirates whose wealth grows significantly slower. Column (3) shows that unlike pirates outside of dedicated pirate gangs, both roaming and camping pirates do significantly worse than civilians. Indeed, pirates who are members of gate-camping gangs do worst. This is surprising given the common assumption that gate-camping is a highly profitable tactic practiced by economically minded pirates rather than “hobbyist” pirates. A possible explanation is that the tactical advantages of gate-camping are not as pronounced as commonly assumed. In addition to the finding that nearly all pirates were able to loot above the median loot value in January, this is a second hint that piracy *generally* is a low-paying activity. We cannot easily distinguish between “hobbyist” pirates and professional pirates: both groups willingly sacrifice money for their love of conflict. Even the allegedly most economically minded pirates pay for their choice to act as pirates.

As a control, column (4) introduces the total number of kills in the examined period. Column (5) does the same with respect to the average daily login time. In analogy to the fixed effects model, the total number of kills is not able to explain the variance in the growth of online wealth in the OLS regression.

The daily login time significantly influences wealth. The coefficient is positive and substantial. An additional t -Test reveals that the daily login time for pirates is significantly higher than that of civilians ($t = -3.37, p < 0.001$) and warriors ($t = -2.03, p = 0.022$). Thus, pirates are not lazier than civilians or warriors. Quite to the contrary, the way they engage in conflict overcompensates the positive effect of a longer average daily login time. Another t -Test reveals that in spite of their longer daily login time, pirates are unable to generate a higher income than civilians ($t = 1.51, p = 0.065$). Thus, the reason that the online wealth of pirates grows at a slower rate is not that they simply spend more of their income.

4.3.4 Alternative economic explanations

In light of the finding that piracy is not a valid choice of activity in terms of short-run monetary considerations, note that there are no obstacles preventing pirates from switching to more profitable activities. Mildenberger (2013a) shows that acting as a pirate is not an ability-based decision. There is a civilian occupation in EVE which involves fighting, but only against computer-controlled characters (so called *mission-running*). But instead of opting for the profitable fighting of user versus computer, pirates opt for the unprofitable fighting of user versus user.

Note also that fighting against computer-controlled characters tends to be easier than fighting human opponents, and that mission-runners earn more than warriors (Mildenberger 2013a). So it is not the case that less able fighters self-select into piracy, while the most able fighters self-select into protecting industrialists.

Long-term economic considerations do not motivate piracy either. Pirates are not rebels aiming for power (Grossman 1999). They are not fighting to obtain control over resources, for no such valuable resources exist in lowsec (Collier and Hoeffler 2004). Pirates are not cultivating a bad reputation in order to scare away potential attackers (Schelling 1978); in-

stead they lose security standing, are outlawed, and become “free game”. Virtual pirates gain no tactical advantage by a conflict-loving reputation (Leeson 2010): given the game mechanics they never have the chance to take their prize without fighting.

While pirates are not engaging in conflict for economic reasons, why they are conflict-loving cannot be told – although some motivations can be excluded. Ethnic or religious tensions are unheard of in EVE, as users do not reveal their offline identity. Also, pirates do not kill based on personal feelings of revenge or hatred. As a developer of EVE puts it: “There is nothing personal in piracy. They [i.e. the victims] have done nothing to make you [i.e. the pirate] angry” (Eriksen, personal communication, 2010). Pirates are not motivated by the cause of redistributing from the rich to the poor. In fact, pirates are on average more wealthy than their victims (Mildenberger 2013a).⁹

The fact that pirates’ motivations cannot be further scrutinized is not a serious limitation. In order for virtual piracy to constitute a tough case for emergent order, that they *are* conflict-loving is more important than *why*. This is because virtual piracy is a form of non-consensual conflict. Virtual pirates could be like “sadistic” hooligans who enjoy *harming* others (Leeson, Smith, and Snow 2012). But they could also merely enjoy *conflict*, e.g. for recreational reasons as a mostly innocent pastime of normal people (like participating in a boxing match in real life). Either way, piracy poses an obstacle to the emergence of order, because unlike real-world boxers or even hooligans, virtual pirates do not opt for only fighting those who also want to fight. In this, they are like the warring hostiles Leeson (2009b) describes. Think of a real-world boxing club roving around looking for trouble with non-boxers. Because piracy is a form of non-consensual conflict it has substantive

⁹ If it were only poor characters who engaged in piracy, one might reason that it is only those users who do not take the virtual world seriously who engage in conflict. This is not the case with the comparably wealthy pirates.

negative economic and political effects on the social level irrespective of pirates' underlying psychological motivations. As EVE users have it, "lowsec is broken" (Scaurus 2012).

