THE PRICE OF 'MAN' AND 'WOMAN': A HEDONIC PRICING MODEL OF AVATAR ATTRIBUTES IN A SYNTHETIC WORLD

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Abstract

This paper explores a unique new source of social valuation: a market for bodies. The internet hosts a number of large synthetic worlds which users can visit by piloting a computer-generated body, known as an avatar. Avatars can have an asset value, in that users can spend time to increase their skills; these asset values can be directly observed in online markets. Auction data for avatars from the synthetic fantasy world of EverQuest are used here to explore a number of questions, especially those involving the relative value of male and female avatars. In EverQuest, about 20 percent of the avatar population is female, and there are no sex-based differences in avatar capabilities. Many avatars (about one-fourth to one-fifth of the population) are cross-gendered, being piloted by a person of the opposite sex. Nonetheless, relations between avatars are gender-based, and include chivalry, dating, and sex. Female avatars tend to be concentrated in highly sexualized Human and Elven races, with very few being present among such aesthetically-challenged races as Ogres and Trolls. Hedonic analysis of the auction price data suggests that gender labels are a less important determinant of avatar values than the 'level,' a game-design metric that indicates the overall capabilities of the avatar. Thus, ability seems more important than sex in determining the value of a body. Nonetheless, among comparable avatars, females do sell at a significant price discount. The average avatar price is 333 dollar; the price discount for females is 40 to 55 dollar, depending on methods. The discount may stem from a number of causes, including discrimination in Earth society, the maleness of the EverQuest player base, or differences in well-being related to male and female courtship roles. We do know, however, that these differences cannot be caused by sex-based differences in the abilities of the body, since in the fantasy world of Norrath, there are none.

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I. Introduction

In 1996, a revolutionary game called Meridian 59 was released by 3DO software. This game combined the 3D graphical interface of games like Quake and Tomb Raider with the multi-user technology of text-based chat rooms (Dibbell, 1993). The result was a persistent 3D world in which a player could interact with thousands of other people simultaneously. This model of interactive entertainment has become extremely popular, with upwards of 5 million participants worldwide at this writing, each paying a $10-$15 connection fee each month. Massively populated persistent worlds (MPPWs), along with pornography, are among the few areas of commerce that have remained consistently profitable through boom and bust on the internet.[1] With a number of large and well-funded corporations currently planning investments in world-building, it seems likely that this forum of human interaction will continue to grow rapidly.[2] As it grows, it attracts increasing attention from academics in a number of disciplines.[3]

This paper exploits a stream of data produced by this phenomenon to investigate the demand for physical attributes (sex) and attributes of the social world (presence of the rule of law). The data consist of auctions for player "avatars," the computer-generated figures that represents the user in a game's 3D virtual reality environment. Avatars can be seen as bundles of attributes; the paper applies hedonic pricing techniques to determine the prices of avatar attributes as well as attributes of the worlds the avatars inhabit.

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[1] See Castronova (2002) for an overview of this market.

[2] Microsoft's long-run investment plans include $2 billion on online gaming. Other players in this space include Sony and AOL Time-Warner. A list of synthetic world games and 3D chat interfaces in development at this writing would occupy several pages. The Sims Online, released in December 2002, includes in-world advertising by McDonald's, Intel, and Levi's.

[3] Law: Mnookin (1996); sociology: Kollock (1999), Taylor (2002); psychology: Turkle (1997); geography: Taylor (1997); literature: Aarseth (1997); cultural studies: Dibbell (1999); media studies: Pearce (2002). There is a notable absence of rigorous empirical work, especially from economics and political science.

While there are many issues that could be addressed with these data, the paper will focus on sexual discrimination. In the real world, men and women are different in terms of their physical bodies, their cultural practices, their interests and goals, and their skills and abilities. There is much debate as to the sources of these differences: is it biology, social norms, culture, or education? Whatever the causes, men and women do not seem to have equivalent economic lives, and there is an ongoing concern about whether the opportunities available for women are equal to those available for men (Blau, Ferber, and Winkler, 2001; Goldin, 1990). Some claim that role differences should be celebrated, not stigmatized (Paglia, 1990). Folbre (2001) argues that the emphasis on paid labor in the contemporary economy has resulted in a net decrease in resource allocation to the once-female task of raising children; as the roles of 'man' and 'woman' are re-defined, there are serious consequences for everyone. At the same time, the negative effects of male/female social interaction and difference seem much harder to change than was once thought (MacKinnon, 1987; Walters, Carter, Papp, and Silverstein, 1988). Certainly, those who might wish to switch sides face a number of difficult financial and social hurdles (Garber, 1997; Califia, 1997; McCloskey, 1999).

