

**Razing the virtual glass ceiling:
Gendered economic disparity in two massive online games¹**

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Abstract

Research has consistently shown a gap between male and female income earners. Explanations have been found in social expectations and mechanisms relating to gender roles. In this paper, we investigate what happens to gendered economic disparity when those mechanisms are removed. We examine wealth creation within the virtual economies of two massively-multiplayer online games (MMOs)—environments where gender cues are malleable and meritocracy trumps identity—in the first study on economic disparity within multiple MMOs. Observed measures of player behavior indicate that player sex and character gender have a statistically significant relationship with virtual wealth, but in practice the effect is very small. While further research is needed on observed gender differences in play styles and motivations in virtual environments, the present results support an optimistic argument: as workplaces turn increasingly virtual, obfuscating physical gender cues and traditional allocation mechanisms, gendered economic disparity in society is likely reduced.

Determinants of economic wellbeing have long been investigated from many angles in the social sciences. One example is the effect that an individual's characteristics, both inherent and acquired, have on income. The characteristics in such studies often include years of schooling, professional status, parents' income, and gender. One finding that is consistent across most economies is that women tend to earn less income and hold less wealth than men (DeNavas-Walt, Proctor, & Smith, 2010; IWPR, 2010; UN, 2005). However, the emergence of new technologically-driven media and environments creates the possibility of work sites where gender cues become less salient, or less observable. As these become more commonplace, it is worth asking whether traditional gender-based disparities will persist. One such setting are so-called "virtual worlds"—play spaces where people's offline identities are often masked or irrelevant, but where behavioral and economic patterns often map to the offline world. This paper tests for gender-based wealth gaps in two different virtual worlds. By examining players' behaviors and linking them with their offline and online identities, the paper will demonstrate that the more egalitarian, meritocratic and effort-based processes within these online games drive who earns what. This suggests that the wealth offline gap appears to be a product of everyday structural inequalities. These results are then discussed in light of predictive gender theories and for their social implications.

The Gender Wealth Gap

Disparities between women and men in national economies exist within both paid and unpaid work. In the paid workplace, structural inequalities such as discriminatory practices (glass ceilings), occupational segregation (pink collar jobs), and devaluing women's skills and performance contribute to lower incomes than men (Bielby & Baron, 1986; Kanter, 1977; Kay & Hagan, 1998; Milkman, 1987; Reskin & McBrier, 2000; Reskin, McBrier, & Kmec, 1999). In the unpaid workplace – the domestic sphere – women are still largely responsible for domestic chores and primary caregivers to children. Because women's careers are structured by familial obligations, they are more likely to have interruptions during their career and work part-time jobs, therefore earning less (Baker & Lero, 1996; Heymann, 2001).

These workplace inequalities are often considered the result of biological sex differences between females and males, but in fact are perpetuated by gender ideologies that deem certain behaviors as appropriately feminine or masculine. Looking at pink-collar jobs, for example, women are considered suitable in occupations such as nurse, teacher, secretary, housekeeper, and so forth because women are feminine: caring, emotional, nurturing, and social (Armstrong & Armstrong, 1993; Morgan, 1998). These occupations not only reflect feminine characteristics and social behaviors, but they are also tied to women's role in the home and the domestic division of labour (Hochschild & Machung, 1989; Shelton & John, 1996). Traditionally, these occupations were considered less important than the kind of work men do (Britton, 2000), and these feminine characteristics that women are said to inherently possess were only suited to some kinds of work – typically not the jobs that men do (Steinberg, 1990). In some workplaces, the presence of women in non-traditional occupations causes inequalities between workers: sexual harassment or ostracizing behaviours create toxic work environments that can lead low job performance, high job turnovers (Cohn, 2000; Reskin & Padavic, 1994), and occupations with few or no women. Conversely, this has implications for men working in non-male-traditional occupations, which can also produce hostile work environments when notions of masculine identity are challenged or

threatened (Cross & Bagilhole, 2002). But in slight contradiction to this, other research points to the advantages men gain in non-traditional jobs, such as expedited promotions, referred to as the glass escalator (Budig, 2002; Evans, 1997; Maume, 1999).