5 Virtual piracy and private rules

Even in an environment as adverse as EVE, and even among pirates with a preference for non-consensual conflict, private rules with the function of substituting mutually beneficial exchange for destructive conflict evolve. The rules governing the ransoming of victims are a virtual world case of spontaneous order.

Holding victims to ransom is an important source of income for notoriously low-earning pirates (Verone 2015). In all militarily one-sided battles pirates might decide to cease fire shortly before the victim's ship is destroyed and demand a ransom for not proceeding. The amount demanded will typically lie below the combined market value of the victim's ship and its cargo (i.e. the victim's negative payoff in case of destruction), but above the value of the loot dropped in case of destruction (i.e. the pirate's positive payoff). Despite some information asymmetries, there typically is room for reaching a mutually beneficial agreement. However, after a ransom has been agreed on and after the victim has paid, the pirate still has the option of dishonoring the ransom by destroying and looting the ship.

Figure 4 presents the typical payoff structure of a ransoming scenario – based on a ship value of 4, a cargo value of 2, an agreed ransom of 3, and a loot value of 1. The victim's choice (as a first mover) is either to pay or not to pay the ransom. The pirate's choice (as second mover) to either destroy or not to destroy.

<INSERT FIGURE 4 HERE>

$[NP, D]$ is the equilibrium in dominant strategies. In an infinitely repeated game, the Pareto-superior cooperative outcome of $[P, ND]$ can be realized if the pirates succeed in convincing their victims that they will honor ransoms – and actually do so. However, the pirates’ assurances are not only undermined by short-term material incentives, but also by the common knowledge that many pirates derive utility from conflict. This factor can be modeled by saying that pirates derive an additional immaterial payoff δ from destroying ships, so that their total payoffs in the case of destruction are $4 + \delta$ (ransom paid) or $1 + \delta$ (no ransom paid), respectively. Destroying a ship after receiving a ransom payment may be particularly psychologically rewarding. As one pirate puts it: “When i get someone to pay me isk then immediately blow them it is the number 1 best feeling of my entire gameplay for that day” (Persifonne 2014). Thus, most users consider it good advice never to pay a ransom (Scaurus 2012).

Theoretically, for some pirates δ might even be sufficiently high to make them prefer $[NP, D]$ to $[P, ND]$. However, most pirates seem to be less conflict-loving than this. They do not want to see one of their few sources of income compromised. In EVE, “honest” pirates despise “dishonest” pirates and try to establish institutions to overcome the threat the latter pose to their business.

Honest pirates produce guides to piracy that stress that ransoms should be honored (Verone 2015). Similarly, whenever there is talk of dishonoring ransoms in forums, honest pirates may intervene and explain the mechanics of the “ransom market” (Adira Nictor 2014). This might be dismissed as cheap talk, though. A more credible strategy is to publicly “name and shame” dishonest pirates. Lists of known honest and dishonest pirates circulate (e.g. RedSplat 2009), and there are recurrent forum posts about incidents of dishonored ransoms naming the pirate involved (e.g. Kavez Vek 2012; Syrias Bizniz 2013).

However, by far the most important tool are the codes of conduct honest pirates groups follow, as they encompass rules to honor ransoms (e.g. “The Tuskers” (Ka Jolo 2010; Ka Jolo 2013), “The Bastards” (The Bastards 2007), “the united.” (Mag’s 2014)). On the one hand, these codes make the terms of engagement for correct ransoming explicit.