But what if one could easily switch from 'man' to woman' and vice versa? Imagine the following experiment: A large group of men and women are placed in a lab. Each participant is given a series of body images – tall, short, fat, thin, male, female – from which to choose; all of these bodies have exactly the same abilities, they just have different appearances. After choosing, lab techs give each respondent the body that was selected. Then all the participants are induced to interact in a pseudo-society, complete with employment, hierarchy, and sexual relationships. Finally, suppose that each

participant was then able to sell his or her body on some well-functioning external market, for US dollars.

The features of this experiment are closely reproduced in the auction markets for avatar bodies. If hedonic price analysis shows that the prices of male and female bodies in these markets are not the same, then the implied difference in well-being must be due to something other than sex-based differences in the abilities of the body, since these do not exist in the synthetic world. Possible candidates include a systematic desire to avoid being the 'female' in the game of 'male' and 'female' social interaction; perhaps being the recipient of amorous advances is less attractive than being the initiator. Another candidate would be the fact that most men play male avatars and most females play female avatars. A statistical correlation between avatar sex and player sex might lead to an extension of real-world discrimination into the synthetic world. Both explanations make sense, given that most players of these games are actually male. Males may systematically prefer not to play female roles in gendered sexual relations, and they also would not want to be considered to be female in real life, even as a matter of probability rather than certainty.

The paper is organized as follows. Section II provides essential background for those unfamiliar with MPPWs, and introduces some positive issues that can be addressed using avatar auction data. Section III lays out a simple theoretical model of the demand for avatar attributes, and describes an empirical hedonic pricing strategy for finding the implicit prices of those attributes. Section IV describes the data and the peculiarities of their source, namely, online auctions for avatars of the game EverQuest. Section V presents results, and Section VI concludes.

II. Avatars

The focus of the paper is the avatar, a digital object that forms the central element of the user interface in MPPWs. Players literally see through the eyes of their avatars, and what they are able to see, and do, depends entirely on the avatar's attributes. Moreover, players can only connect to other people through *their* avatars. If I want to chat with Mrs. Jones, I must first move my avatar within hearing range of Mrs. Jones' avatar. If I want her to see me wave 'hello', I have to make sure that my avatar is standing in front of hers. In effect, the avatar becomes the player's body, for all intents and purposes, when the player is present in the virtual world.

As with Earth bodies, avatar bodies have a large impact on well-being. Tall avatars can see over short ones, and strong avatars can fight better than weak ones. Avatars with more accomplishments in the world generally have greater powers: they fight better, travel faster, and have more and better things (weapons, houses, vehicles). Avatars that have male and female characteristics (in terms of body shape, facial hair, and so on – although, see note 21) are treated as 'male' and 'female,' just as they are on Earth, by the society of other players.

However, very much unlike Earth, people who enter a synthetic world can have a great deal of influence on the kind of body they inhabit. Many choices are made when first entering the world: Shall I be an Ogre or a Human? What will my face look like? Should I be Male or Female? Other avatar attributes can be acquired with an investment of time. Your avatar can make a *good* magic sword by devoting hundreds of hours to

building his skills in weaponcrafting.[4] From an ex ante standpoint, a player can have any kind of body that she wants.

Ex post, however, a player can become locked in to a certain body type. Suppose you have chosen to be an Elven Female and have devoted hundreds of hours to becoming a master weaponcrafter. This skill is now quite lucrative, as there are few other avatars in the game world that can make swords as powerful as yours. You might even be able to earn a significant real-world income from selling your wares on internet auction sites like Ebay. However, if you become unhappy being an elf, or a female, or if you would just like to try something new, you face a large switching cost in that any new avatar you decide to play will not have the weaponcrafting skill of the old one. Most MPPWs have significant avatar lock-in effects such as this, as a core feature of the game. As a result, it can be a very expensive proposition, in terms of time, to change the kind of avatar one inhabits.

There is one rapid way for a player to change her avatar attributes, however: just buy an avatar with the desired attributes from someone else. On any given day, hundreds of live auctions for avatars in various games can be found on online auction sites like Ebay and PlayerAuctions.com (Dibbell, 2003; Castronova, 2001). Such sites also host thriving markets for in-game goods as well. The markets are generated by the fact that some people are relatively well-endowed with time, while others are relatively well-endowed with money. For many people, it makes no sense to spend hundreds of hours

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[4] Usually this is done by standing the poor fellow next to a forge and endlessly repeating a mindless task that bears some resemblance to smithing. "Take one unit of ore, one flask of water, and one brick of coal, place them in the forge, and click 'Craft.'" It might take hundreds of thousands of clicks to make your avatar a master craftsman. In many games, true crafting mastery requires years of time investment.

developing a skill in an avatar when an avatar with those attributes can be purchased immediately for $300.