As women's participation in the labor force increased in the 1970s, more women entered non-traditional occupations, showing that women possessed the skills and intellect to succeed at what was deemed 'men's work'. Considerable research argued that gender ideologies surrounding the kinds of work that women and men can do are perpetuated by socially constructed characteristics and behaviours of femininity and masculinity (Acker, 1990; Steinberg, 1990). The ideology of gender that is prevalent throughout all social institutions frames what is expected, allowed, and valued in women and men. This ideology is expressed in what women and men do (roles), how women and men relate to each other (relationships), and how women and men perceive themselves (identities; Goldin, 1994; Walby, 1986). In other words, gendered scripts are different for women and men. They are reinforced throughout the family, education system, workplace, media, and so forth. More importantly, both feminine and masculine behaviours can be practiced or performed by both women and men, which separates these scripts from biological sex (West & Fenstermaker, 1995; Zimmerman, 2001).

Such ideological gender differences are difficult to test empirically because the social institutions that facilitate these gender ideologies are pervasive. A true test would require removing people from their culture and examining them in a controlled setting divorced from these institutions. Online virtual worlds present precisely the kind of social environments that are shielded from many everyday institutions. Participation takes place with an identity that is largely separated from one's workplace identity, often at one's private quarters and on one's own time. Further, the fantastical settings that online games offer encourage people to leave behind their everyday modes of thought. This is not to say that virtual worlds are devoid of their own systems, institutions, and what designers call "game mechanics" (Sellers, 2006) and others call "social architecture" (Lessig, 1999). However, these facets of virtual worlds are driven by the goals of play, which are generally different than the goals of everyday life in two key respects. First, virtual worlds are oriented around achievement and objective measurement, unlike conventional careers, which rarely offer the level playing field that games do. Second, while the physical world is rife with identity-based cues, such cues are malleable within virtual worlds. Crucially, participants are able to choose which gender they appear to be. Thus, using a virtual setting to test for differences in economic outcomes allows us to control for many of the institutional and identity-driven elements we want to filter out. Testing for gender differences in a virtual space will tell us that if disparities do not exist in virtual economies, they are very likely to be driven by social institutions, not biological sex differences. This in turn would suggest that removing such barriers allows for parity, and given the increasing adoption of virtual communication tools for everyday work, hints at a future where such barriers will decline naturally.

The current paper examines such disparities using data from two major virtual economies: the massively-multiplayer online games (MMOs) EVE Online (EVE) and EverQuest II (EQII). Both datasets are unusual in that they consist of behavioural data from thousands of participants in a virtual economy, and combine this with self-reported data on participants' real-world socio-demographic backgrounds. Because of the rarity of these data, this is the first time these datasets have been used together and the

first comparison of two such worlds. Although EVE and EQII do not represent all virtual economies, these samples permit a wide yet focused look into the socio-demographic structuring of both digital and offline economies.

The Virtue of Virtual Economies

In the past ten years there has been an increasing interest in virtual economies. At the outset, Castronova brought attention to the commercial and economic potential of virtual worlds by drawing comparisons between national economies and the Massively Multiplayer Online Game (MMO) EverQuest, in which people traded virtual swords and coins for real money (Castronova, 2001). Other research on virtual economies has followed (e.g., Lehtiniemi, 2009). As the popularity of MMOs has grown, the value of the real-money trade has increased significantly. Lehdonvirta and Ernkvist (2011) estimated that players traded approximately 3.0 billion U.S. dollars' worth of virtual goods between each other in 2009, while game operators sold approximately \$7 billion worth of virtual goods to players. The fact that virtual wealth is convertible to national currency makes the question of gender differences in virtual wealth a "real" issue.