The Tuskers honor ransoms. ... Please note that just because you pay ISK to a Tusker, we are not obligated to let you go. We are only obligated to do what we say we will do according to the terms offered. If you pay a “ransom” that is not demanded, the Tusker may elect to keep the ISK as a no-strings gesture of goodwill. If you pay the specified ransom, but break one of the terms, your ship and/or capsule may be destroyed. Here are some examples of “terms” that may go with a ransom demand:

- You must cease firing upon your attackers. ...
- You must pay within a specified time period.
- You are only “safe” for a specified time period.
- You are only “safe” while taking specified actions (e.g. leaving the system) (Ka Jolo 2010)

The codes do not forbid the violence necessary to enter a ransoming scenario (Wu Han 2014). Similarly, they often cite exceptions in which killing the victim once a ransom has been agreed on is allowed, e.g. when a number of ships suddenly appears in the solar system (a potential rescue mission) (Verone 2015). That is, the codes regulate violence rather than to eliminate it.

On the other hand, the codes outline how violations will be punished. Typically, if a ransom was dishonored by accident, the pirates will apologize and reimburse the victim. “My gang refunded a 1 billion ISK ransom ... tonight because someone in gang screwed up and mislicked. ... 200 mil each is a small price to pay to retain our reputation.” (Valleria Darkmoon 2012).

Yet, if a member of an honest pirate group intentionally dishonors a ransom, he usually is excluded from the group (e.g. Wu Han 2014; Ka Jolo 2010). The leaders of honest pirate gangs explicitly ask victims to report such incidents (RedSplat 2009).

Finally, if certain pirates repeatedly dishonor ransoms, a joint action of honest pirate groups may be initiated.

There are some who will take your money and then gleefully blow you up. Take their names down and post it on various forums and discussion groups. Reputations do matter and a pirate corp with a reputation for going back on their word will see their ransom income shrink. Other pirate corporations (interested in maintaining the “honour” of piracy) might feel compelled to intervene. (Wu Han 2014)

Honest pirate gangs explicitly require candidates for recruitment to acknowledge that they have read the code and will abide by it for the time of their membership (Ka Jolo 2008; The Bastards 2007).

Among honest pirates, codes of conduct are an effective means to regulate conflict and counter overbearing conflict-lovingness. The penalty of exclusion from a gang is severe. Especially as it is foremost the renowned and successful pirate gangs who establish codes of conduct. Competition for membership in these gangs is intense, and recruiters tend to ask members of the pirate’s former gang for his reputation.

However, the effectiveness of codes has its limits. Honest pirates have failed to make outsiders honor ransoms to a larger extent. The “Golden Age of Piracy”, when victims regularly paid ransoms because they knew they were generally honored, did exist in the early days of EVE but is now over, as general opinion has it (Ginseng Jita 2012).

A second piece of evidence to this effect is the breakdown of a third-party service for securing the compliance with agreed ransoms. In 2012, the “Tuskers” announced they

would establish a service making honoring ransoms easier by addressing the problem of trust between victim and pirate (Jaxley 2012). Instead of the victim directly paying the ransoming pirate, the victim pays the ransom (plus a small fee) to a member of the “Tuskers”, who only forwards the ransom to the acting pirate once the victim announces he has escaped safely. The launch of this service was widely acclaimed by the pirate community. Still, the service eventually broke down for reasons already predicted at the time of its launch (Jaxley 2012).

First, reputation only travels so far. Although the “Tuskers” are widely known, they were not as well known as for every victim to associate their name to trustworthiness with respect to ransoms. Second, there is competition between rivaling private gangs. Other gangs were unwilling to assist the “Tuskers” in making money – or to acknowledge the “Tuskers” as more trustworthy than themselves. Third, for many users “honest pirate” remains an oxymoron. They emphasize that they consider it good advice never to trust any member of a social group who robs others for a living and who is known for being conflict-loving. This is what distinguishes the failed third-party ransoming service from functioning third-party assurances in other markets, e.g. the particularly famous service operated by the user ‘Chribba’ (Westhorpe 2013). Not only are those users who run such services successfully exceptionally widely known and even more notoriously trustworthy.¹⁰ But also their reputation of being trustworthy is not undermined by how they earn their living. ‘Chribba’, for instance, is EVE’s most famous civilian miner.

Clearly, a “state-enforced” ransoming mechanism operated by the one ultimately dominant and universally known organization in EVE, *CCP Games*, could overcome these problems and allow to significantly raise the number of ransoms honored. This is why there are

¹⁰ If asked for important unwritten laws in EVE, developers reply: “Chribba can be trusted.” (e.g. Eriksen, Hreiðarsson, Kjarval, personal communication, 2010).

recurrent demands from the pirate community to implement a public rule to this effect (Mag's 2014).