With avatars being essentially a bundle of attributes, like houses, it makes sense to ask how these markets value different attributes. It seems likely that they would place some value on higher skill levels. But it is not clear how they would price different attributes like sex, height, or strength. They may also put a price on the *kind* of world that the avatar inhabits, because some avatars live in more lawless worlds than others.

In short, avatar auctions are free markets for bodily and environmental attributes. They bear interest on positive grounds for a number of reasons. First, while there have always been markets for environmental attributes (e.g. the housing market; see Freeman, 1979), there have been no markets for bodily attributes. Since it is possible that humans will spend an increasingly large fraction of their conscious time in computer-generated graphical worlds (Kurzweil, 1999), being represented there by avatars of all shapes and sizes, markets for avatars may eventually become as important as markets for automobiles and clothing are now.[5] Even the Earth body is increasingly subject to manipulation by the medical sciences, and much of this development is demand-driven; there seems to be a great deal of latent demand to live in a different body, and this demand may express itself powerfully in avatar markets. It is of interest to determine what sort of attributes command the highest prices.

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[5] Evidence suggests (Kurzweil, 1999) that the expansion of computing technology will continue. As it does so, humans and their machines will integrate to an increasing degree. Machines have begun to give humans the option of spending time in beautiful fantasy worlds, and an increasingly large number of them are doing so. In 2001, revenues of the interactive entertainment industry ($10 billion) exceeded the Hollywood box office for the first time. If the trend continues, people may increasingly be known through their avatar rather than their Earth body.

There are more immediate applications as well. A market in which people can freely buy and sell their bodies allows us to examine the implicit prices of other things of interest. For example, a given avatar will reside on a specific 'server,' which is, in effect, a specific version or replica of the game world. The game EverQuest has 44 servers as of this writing; each one hosts the same world for a different community of players. Significantly, the rules of the game may be different on different servers; of EverQuest's 44 servers, four are host to a 'player versus player' (PvP) rule set. Under those rules, players can attack and kill other players. Is this Hobbesian style of play so unpleasant that it affects the prices of avatars in state-of-nature worlds?

For these and other questions, avatar markets present a unique opportunity for analysis. At some level, ex ante, any person may build any avatar they desire simply by spending time doing it. Also, they may choose to "live" on any server of any game, with any desired ruleset or atmosphere or community. Yet, once they are there, and have committed time to a specific avatar, it becomes costly to switch. Ex-post, switching costs lock the player into a specific avatar in a specific world. This lock-in has created a player to player market in avatars, through which the attributes of the body and the environment may be indirectly estimated. In order to unpack these issues with more clarity, the next section provides a simple model of the demand for avatar attributes.

III. A Simple Theory of Avatar Demand

People who participate in MPPWs face the problem of allocating time among the many avatars they may inhabit.[6] Assume that each agent may only inhabit one avatar at a

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[6] Becker's (1965) model of time allocation also includes the money cost of consumption. MMORPG players pay a monthly fee; there is no marginal cost for spending another hour in an avatar. To keep the

time.[7] Let there be N possible avatars, index n = 1, …, N. Without loss of generality, one could assume that the index n = 1 identifies the "Earth avatar," the human body. Within the time budget T, the agent must solve the following problem:

$$\underset{t_1,...,t_N}{Max}\, U(t_1,...,t_N) \text{ subject to } t_1 + ... + t_N \leq T$$

The amount of time devoted to a given avatar depends on the avatar's attributes. These include aspects that are unique to the avatar itself (her height) as well as to the world in which she exists. Let x_n be a vector of attributes of avatar n, and let the attributes of all the possible avatars serve as parameters of the utility function. The choice problem becomes:

$$\underset{t_1,...,t_N}{Max}\, U(t_1,...,t_N; \underline{x}_1,...,\underline{x}_N) \text{ subject to } t_1 + ... + t_N \leq T$$

where the elements to the left of the semi-colon are arguments of the utility function, and the elements to the right are parameters of the utility function. To construct an example of a utility function, let $h^*(\underline{x})$ be a function that maps an avatar's characteristics into a positive real number. Then define the function $h(\underline{x}_n)$ as

$$h(\underline{x}_n) = \frac{h^*(\underline{x}_n)}{\displaystyle\sum_{i=1}^{N} h^*(\underline{x}_i)}$$

The function $h(\underline{x}_n)$ maps attributes into a positive number between 0 and 1. Then a valid utility function describing this agent's decision-making might be:

$$U(t_1,...,t_N; \underline{x}_1,...,\underline{x}_N) = \sum_{n=1}^{N} h(\underline{x}_n) \ln(t_n)$$

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exposition simple, I will defer to future research the larger problem of choosing subscriptions to game-worlds. But see the related discussion in Castronova (2002).