In MMOs, wealth is typically attained through game play (quests, kills) and can be measured by local currency (bank coins), character level (skill, experience points), and inventory (armour, weapons). Although the types of coins, skills and experience points vary between MMOs, the premise of accumulating items or traits as game play rewards (or income) is consistent enough across MMOs to qualify as 'wealth'. MMOs are also social spaces (Book, 2004; Williams, 2006a, 2006b, 2006c; Williams, et al., 2006) with social networks inside and outside the game that structure income and wealth (Lehdonvirta, Wilska, & Johnson, 2009).

While existing MMO research examines wealth from a structural perspective (such as GNP; Castronova 2001), or deviant economic practices by certain groups (such as 'gold farmers'; Heeks, 2010; Keegan, Ahmad, Williams, Srivastava, & Contractor), there is no research about economic disparities in MMOs and where the wealth actually resides within the individual demographics of the players and characters. This is likely because prior research has not been able to marry real-world variables with virtual-world behaviors. Although people are spending an increasing amount of time and even real money within virtual economies (Lehdonvirta, 2005), we know little about whether the gender disparities apparent in national economies also exist in virtual economies. On the one hand, we might expect gender differences in wealth to exist in virtual environments because they exist globally. On the other hand, we might expect that economic disparities between women and men would not exist because virtual economies are structured in ways that eliminate many of the factors underlying gender gaps, such as wage differences. Research on MMOs outside of the economic context suggests that the latter is more likely (Steinkuehler & Williams, 2006).

MMOs represent a different kind of environment than the typical workplace. For example, the structural disparities are not comparable; there are no salary or wage differences per se, no glass ceilings, and no pink-collar jobs. Moreover, people voluntarily immerse themselves in MMOs as a hobby or leisure activity, as a social place to meet people, or just a place to escape the everyday mundane. And further,

they often pay to play. Therefore, the ‘work’ that people need to do in-world to gain wealth clearly has different connotations than work in the physical world. Wealth in MMOs for the most part is meritocratic – one works to earn wealth by levelling, questing, and acquiring experience and skill points. This can often be laborious and repetitive rather than fun or entertaining (Sotamaa, 2007; Steinkuehler & Williams, 2006; Yee, 2008). Productive leisure, or ‘playbour’ (Kücklich, 2005), combines immaterial labour with play and reflects the blurring boundaries between work and leisure in today’s society.

Structurally, MMOs present more equal economic environments for women and men than the physical world; the player’s actions and performance (and time spent playing the game) leads to increased wealth regardless of sex or gender. This is consistent with the notion of online games as a meritocratic, level playing-field in which offline identity characteristics do not influence social interactions in the same way as they do offline (Steinkuehler & Williams, 2006). Players recognize and use this characteristic of MMOs to their benefit, sometimes intentionally masking cues that could otherwise lead to discrimination (Williams, Kennedy, & Moore, 2010). Further, a controlled field experiment on an MMO found that the removal of voice cues, for which humans readily encode gender information (Nass & Gong, 2000), reduced discrimination among players, while the reintroduction of these cues increased discrimination (Williams, Caplan, & Xiong, 2007). Taken together, this suggests that offline gender-based economic disparities would not be paralleled in MMOs unless players brought such baggage in with them, which tends to happen more within smaller groups of trusted others (e.g., guildmates) than with strangers (Ratan, Chung, Shen, Williams, & Poole, 2010). Our first hypothesis is thus:

H1: There are no virtual wealth differences between men and women in MMOs.

The Value of Virtual Gender

Because economic interactions in MMOs are carried out through avatars, or the guises through which users appear to others, it is not immediately obvious whether the player and avatar’s gender match. “Being female” and “appearing female” may both affect wealth accumulation, and so it is important to understand how such gender performance operates.