6 Conclusion

If building on the human aversion to conflict and following private rules of order are two important escape routes out of the Hobbesian jungle, this paper finds that we should probably put less trust than one might think on the former and even more than already known on the latter.

Virtual pirates are not conflict-averse but conflict-loving. They are the proverbial “few bad apples” that keep an entire region trapped in anarchy. Now, given the very low costs of conflict in virtual worlds, we cannot easily generalize from their conflict-lovingness to other agents or settings. For instance, it is difficult to argue that virtual pirates are similar to those small random groups of people who are responsible for a recurring mixture of organized crime, high murder rates, and low-intensity conflicts which keeps many underdeveloped countries in a “violence trap” (The World Bank 2011). Given that real-world conflict-ridden regions are in important ways similar to EVE, low conflict-aversion or even conflict-lovingness might be a factor to reckon with in real life.¹¹ Thus, it is certainly better to avail of the virtual evidence rather than not. Ultimately, though, the unusually low costs of virtual conflict disallow most generalizations.

Yet, precisely because virtual worlds are an extremely conflict-prone environment, the paper's analysis of virtual piracy serves to corroborate the finding that spontaneously emerging private rules of order may help to overcome a Hobbesian war of each against all – even in very adverse conditions. Virtual pirate gangs use violence to earn a living. They

¹¹ I am notably thinking of low opportunity costs of conflict, the institutionally weak environment, and a high number of readily available young males.

are in a constant state of war with everybody else. They derive utility from non-consensual conflict. And the costs of conflict they face are very low. Still, they uphold rules that have the function of substituting mutually beneficial exchange for destructive conflict. And they make efforts to expand them to the entire universe.

References

- Aas, Benjamin Gregor, Katharina Meyerbröker, and Paul M G Emmelkamp. 2010. 'Who Am I - and If So, Where? A Study on Personality in Virtual Realities.' *Journal of Virtual Worlds Research* 2 (5).
<https://journals.tdl.org/jvwr/article/view/776/708>.
- Abbink, Klaus. 2012. 'Laboratory Experiments on Conflict.' In *The Oxford Handbook of the Economics of Peace and Conflict*, edited by Michelle R Garfinkel and Stergios Skaperdas, 532–56. Oxford: Oxford University Press.
- Adira Nictor. 2014. 'How Does Dishonoring Ransoms Make You Feel?' *EVE Forums - General Discussion*.
<https://forums.eveonline.com/default.aspx?g=posts&t=384993&p=3>.
- Aronson, Elliot, and J Merrill Carlsmith. 1968. 'Experimentation in Social Psychology.' In *The Handbook of Social Psychology*, edited by G Lindzey and Elliot Aronson. Reading, MA: Addison-Wesley.
- Axelrod, Robert. 1985. *The Evolution of Cooperation*. New York: Basic Books.
- Bainbridge, William Sims. 2007. 'The Scientific Research Potential of Virtual Worlds.' *Science* 317: 472–76.
- Bargh, John A, Katelyn Y A McKenna, and Grainne M Fitzsimons. 2002. 'Can You See the Real Me? Activation and Expression of the "True Self" on the Internet'. *Journal of Social Issues* 58 (1): 33–48.
- Baumeister, Roy F., and Kathleen D. Vohs. 2005. 'Four Roots of Evil.' In *The Social Psychology of Good and Evil*, edited by Arthur G. Miller, 85–101. New York: The Guilford Press.
- Brennan, Geoffrey, and James M Buchanan. 1985. *The Reason of Rules*. Cambridge: Cambridge University Press.
- Buckels, Erin E, Daniel N Jones, and Delroy L Paulhus. 2013. 'Behavioral Confirmation of Everyday Sadism.' *Psychological Science* 24 (11): 2201–9.
- Buckels, Erin E, Paul D Trapnell, and Delroy L Paulhus. 2014. 'Trolls Just Want to Have Fun.' *Personality and Individual Differences* 67: 97–102.