[7] Actually, many players run more than one avatar simultaneously by running a game on multiple computers. The second (or third) avatar is only a "bot," however, with its actions automated as a form of service provision to the main avatar.

This is a Cobb-Douglas utility function applied to the agent's time allocations, with avatar attributes serving as the weights apply to the different uses of time. It implies demand functions of the form

$$t_n^* = h(\underline{x}_n)T$$

Thus, the demand for time in an avatar can be expressed as a function of the avatar's attributes. In a dynamic model, one could show how the value of avatar attributes would be capitalized into the price of an avatar in a general market for avatars. This is an exact analog of the way that house attributes, which affect the value of housing services on an ongoing basis, become capitalized into the asset value of houses in the housing market.

Once attributes become capitalized in an asset, their implicit price can be determined by regressing the asset price on a vector of attributes. The technique is known as *hedonic pricing*; if the regression is expressed as Price = f($\underline{x}$), then the implicit price of the ith attribute is $p_i = \partial f(\underline{x})/\partial x_i$. Hedonic pricing methods are consistent with the consumer theory of Lancaster (1966), as developed in the seminal paper by Rosen (1974), but they were in use decades earlier as a way to place a value on the quality of agricultural products (Waugh, 1928). Popular applications today include item quality (Thomas, 1993) and housing amenities (Freeman, 1979). Rosen (1974) argues for nonlinear forms for the attribute regression functions. Bartik (1987) argues that there is no need to model the supply side of this market; a regression of price on item characteristics identifies the implicit prices of the characteristics. For an overview of methods, and examples of the extensive use of hedonic pricing in public policy analysis, see Boardman, Greenberg, Weimer, and Vining (1996).

In what follows, we will apply hedonic pricing techniques to the market for avatars from a particular synthetic world, "Norrath," which is the fantasy world of the game EverQuest.

IV. Empirical Background: The Gameworld of EverQuest

A. EverQuest. Auction data from the computer game EverQuest form the backbone of the study. EverQuest was released in March 1999 by Verant Interactive, a division of Sony Online Entertainment. It is an MPPW, and Norrath, its fantasy world, has a population of about 400,000 active accounts and the terrain itself is being used by as many as 100,000 users at any one time. More precisely, it should be said that 100,000 people are visiting a *version* of Norrath. The game is divided into about 44 different servers, and each server hosts an exact replica of Norrath for a sub-population of about 2,000 people. Bound by the rules of the game and the physical universe, the 44 communities of players interact in pursuit of various objectives.

The objectives themselves are not identical across players. Some people come only to socialize with others. Some enjoy exploring new terrain. Some like to make new game items (helmets, robes), while others like to 'play' at the markets, buying and selling items that others make. Some enjoy combat with computer-generated monsters (or other avatars, on PvP servers). The world serves as an effective host to all of these activities.[8]

The amount of pleasure that can be had while doing these things is a direct function of the attributes of the avatar one inhabits. One of the key attributes is the *level* of the avatar. When an avatar kills a monster, he is awarded 'experience points,' and

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[8] Richard Bartle, the inventor of Multi-User Dungeons (MUDs) in the late 1970s, categorized all players into four types: Achievers, Explorers, Socializers, and Killers. See Bartle (1996).

when a sufficient number of these points is accumulated, the avatar is advanced by one level. Every time an avatar gains a level, he acquires new powers. Thus, a level 20 warrior can do much more damage with his sword than a level 2 warrior. Being more able in combat, the level 20 warrior can pursue a number of activities more effectively. For example, if his owner likes to explore, the level 20 warrior is clearly better than the level 2 warrior: he can explore areas whose monsters would kill the level 2 warrior but not his stronger colleague.[9]

Other attributes include the class, race, sex, and appearance of the avatar. The *class* refers to the occupation of the avatar: Wizard, Warrior, Cleric, and so on. Avatars of different classes have natural affinities for doing different things; wizards are good at magic, warriors excel at armed combat, clerics are good at healing others and removing things like poisons and diseases. The *race* refers to the races that exist in the lore of the world; in EverQuest, the lore includes human races, dwarves, elves, trolls, and so on.[10] The races differ in two respects. First, different races generally have different *ability scores*. An avatar is endowed with a set of abilities (Strength, Intelligence, Wisdom, etc.) that affect her performance at various tasks; high strength helps with combat, and high intelligence with magic, for example. Thus while warriors will be good at combat generally, a dwarven warrior, with high strength, will be especially good. An elvish warrior will be weak but highly intelligent; in terms of game mechanics, this will not be of much assistance, since a warrior needs brute strength, not mental capacity. The second