While previous research has found most players choose characters that match their own gender, presumably for reasons of identity consistency (Huh & Williams, 2010; Hussain & Griffiths, 2008), many players also choose oppositely-gendered characters. Such gender swapping is a common form of identity play in some online environments. In one of the first studies to address this topic, 40 percent of participants in a virtual environment were found to use an avatar of the opposite gender (Hogan, et al., 1999). In a more recent study, 57 percent of respondents reported having swapped genders in virtual spaces (Hussain & Griffiths, 2008). Early research noted that one of the primary reasons for gender-switching was the desire to explore and play the role of a person different from one’s self (Roberts & Parks, 1999).

However, players also choose character gender for game-related functional reasons. Some women use male avatars to circumvent negativity and prejudice towards women, as well as unwanted courting behaviour or sexual advances, in male-dominated virtual environments (Roberts & Parks, 1999; Yee, 2008). In other types of computer-mediated spaces, previous research also found a high prevalence of

this type of negative interaction, such as unwelcome questions about one's physical appearance, invitations for cybersex, threatening and hostile messages, harassment, and cyberstalking (Ellison & Akdeniz, 1998; Fallon, 1998; Ferganchick-Neufang, 1998; Herring, 1999; Spender, 1997; Spertus, 1996; Tannen, 1994). Given the past experiences of women in computer-mediated spaces, it is not surprising that women might gender swap to avoid this kind of negativity.

On the other hand, some men use female avatars to enjoy gendered benefits, such as attention and gifts lavished by other males (MacCallum-Stewart, 2008). Others note more voyeuristic motivations in the enjoyment of controlling and looking at a virtual female body without necessarily having any intention to play a feminine role (Hussain & Griffiths, 2008; Yee, 2008). Men also typically gender swap more often than women do in MMOs (Huh & Williams, 2010; Hussain & Griffiths, 2008).

Some women gender-swappers tend to 'out-man' the male players (Huh & Williams, 2010). This means that these women hyper-perform masculine game play while they play as male characters: they chat less, achieve and 'level up' their characters more, and engage in more player versus player (PvP) combat as male characters than women who play as female characters. In other words, there is a major difference in game play style between women who play as male characters and women who play as female characters. However, this is a very small portion of the whole gaming population, as women typically represent no more than 20 percent of MMO players and the majority tend to use female avatars (Williams, Yee, & Caplan, 2008; Yee, 2006a). In the case of male players, there are mixed results on whether gender-swapping influences behavior. Huh and Williams (2010) found that the game play behaviour of men does not change when they gender-swap, but Lehdonvirta et al. (2012) found that using a female character helps men overcome their gender role-related inhibition on seeking help from others.

If a majority of players who engage in gender swapping were found to behave in ways that are consistent with the typical roles of their characters' gender, then perhaps offline expectations would influence economic disparities along gender lines. However, the majority of players choose characters that are consistent with their biological sex. Those who do gender swap appear to be affected by their characters' gender only in some cases. This suggests that character gender in MMOs should not lead to the kinds of significant economic disparities that are found in conventional workplaces. Perhaps just as importantly, character gender is often ignored by players as an identity cue. Without that cue being as salient as it is offline, it is unlikely to impact wealth-earning interactions. For example, if a player wants to buy a shipment of fictional ore, *ceteris paribus*, she is unlikely to care if the seller is named "SheDevil" or "Hulk." A good price is a good price and the player knows that "SheDevil" is quite possibly a man anyway. In a competitive and meritocratic system where no one places much value on identity cues, market forces and effort are more likely to drive wealth than avatar gender—whether it matches the offline gender or not. Thus our second hypothesis is:

H2: There are no virtual wealth differences between players who use male characters and those who use female characters.

Method

To address the hypotheses put forth above, we compared economic data from two large-scale MMOs, EVE Online and EverQuest II. This comparison is possible because the operators of both games, CCP Games and Sony Online Entertainment, respectively, provided privacy-protected and anonymized server-log data to the researchers. While the virtual environments and types of activities in both games are quite different, they contain similar general elements that facilitate the comparison of wealth accumulation in each game.