- Bush, Winston. 1972. 'Individual Welfare in Anarchy.' In *Explorations in the Theory of Anarchy*, edited by Gordon Tullock, 5–18. Blacksburg: Center for Study of Public Choice.
- Cameron, A Colin, and Pravin K Trivedi. 2009. *Microeconometrics Using Stata*. College Station: Stata Press.
- Castronova, Edward. 2001. 'Virtual Worlds: A First Hand Account of Market and Society on the Cyberian Frontier.' *CEISifo Working Paper* 618: 1–41.
- . 2008. 'A Test of the Law of Demand in Virtual World: Exploring the Petri-Dish Approach to Social Sciences.' *CEISifo Working Paper* 2355: 1–23.
- CCP Games. 2012. 'Introducing the New and Improved Crimewatch.' *EVE Community - Dev Blogs*. April 10. <http://community.eveonline.com/news/dev-blogs/73443>.
- . 2013. 'WantToTrade: Tags for Security Status.' *EVE Community - Dev Blogs*. May 2. <http://community.eveonline.com/news/dev-blogs/wanttotrade-tags-for-security-status/>.
- Collier, Paul, and Anke Hoeffler. 2004. 'Greed and Grievance in Civil Wars.' *Oxford Economic Papers* 56 (4): 563–95.
- Cosmic Encounter. 2011. 'Corporation Details - Cosmic Encounter [QPIC] - January 2011.' *EVE-Kill.net*. https://eve-kill.net/?a=corp_detail&crp_id=49520&view=violent_systems&m=01&cy=2011.
- Duffy, John, and Minseong Kim. 2005. 'Anarchy in the Laboratory (and the Role of the State).' *Journal of Economic Behavior and Organization* 56: 297–329.
- Dzeeta. 2011. 'Working Ship Replacement Programs.' *EVE Forums - General Discussion*. <http://oldforums.eveonline.com/?a=topic&threadID=1502844>.
- EVE University. 2015. 'Factional Warfare.' *UniWiki*. http://wiki.eveuniversity.org/Factional_Warfare.
- Fiedler, Marina, and Ernan Haruvy. 2009. 'The Lab versus the Virtual Lab and Virtual Field - An Experimental Investigation of Trust Games with Communication.' *Journal of Economic Behavior and Organization* 72: 716–24.
- Ginseng Jita. 2012. 'The Golden Age of Piracy.' *EVE Forums - General Discussion*. <https://forums.eveonline.com/default.aspx?g=posts&t=114655>.
- Grossman, Herschel I. 1999. 'Kleptocracy and Revolutions.' *Oxford Economic Papers* 51: 267–83.
- Guðmundsson, Eyjólfur. 2009. 'Quarterly Economic Newsletter - EVE Online 2nd Quarter 2009.' <http://www.eveonline.com/devblog.asp?a=blog&bid=686>.
- . 2010. 'Quarterly Economic Newsletter - EVE Online 2nd Quarter 2010.' <http://www.eveonline.com/devblog.asp?a=blog&bid=780>.