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[9] In these games, "killing" and "death" do not actually terminate the avatar. Instead, they impose some kind of penalty, such as: the avatar is transported back to her home town and a large number of experience points are lost. Death does matter, however. In EverQuest, a single death can mean the loss of experience points and equipment that can take many hours to regain.
[10] The lore of most synthetic worlds is based on either fantasy or science fiction. Many concepts originally sprung from the mind J.R.R. Tolkien more than 50 years ago; his is a very long and persistent shadow.

aspect of race is related to appearance, as the different races look very different from one another. Dwarves are short and stout. Elves have pointed ears. Trolls are large, green, and (to this writer's eyes anyway) ugly. And so on.

Within each race, a player can make his avatar have either *sex*, male or female. He can also, within a racial category, further change *appearance* to personalize the avatar. Typically this involves changing the way the face looks – perhaps Troll face number 12 is not so ugly after all. In the course of the game, different costumes can be applied to get different looks. It is important to note that activities in the game world are in no way affected by either sex or appearance of the avatars. If I make a human warrior, that avatar will have a certain effectiveness at various tasks based on being 1) human, and 2) a warrior.[11] Nothing else matters, at least in terms of the mechanics of game play.

In terms of general existence in the gameworld, however, appearance matters a great deal. This is a role-playing game, and while the game mechanics do not impose any such stereotypes, it is nonetheless true that avatars of different classes, races, sexes, and appearances are treated differently by the community of players. And, as is consistent with any general theory of social norm equilibrium, players who drive these avatars

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Tolkien was also the first practical theorist in the art of constructing a fantasy-mediated life (Tolkien, 1939).

[11] When an avatar is created, players are given a limited budget of ability points to spend on the different abilities, and these can be used to raise abilities at will. Example: Abilities are Strength and Intelligence, with Humans having base scores of 75 and 75 and Dwarves having base scores of 95 and 55, respectively. All players get 20 ability points to spend at the start. So one could make a Dwarven warrior with strength 115 and intelligence 55, or a Human warrior with strength 95 and intelligence 75. Or one could make a (bad) Human warrior with Strength 75 and Intelligence 95. The point is that the avatar's effectiveness is determined, in the end, only by these ability scores, not by the race *per se*, and certainly not by appearance or sex.

conform to social norms by acting in the expected way. Doing so simply reduces stigma. Thus, dwarves are often gruff, and beautiful elven princesses offer comfort and solace.[12]

Table 1. Sex and the EverQuest User Base

All figures in percent	All	Male Users	Female Users
User population	100.0	92.4	7.6
Users with at least one male avatar	85.1	93.7	18.8
Users with at least one female avatar	31.1	26.8	93.4
Users whose main avatar is male	81.7	87.7	10.4
Users whose main avatar is female	18.3	12.3	89.6

Source: Norrath Economic Survey, August 2001. N = 3,619. See Castronova (2001) for details. 'Main avatar' refers to the avatar that receives most user time investment, as indicated by the respondent.

Never mind the possibility that the dwarf is being played by a housewife in Tokyo, or that the elven princess is really a truck driver from the Bronx. Players take avatar appearance (within the context of the game's lore) as a cue to behavior, which is then enforced socially.

This difference between mechanical effectiveness (based on ability scores, equipment, level, and so on) and social effectiveness (which depends on the social norms of the player population) is most acute with regard to the sex of the avatar. As stated above, the avatar's sex has no impact whatsoever on any action in the game. Moreover, while about most avatars are male, men and women tend to play opposite-sex avatars fairly frequently. Data from a survey of EverQuest players in August 2001 are reported in Table 1. The figures show that while more than 90 percent of users are male, only about 80 percent of avatars are male. This is because about every one in five players (more among women) plays at least one avatar of the opposite sex. If we consider the 'main'

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[12] "Speaking" in these worlds is actually chatting, via text-based instant messaging. Chat language is

avatar – the one respondents indicate is their principle persona in the fantasy world –

about one in ten players is crossing gender lines. Nonetheless, there is a positive

correlation between user sex and avatar sex. Thus, there may be some reason for male

Figure 1. Examples of gendered communication in EverQuest society

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Poster: Jabby (231 posts), responding to a thread on why certain races are picked: "I picked high elf for cha, and due the un-resistable draw we have on wood elf hottie females." (note: *cha* = charisma, a game statistic)

Poster: Hyena Shaman (620 posts), responding to a thread on how people choose their character types: "So, [I] made Gandwer. And somehow managed to stick with playing a Shaman who's blind as a bat and has tits the size of cannonballs for 53 levels now. (At least now I know what body part the 'slam' ability uses.)."