Game Descriptions

EVE was launched in 2003 by Iceland-based game company CCP Games, and currently has over 300,000 players (Guðmundsson, 2010). It is a space-themed MMO where players pilot starships in a universe of approximately 7,500 star systems. The vast majority of players are from North America and Europe. Players are represented to others by upper-body avatar portraits or the spaceships they are piloting. Players are organized into corporations and can specialize in activities such as mining, hauling, industrial management, trading or security. Compared to other online games, EVE has a very detailed virtual economy and many game-play activities revolve around the production, distribution and marketing of spaceship parts, raw materials and other virtual commodities.

EQII, the sequel to EverQuest, was launched by the American company Sony Online Entertainment in November of 2004 and attracted several hundred thousand players (Schiesel, 2007). Like in World of Warcraft, which is currently the most popular Western MMO, EQII is set in a fantasy world and players use magical characters to complete quests, acquire equipment, kill monsters, and socialize with other players. The game includes various classes and races of characters, each of which offers unique abilities within the game world. As is common in the genre, players accomplish more when they work together in groups, and thus the social interaction component of the game is important. Like most fantasy MMOs, EQII has an economic component in that players must manage their finances to buy the most suitable equipment and maintain housing and storage. However, it is not the focal point of game play as it is in EVE; while some players enjoy the financial aspect of the game, many ignore it entirely.

Thus, these two MMOs share some general similarities but also some differences. Both offer persistent “always-on” virtual environments that guide player activities and within which players socialize and compete with each other. EQII reflects the typical role-play game (RPG), which account for most (over 94%) of MMO subscriptions (Woodcock, 2008), and are rooted in Tolkein-esque fantasy fiction. EVE is not about killing monsters and going on heroic quests. Instead, it is about finance, trade, and resource management. Many players actively use complex spreadsheets to calculate the necessary amount of materials, time investment, and expected profit from the production of items and other activities. This is not typical of most MMOs. Instead, activities in EVE bear a resemblance to real-life economic processes and business practices with respect to the activities that lead to success. Exploring two MMOs that differ so greatly in their economic aspects offers better generalizability and breadth in interpreting the results.

Populations

In both games, players can use multiple characters. In the current study, the unit of analysis is a single player's main character, defined in EVE as the character with the most skill points, and in EQII as the character with the most playing time. Only active and paying players are considered. Active players are those who have not quit or been banned. Paying players are those using regular, not trial accounts. These limits were defined at the time of data extraction, July 17, 2007 for the EVE sample and September 11, 2006 for the EQII sample. For EVE, the sample begins on November 1, 2005, when the logs for all relevant variables became available. For EQII, the range begins on January 1, 2006.

The analysis was not performed on the whole population of either game, but instead on sub-samples. The EVE sample was assembled from a stratified random sample in which an even number of males and females were selected. This method was used because the gender distribution of EVE players is highly asymmetrical, with only about five percent of active players being female. After removing outlier players (those with only deleted characters or main characters with negative account balances and negative skills) from an initial sample of 8000, the remaining sample consisted of 3904 males and 3806 females, resulting in a total of 7710 players. The mean age of this population was 29 (SD = 7.41).

The EQII analysis was conducted on a similarly stratified random sample also because of a skew toward male players (87%). After removing cases with incomplete data from an initial sample of 10,000, the remaining sample consisted of 3086 males and 3075 females, resulting in a total of 6161 players. The mean age of this population was 31 (SD = 9.33). Overall, the current paper utilizes a total n of 13,871.

Measures

Both game operators provided the researchers with demographic information about players as well as behavioural server-log data, all of which was privacy protected and anonymized. The demographic information included the player's age (calculated from date of birth) and physical sex as entered when they first signed up for the game. The behavioural server-log data included the player's main character gender, amount of time spent logged onto the game with that character, skill level of the character, and total wealth accumulated by the character. Player age, time spent, and skill level measures were used as controls in the analysis. Age has been found to affect MMO play behavior (Williams, et al., 2008; Yee, 2006b) and thus could influence wealth accumulation in systematic ways, while familiarity with MMO design suggests that time spent playing and character skill level are the biggest direct contributors to wealth accumulation in MMOs: playing more, just like working more, tends to lead to more activity and expertise, and thus more earnings and wealth.