- Havoc Violence and Chaos. 2011. 'Corporation Details - Havoc Violence and Chaos [-HVC-] - January 2011.' *EVE-Kill.net*. http://eve-kill.net/?a=corp_detail&crp_id=9123&view=violent_systems&m=01&y=2011.
- Hirshleifer, Jack. 1995. 'Anarchy and Its Breakdown.' *Journal of Political Economy* 103 (1): 26–52.
- Hoffman, Elizabeth, Kevin McCabe, Keith Shachat, and Vernon Smith. 1994. 'Preferences, Property Rights and Anonymity in Bargaining Games.' *Games and Economic Behavior* 7: 346–80.
- Jaxley. 2012. 'Tuskers Announcing Third Party Ransom Service.' *EVE Forums - Crime & Punishment*.
<https://forums.eveonline.com/default.aspx?g=posts&t=135454>.
- Ka Jolo. 2008. 'How to Apply to the Tuskers.' *The Tuskers*. <http://www.the-tuskers.com/forum/viewtopic.php?f=2&t=2>.
- . 2010. 'The Tuskers Honor Ransoms.' *The Tuskers*. <http://www.the-tuskers.com/forum/viewtopic.php?f=35&t=1599>.
- . 2013. 'The Tusker Code.' *The Tuskers*. <http://www.the-tuskers.info/viewtopic.php?f=3&t=63>.
- Kavez Vek. 2012. 'Ransom Unhonored.' *EVE Forums - Crime & Punishment*.
<https://forums.eveonline.com/default.aspx?g=posts&t=75754>.
- Laitin, David. 1995. 'National Revivals and Violence.' *Archives Européennes de Sociologie* 36 (1): 3–43.
- Lastowka, F Gregory, and Dan Hunter. 2004. 'The Laws of Virtual Worlds.' *California Law Review* 92 (1): 3–73.
- Leeson, Peter T. 2007. 'An-Arrgh-Chy: The Law and Economics of Pirate Organization.' *Journal of Political Economy* 115 (6): 1049–94.
- . 2009a. 'The Calculus of Piratical Consent: The Myth of the Myth of Social Contract.' *Public Choice* 139 (3-4): 443–59.
- . 2009b. 'The Laws of Lawlessness.' *Journal of Legal Studies* 38: 471–503.
- . 2010. 'Pirational Choice: The Economics of Infamous Pirate Practices.' *Journal of Economic Behavior and Organization* 76 (3): 497–510.
- Leeson, Peter T, Daniel J Smith, and Nicholas A Snow. 2012. 'Hooligans.' *Revue D'économie Politique* 122 (2): 213–31.
- Lessig, Lawrence. 1999. *Code and Other Laws of Cyberspace*. New York: Basic Books.
- Ludlow, Peter. 2001. 'New Foundations: On the Emergence of Sovereign Cyberstates and Their Governance Structures.' In *Crypto Anarchy, Cyberstates, and Pirate Utopias*, edited by Peter Ludlow, 1–23. Cambridge, MA: The MIT Press.

- Mag's. 2014. 'Ransoming.' *EVE Forums - Features & Ideas Discussion*.
<https://forums.eveonline.com/default.aspx?g=posts&m=4989253>.
- McKenna, Katelyn Y A, and John A Bargh. 2000. 'Plan 9 From Cyberspace: The Implications of the Internet for Personality and Social Psychology.' *Personality and Social Psychology Review* 4 (1): 57–75.
- Messinger, Paul R, Xin Ge, Eleni Stroulia, Kelly Lyons, Kristen Smirnov, and Michael Bone. 2008. 'On the Relationship between My Avatar and Myself.' *Journal of Virtual Worlds Research* 1 (2).
<https://journals.tdl.org/jvwr/article/view/352/263>.
- Mildenberger, Carl David. 2013a. *Economics and Social Conflict*. Basingstoke: Palgrave Macmillan.
- . 2013b. 'The Constitutional Political Economy of Virtual Worlds.' *Constitutional Political Economy* 24 (3): 239–64.
- Peng, Wei, Ming Liu, and Yi Mou. 2008. 'Do Aggressive People Play Violent Computer Games in a More Aggressive Way? Individual Difference and Idiosyncratic Game-Playing Experience.' *CyberPsychology & Behavior* 11: 157–61.
- Persifonne. 2014. 'How Does Dishonoring Ransoms Make You Feel?' *EVE Forums - General Discussion*.
<https://forums.eveonline.com/default.aspx?g=posts&t=384993>.
- Powell, Benjamin, and Bart J Wilson. 2008. 'An Experimental Investigation of Hobbesian Jungles.' *Journal of Economic Behavior and Organization* 66: 669–86.
- RedSplat. 2009. 'Ransom List.' *EVE Forums - Crime & Punishment*.
<http://oldforums.eveonline.com/?a=topic&threadID=999677>.
- Scaurus, Marc. 2012. 'A Lack of Vision: Lowsec.' *The Mittani*. September 10.
<https://www.themittani.com/features/lack-vision-lowsec>.
- Schelling, Thomas C. 1960. *The Strategy of Conflict*. London: Oxford University Press.
- . 1978. 'Altruism, Meanness, and Other Potentially Strategic Behaviors.' *American Economic Review* 68 (2): 229–30.
- Skaperdas, Stergios. 2006. 'Anarchy.' In *The Oxford Handbook of Political Economy*, edited by Barry R Weingast and Donald A Wittman, 881–98. Oxford: Oxford University Press.
- Skarbek, David B. 2010. 'Putting the "Con" into Constitutions: The Economics of Prison Gangs.' *The Journal of Law, Economics, & Organization* 26 (2): 183–211.
- . 2011. 'Governance and Prison Gangs.' *American Political Science Review* 105 (4): 702–16.