Poster: Xmod2 (712 posts), responding to a thread on the new character graphics in the *Shadows of Luclin* expansion of EverQuest: "I like big boobs, but not so big they are saggy! ROFLMAO! [A barbarian female character] can hang out with a HALFLING and she can rest them on his head! That is all they are good for anyway besides laughing at. P.S. If you don't like big boobs, then play GNOME FEMALE, she is like a gymnast and UNDERDEVLOPED lol. (oYo) <- barb. (.)(.) <- Gnome!" (notes: *ROFLMAO* = roll on the floor laughing my ass off. *HALFLING* = a short character type. *lol* = laugh out loud. *barb* = barbarian, a racial type.)

Poster: Zhannon (373 posts): "I have a question for anyone who plays a Female Erudite Mage. I have gotten the cutest little pair of leggings; they are called Black Chitin leggings and they make the most darling little black skirt. However, I have found to my distress that there is nothing to match it; no black chitin tunics, sleeves, shoes, etc. Is there a black top, black shoes, and black sleeves that a female Erudite can wear?"

Poster: Elayne (30 posts): "About the best tunic I've seen for a caster is the Kelp tunic from Sirens Grotto. Female Erudian Guildie has one and it looks swish. Sort of metalic pink tunic. Looks like a pushup sports leather tunic on a female human and I want one. /drool." (notes: *Guildie* = guild member. */drool* = a command line that would cause an in-game character to visibly drool.

Poster: Tinolan (1,118 posts), responding to commentary about a male avatar that does a dancing animation – one characterized as 'a little femmy' by a previous poster: "A little femmy? You are mistaken, sir! The ladies LOVE a guy that can dance. Let's see...a woman has a choice between some manly man that's covered in blood and ichor, and a 'femmy', handsome, well-dressed, clean, charming, articulate bard. I think we know which one they'd choose, other than the weirdos." (note: *bard* = an occupation in EverQuest.)

Source: Message boards at the Caster's Realm fan site, November 18, 2002.

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sufficiently developed to permit the transmission of all of the subtleties of speech. Individuals are known to have avatar-mediated sex, via chat.

and female avatars to be treated differently by society, simply because of the statistical inference that the sex of the avatar reveals, probabilistically, the sex of the player.

Despite the less-than-perfect correlation of player sex and avatar sex, male-female interactions in Norrath are still gendered, and sex matters. Figure 1 reproduces commentary captured from discussion boards devoted to EverQuest, in which players comment on different aspects of the gender of their avatars. The commentary – which is representative of what can be heard during game play – reveals the lengths to which players go to role-play the gender of their avatars. The highly sexualized graphical representations of some of the avatars also seem to encourage gendered social interactions (see Figure 2). As a result, gender roles are exaggerated, if anything, a feature that is common to many online communities. A fairly substantial literature in cultural studies and sociology has established that avatar-mediated societies accept the gender of the avatar as *the* gender in social interactions, even though the gender of the player is unknown (Smith and Kollock, 1998; Dibbell, 1999; Turkle, 1995). This literature also argues that exaggerated sexuality and sexual interplay is not necessarily a bad thing in the context of fantasy gaming worlds. Play-sexuality can be psychologically and developmentally valuable (Jones, 2002; Cassell and Jenkins, 1998).[13]

Because of this pattern of sexual abilities and roles, the world of Norrath presents a unique opportunity to test the following hypothesis: Suppose that the bodies of men and women were made completely equal, in a way that was common knowledge to everyone in society. Suppose further that the maleness and femaleness of bodies could be costlessly changed, so that male-minded people could inhabit female bodies, and vice versa, again,

as common knowledge in society. Under the terms of this experiment, any discrimination

between the sexes, however observed, could not be the result of distinctions based on

bodily abilities. Rather, any such discrimination would be derived solely from differences

in a) male and female mentalities, and b) male and female social roles. In other words,

one sex might be discriminated against on the basis of differences in mentalities, but only

Figure 2. Images of EverQuest Avatars

Wood Elf Female

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[13] The author has played female avatars in EverQuest extensively and can personally testify that men are men and women are women in the fantasy world of Norrath. The reader is invited to test the hypothesis by buying any massively-multiplayer online roleplaying game and secretly switching genders for awhile.