All of these variables are straightforward and similarly defined in both games except for skill level and wealth accumulation, which require further explanation. In EVE, character skill level is defined as the number of skill points that a character has accumulated. These points are awarded when players assign their avatars to 'train' specific skills that fall into broader categories, such as mining or combat. In EQII, character skill level, referred to simply as character level, is based on the amount of experience points (XP) a character accumulates. These points are awarded for various in-game activities, such as killing monsters or completing quests. This system is typical of the RPG genre. Both variables fulfill the same

function in the present analyses: to control for the effect of the character's prowess on wealth accumulation.

Player wealth, in EVE, is defined as the sum of virtual currency the main character possesses and the market value of all items the character possesses. The market value of an item was obtained by computing the average price of all market transactions of the item in the month prior to data collection.

In EQII, wealth is defined as the earned sum of platinum, gold, silver, and copper, which are all different units of measurement for the same currency used in the game. Unlike in EVE, this value is based on the amount accumulated and is not affected by the amount spent. Thus, there was no need to calculate the market value of items possessed as an indication of wealth.

A regression analysis was used to test the hypotheses regarding potential effects on wealth by player gender (H1) and character gender (H2). As is typical in studies on gender gaps, the dependent variable was log-transformed (Albrecht, Björklund, & Vroman, 2003; Marini & Fan, 1997). This normalizes the otherwise highly skewed wealth distribution and allows the coefficients in the regression model to be interpreted as percentage changes, an approximation that holds for small changes in the variable (Stock & Watson, 2007). The independent variables playtime and character prowess were also log-transformed, because we know from game mechanics that their effect on wealth is exponential rather than linear – thus resulting in log-log regression. The independent variables player gender, character gender and player age were not transformed, thus log-linear regression.

In log-linear regression, the coefficients indicate how many percent the dependent variable changes in response to a one-unit change in the independent variable. In log-log regression, the coefficient indicates how many percent the dependent variable changes in response to a one-percent change in the independent variable. This method is commonly used in econometrics, because many relationships are naturally expressed in terms of percentages (Stock & Watson, 2007).

Results

Two models were constructed for each of the data sets to illustrate the relative effect strength of the independent variables. The first model contained only player age, character skill level, and play time – our control variables. The second model also included player gender and character gender – the variables in which we are most interested (see Table 1 and 2).

Model 1 for both games shows that there are large wealth disparities in both MMOs that appear to be driven by time played. In EVE, player skill also plays a large role, while in EQII, the effect of age is also significant but small. Specifically, in EVE, a one percent increase in skill level or time played is associated with a .51 percent or .64 percent increase in wealth, respectively. In EQII, a one percent increase in time played or age is associated with a 1.17 percent increase or .01 percent decrease in wealth, respectively.

As for Model 2, in EVE, both player gender and character gender were found to be significant predictors of wealth. Male players are on average approximately 11 percent wealthier than female players, while male characters in the sample are on average approximately 7 percent wealthier than female

characters. These results are inconsistent with our hypotheses, which posited that no gender differences would be observed. However, the R² of the second model is not improved over Model 1, implying that in practice, the gender variables do not influence the dependent variable greatly. This is further confirmed by the effect size measure, Cohen's D, which is much smaller for player gender (.07) and character gender (.09) than for skill level (.98) and time played (1.26). In other words, the analysis shows that there is a statistically observable gender wealth gap in EVE, in terms of both player gender and character gender, but in practice this gap is minor in relation to the wealth disparities that occur in the game due to other reasons.