- Slater, Mel, Angus Antley, Adam Davison, David Swapp, Christoph Guger, Chris Barker, Nancy Pistrang, and Maria V. Sanchez-Vives. 2006. 'A Virtual Reprise of the Stanley Milgram Obedience Experiments.' *PLoS ONE* 1 (1). doi:10.1371/journal.pone.0000039.
- Slonim, Robert L, and Alvin E Roth. 1998. 'Learning in High Stakes Ultimatum Games: An Experiment in the Slovak Republic.' *Economics of Governance* 66: 569–96.
- Smith, Adam C, David B Skarbek, and Bart J Wilson. 2012. 'Anarchy, Groups, and Conflict: An Experiment on the Emergence of Protective Associations.' *Social Choice & Welfare* 38 (2): 325–53.
- Syrías Bizniz. 2013. 'Naming and Shaming - Saji'us Does Not Honor Ransoms.' *EVE Forums - Crime & Punishment*. <https://forums.eveonline.com/default.aspx?g=posts&m=3403210>.
- The Bastards. 2007. 'The Bastards Ransom Policy.' *The Bastards*. <http://www.the-bastards.net/ransomboard/index.php?p=policy>.
- The World Bank. 2011. *World Development Report 2011. Conflict, Security, and Development*. Washington DC. <http://wdr2011.worldbank.org/fulltext>.
- Tullock, Gordon, ed. 1972. *Explorations in the Theory of Anarchy*. Blacksburg: Center for Study of Public Choice.
- Valleria Darkmoon. 2012. 'Ransom Unhonored.' *EVE Forums - Crime & Punishment*. <https://forums.eveonline.com/default.aspx?g=posts&t=75754&p=3>.
- Verone. 2015. 'Piracy Guide.' *EVElopedia*. https://wiki.eveonline.com/en/wiki/Piracy_guide.
- Westhorpe, Mat. 2013. 'EVE Player Celebrities - The Icon: Chribba.' *Gameskinny*. July 15. <http://www.gameskinny.com/34krz/eve-player-celebrities-the-icon-chribba>.
- Whitty, Monica T, Garry Young, and Lewis Goodings. 2011. 'What I Won't Do in Pixels: Examining the Limits of Taboo Violation in MMORPGs.' *Computers in Human Behavior* 27: 268–75.
- Worth, Narnia C, and Angela S Book. 2014. 'Personality and Behavior in a Massively Multiplayer Online Role-Playing Game.' *Computers in Human Behavior* 38: 322–30.
- Wu Han. 2014. 'The Bastards.' *EVElopedia*. [https://wiki.eveonline.com/en/wiki/The_Bastards_\(Player_corporation\)](https://wiki.eveonline.com/en/wiki/The_Bastards_(Player_corporation)).
- Xander Pheona. 2015. 'EVE Online - The Players.' *EVE Online*. <http://www.eveonline.com/>.
- Yee, Nick. 2006. 'The Demographics, Motivations, and Derived Experiences of Users of Massively Multi-User Online Graphical Environments.' *Presence: Teleoperators and Virtual Environments* 15: 309–29.

- Yee, Nick, Jeremy N Bailenson, Mark Urbanek, Francis Chang, and Dan Merget. 2007. 'The Unbearable Likeness of Being Digital: The Persistence of Nonverbal Social Norms in Online Virtual Environments.' *CyberPsychology & Behavior* 10 (1): 115–21.
- Yee, Nick, Helen Harris, Maria Jabon, and Jeremy N Bailenson. 2011. 'The Expression of Personality in Virtual Worlds.' *Social Psychology and Personality Science* 2: 5–12.
- Yin, Robert K. 2014. *Case Study Research*. 5th ed. Los Angeles: SAGE.
- Zimbardo, Philip G. 2005. 'A Situationist Perspective on the Psychology of Evil - Understanding How Good People Are Transformed into Perpetrators.' In *The Social Psychology of Good and Evil*, edited by Arthur G. Miller, 21–50. New York: The Guilford Press.