Erudite Male and Female

Sources: Elf: EverQuest Casters Realm, eq.crgaming.com; Erudites: Allakhazam's Magical Realm, everquest.allakhazam.com

if people can use the sex of the body to guess the sex of the mind behind it. If males tend to inhabit male bodies, and females tend to inhabit female bodies, then one might infer, statistically, the sex of the player, and one might discriminate on that basis. Alternatively, player society may simply construct different roles for avatars of different sexes, and, in its role-playing, effectively discriminate against avatars with one sex or the other. The absence of discrimination in this experimental situation would suggest, conversely, that all such discrimination on Earth derives from sex-based differences in the body. Once those are removed, by the construction of the experiment, all grounds for discrimination are also removed.

B. Data. The well-being effects of these features of the EverQuest social world can be examined using data from online auctions of EverQuest avatars. Studies using data

from online auction sites such as Ebay have been accepted in the scholarly literature for several years (Bajari and Hortacsu, 2002). Roth and Ockenfels (2002) use online auction data to study bidding patterns. Conversely, there appears to be no study suggesting that fraud, frivolous bidding, adverse selection, or information asymmetries affect the validity of auction prices as indicators of value.[14] The literature thus suggests that online auction data capture the price of goods in an economically meaningful way.

Online auctions are the principle market for buying and selling items associated with synthetic worlds, and the trade is active and sophisticated. There is a futures market: auctions for items in the synthetic world of the game Asheron's Call began to appear in on Ebay in November 2002, several weeks before the game was released. Some game developers feel that the online trading damages the atmosphere of the game. Others argue that online trading is the expression of an important property right. The issue has even gone to court (Becker, 2002). Sony, the makers of EverQuest, asked Ebay to ban all EverQuest-related auctions; Ebay complied, but the trade moved to a new site, PlayerAuctions.com, where it continues to thrive.

EverQuest auctions can be broken into three categories: cash, items, and accounts. Trade in cash involves the 'platinum piece,' which is the currency of 'Norrath,' EverQuest's fantasy world. It is essentially a foreign exchange market; in February 2003, the Norrathian PP trades at about 250pp to the dollar, down from 100PP August 2001.[15] Similarly, the auction trade in items is essentially a market for durable used goods; a

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[14] The validity of the pricing system is maintained by the existence of simple schemes of reputation accounting. Ebay maintains a database of good/bad feedback that seems sufficient to sustain trust; in 2002, the aggregate Ebay trade volume was $14.87 billion. See Kollock (1999) for a history of trust-building institutions on the internet.

[15] Like most other synthetic worlds, Norrath is plagued by inflation, for reasons that are too complex to go into here. See Castronova (2001).

typical item might be a magic sword, quite useful in slaying dragons, and a typical price

might be $20. Some items command much higher prices, however, ranging into the

thousands of dollars. These are highly-effective, extremely rare items that could only be

obtained in the game itself through the commitment of literally hundreds of hours to

gameplay.

The third category consists of auctions for accounts. Each EverQuest user must

sign up for an access account in order to enter the gameworld. The account has a unique

name and password. A player loads the EverQuest software, enters name and password,

and then is given a menu of server-worlds to play in. On choosing a server, the player is

presented with a menu of up to 8 'character' slots. At first, each slot is empty; it reads

"Create new character." By clicking on the slot, the player enters a menu-driven interface

by which he or she can create a new avatar body, by choosing from a number of races

(Troll, Elf, etc.), occupations (Wizard, Warrior, etc.), sexes (Male, Female), and

appearances (tall, short, blonde, bearded, etc.). See Figure 3 for a brief description of the

races and classes of the avatars of Norrath. Finally, the player receives a budget of ability

points to spend on various avatar attributes (Strength, Intelligence, Wisdom, etc.).

Significantly, the ability budget may depend on the race and occupation of the avatar, but

not on its sex or appearance. Lastly, the player chooses a name. When finished, the player

clicks an 'accept' button, and the avatar is created and placed in one of the 8 character

slots. From this point forward, if the player wishes to enter the world as this avatar, he or

she clicks on this character and is transported into the gameworld as the driver of this

particular avatar vehicle. The player may make up to 8 characters on each of EverQuest's

40+ servers.