Table 1. Regression Models on Wealth in EVE

	Model 1				Model 2			
	B	t	Cohen's d		B	t	Cohen's d	
Player Age	0	0.094			0	0.32		
Skill Level	0.51	43.05 ***	0.98	large	0.51	43.1 ***	0.98	large
Time Played	0.64	55.23 ***	1.26	large	0.64	55.1 ***	1.26	large
Player Sex (0M, 1F)					-0.11	3.27 ***	0.07	small
Character Gender (0M, 1F)					-0.07	2.29 **	0.05	small
<i>df</i>	7707				7704			
<i>R</i> ²	0.66				0.66			

Note: † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

^ >0.8 considered large, >0.2 medium, <.2 small

For EQII, only character gender in Model 2 is a significant predictor of wealth. Interestingly, the direction of the effect is opposite to EVE: female characters in the sample are on average 27 percent wealthier than male characters. However, as with EVE, the R² of the second model is not improved over Model 1, implying that this variable has little practical effect on the dependent variable. This is also confirmed by Cohen's D, which is much smaller for character gender (.07) than for time played (1.7). We conclude that in the analyses pertaining to both EVE and EQII, hypotheses H1 and H2 are partially supported: gender seems to play little practical role in determining player wealth in these virtual worlds. However, the results are not unambiguous and raise additional questions, which will be discussed below.

Table 2. Regression Models on Wealth in EQII

	Model 1			Model 2			
	B	t	Cohen's d	B	t	Cohen's d	
Player Age	-0.01	-2.77 **	-0.06	small	-0.01	-2.89 **	-0.06 small
Skill Level	-0.04	-2.24 *	-0.05	small	-0.04	-2.22 *	-0.05 small
Time Played	1.17	81.77 ***	1.71	large	1.17	81.04 ***	1.70 large
Player Sex (0M, 1F)					-0.10	-1.23	
Character Gender (0M, 1F)					0.27	3.47 **	0.07 small
<i>df</i>	5591			5589			
<i>R</i> ²	0.58			0.58			

Note: † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

^ >0.8 considered large, >0.2 medium, <.2 small

Discussion

The present study examined whether offline gender-based wealth disparities would persist into virtual worlds where gender cues become less salient and where more meritocratic systems drive daily behaviour. Data from two large MMOs, EVE and EQII, partially supported the expectation that no virtual wealth differences between males and females exist, regardless of the gender of their avatars. There were, however, large differences in wealth as a function of time spent playing and skill level of the players, indicating that these factors drive the variance in wealth. These findings were mostly consistent across the two games.

However, the results concerning the gender effect are not unambiguous. A small gender gap was detected; although statistical measures suggest that this gap is not significant in practice, further research may be needed to establish whether this is generally the case. This could include studies on the subjective experience of players (whether players perceive a gender gap themselves), as well as more detailed statistical explorations of different sub-phenomena in the games. A second ambiguity is that this small gender gap in the two MMOs were in the opposite direction from each other. This finding highlights the importance of comparative research; had we used only one data set, the risk of drawing unwarranted generalizations would have been great. The data at hand does not permit us to examine the possible reasons behind this difference in more detail, but some speculation can be offered.

Different MMOs reward different kinds of activities: some provide a better economic return on fighting and exploring, while some favor trading and social interaction, for example. If there are gender differences in play styles, that is, which activities men and women favor, then this would be reflected as a gender economic gap that varies between MMOs. The closest analogy for this disparity-generating mechanism is occupational segregation (blue vs. pink-collar jobs) in conventional workplaces.

This difference may be related to gendered motivations for play. Previous research has found that males are motivated by achievement while females are motivated by socialization and immersion (Yee, 2006b). Thus, if achievement leads to more wealth accumulation, then male players would end up earning more, but this would not necessarily imply structural biases or innate differences in ability to earn wealth. Regarding the present study, differences in the types of activities that lead to wealth accumulation between the two games may be responsible for why the small gender gaps were found to be in opposite directions. Specifically, in EVE, earning wealth is one of the most obvious goals of the game. Players are constantly reminded of how much money they have and this guides what they can do in the game. Thus, achievement is perceived as the accumulation of wealth and so males are more motivated to accumulate wealth in EVE. On the contrary, in EQII, there are many other statistics that are associated with achievement, such as experience points, achievement points, and kills. While these activities generate wealth, there are other activities in the game that generate wealth more directly, such as crafting and trading, and these activities are associated more with socialization than achievement. The former activities are more likely to appeal to males and the latter to females. However, in EQII, females who gender-jump were found to play more like males (Huh & Williams, 2010) and so they may also be more attracted to the achievement-oriented activities. This may help explain why players with female characters are motivated to earn more than players with male characters in EQII. While this current explanation is speculative, we hope to address this question in further research by comparing a range of games with respect to gendered player motivations and behaviors.

Nevertheless, the results at hand suggest that discriminatory practices, occupational segregation, and devaluing women's skills and work performance are not significant issues in virtual economies. If this is so, it would mean that MMOs present a more equal economic environment than national economies do. Wealth is gained by the player's actions, performance, and time spent playing the game, regardless of sex or gender. Overall, the data support arguments that such spaces provide a level playing field and act as an equalizer of social characteristics that would otherwise be salient in the physical world (Steinkuehler & Williams, 2006).

This finding suggests that virtual worlds may be egalitarian sites for education and training, which is very positive given the increasing incorporation of MMOs into learning curricula and occupational training (Brown & Thomas, 2006; Chen, 2008; Nardi & Harris, 2006; Schultze, Nardi, Rennecker, Stucky, & Hiltz, 2007; Steinkuehler, 2004). But beyond education and training, our everyday social lives and economic activities increasingly incorporate complex mediated communication, such as virtual worlds. It is therefore possible that MMOs are harbingers of future gender-based economic relationships. If future communication systems and technologies continue to make gender a less salient cue, the research here suggests that those systems will diminish gender gaps. In other words, given that removing identity cues leads to less discrimination (though also less depth to relationships; Williams, et al., 2007), future

systems that mask gender may lead to economic gains for women (and other kinds of gains for men; Lehtonvirta et al., 2012).

The mechanism responsible for this may relate to the Hyperpersonal model of computer-mediated communication, which suggests that a reduction in identity and behavioral cues leads to improved interpersonal interactions through selective self-presentation and the idealization of communication partners (Walther, 1996; Walther, 2007). This improvement of interpersonal relationships may help facilitate the level playing-field that is integral to equitable gendered economic relationships in MMOs and thus in everyday workplaces that incorporate such communication technologies. Future research could examine this potential mechanism by comparing the types of cues available in a given medium, the quality of interpersonal interactions, and the existence or extent of gendered economic disparities within the space.

Aside from exploring causal mechanisms, future research could build upon the present findings by examining whether the incorporation of new communication media into the workplace diminishes gender-related economic disparities when such media reduce the salience of gender cues within work-related activities. For example, a study could compare salary disparities within an industry or corporation before and after the adoption of communication media that facilitated virtual work from home, controlling for other factors that may influence salary disparities over time. If such a study could examine media use at a granularity that allowed for the comparison of multiple modalities (e.g., avatar-based text chat vs. voice), the results could suggest important implications about the types of gender cues that detract more from economic parity. Alternatively, if a study could compare media adoption across various industries or corporations, the results may provide insights about the role that organizational context plays in facilitating gendered economic parity through gender-cue limited media.

Regardless of the specific approach, future research in this area must build on the understanding that humans are innately curious about gender (Nass & Gong, 2000), but the communication media through which gender is presented can be used to overcome gender-related structural inequalities and economic disparities. A well-researched literature on the relationship between such media and economic behaviors will contribute to media theories that can be applied not only within purely virtual contexts but also to real-money workplaces that increasingly incorporate virtual communication. Thus, this research may help guide the development of large-scale organizations that are devoid of gendered structural inequalities and economic disparities, thereby razing the metaphorical glass ceiling writ large.

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