Once in the world, the player may maneuver the avatar about according to whatever whim suits the moment. By interacting with others, and the environment, the avatar can attain significant new skills, abilities, cash, and items. All of these things help the player enjoy the world and improve its contribution to the player's sense of well-being; as noted above, there is a particular statistic called the "level" (ranging from 1 to 65) that has perhaps the biggest impact on the utility of the avatar. Acquiring items and raising the avatar's level takes time, often an immense amount of it (Castronova, 2001). Most players find that there is more joy to be found in developing one avatar to a high level, rather than building a broad portfolio of less-developed avatars. Most accounts have what is known as a "main" avatar, which is the most developed and most used among the dozens of avatars which a player may have on a given account. Thus, in the world of EverQuest, one's overall status and position in the game can be summarized by

Figure 3. The Races and Classes of Norrath Society

Races	Classes
Barbarians – Large humans. Big-boned and gruff. Wear kilts. Live in the frozen north.	*Bard* – Music-player, singer, and fighter.
Dark Elves – Evil elves, with dark blue skin. Outcasts from elf society.	*Beastlord* – Fighter who commands animals for assistance.
Dwarves – Strong, short people. Fairly crude. Miners.	*Cleric* – Priest. Healer and hunter of the undead.
Wood elves – Nimble, smallish creatures with pointed ears. Love nature and live in trees.	*Druid* – Nature priest. Heals and uses wind and fire to attack enemies.
Erudites – Brilliant and haughty humans. Brown-skinned. Urbanites.	*Enchanter* – Magic-user who charms and mesmerizes opponents.
Gnomes – Short, intelligent tinkerers. Live underground and build contraptions.	*Magician* – Magic-user who summons forces of nature to fight enemies.
Half-Elves – Mixed breed between human and elf. Somewhat nimble, somewhat strong. Possess the lore of both races.	*Monk* – Lightly-armored hand-to-hand fighter.
Halflings – Small, hairy-footed tricksters. Live in hill-homes.	*Necromancer* – Magic-user who summons and controls undead creatures.
High Elves – Elven aristocracy. Intelligent and arrogant. Urbanites.	*Paladin* – Heavily-armored holy knight. Can cast some cleric spells.
Humans – Normal in all attributes; the standard race, by definition.	*Ranger* – Lightly-armored hunter. Explores and tracks animals. Can cast some druid spells.
Iksar – Evil lizard-people. On bad terms with all other races.	*Rogue* – Swashbuckler and thief, thrives on knife attacks from behind.

Ogres – Huge and strong, but stupid, savages. Eat other races if allowed. Have difficulty spelling. Live in crude stone shelters.	*Shaman* – Spirit priest. Heals, casts disease spells, concocts poisons.
Trolls – Large, green-skinned, evil. Not too smart. Like ogres, have a taste for dwarves, gnomes, etc. Live in swamps.	*Shadowknight* –Armored evil knight. Can cast nefarious, life-draining spells.
Vah Shir – Cat-people. Affinity for animals. Live on the moon.	*Warrior* – Heavily armored fighter. No spells.
	Wizard – Magic-user who casts the most destructive damage spells.

Source: EverQuest, a massively-multiplayer online roleplaying game, developed by Verant Interactive and published by Sony. These races and class were available between October 1, 2002 and February 1, 2003.

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stating the occupation and level of one's main avatar: "I have a 65 Wizard" means "I am a powerful spellcaster in this world."

Accounts may be usefully sold. Anyone in the world who starts the game EverQuest and enters the correct name and password can freely make use of all properties, items, and software associated with that account. This means that every avatar, on every server, may be used as a vehicle by the new owner of the account. Typically, those who buy an account would receive a well-developed main character on one server, who has a great deal of equipment and cash, as well as a number of poorly-developed characters, with little money and few items, scattered across several other servers. Thus, buying an account is (with some exceptions) equivalent to buying a main avatar. This is reflected in auction markets for accounts. The auction titles almost always state two things: the level of the main avatar on the account, and that avatar's occupation. For example, an auction might be listed as "63 Epic Ranger," an account whose main avatar is a ranger-class avatar at level 63; the avatar also has an epic-level piece of equipment, something that is very hard to get. An auction listing may say something about other avatars on the account ("60 Epic Necromancer & 59 Beastlord: Uber Gear"), but most advertise a single avatar as the primary content of the auction. Thus, with rare

exceptions, the auction price appears to be a direct measure of the value of the main avatar.[16] Other details of the listing (sex, race, and server) are usually found only by clicking on the title and loading the entire auction description.

Note that the auction data do no have any information about the seller or the buyer. It will therefore not be possible to include user characteristics in the hedonic regressions. We do know some things about EverQuest's user base from the Norrath Economic Survey (Castronova, 2001), however. Given that a very large portion of the user base is male (see Table 1), it would be prudent to assume that any price effects are not general, but rather only reflect the judgments of the male portion of the population. Also, the user base consists mostly of single people aged 18-29, so results could not be generalized outside this age group, or to married people.

The data for this paper were taken from the auction database at PlayerAuctions.com between October 2002 and January 2003.[17] An effort was made to retrieve all completed account auctions from the site in this time period; the total number of reviewed auctions was approximately 2600.[18] Of these, an auction was included in the

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[16] In practice, features of the accounts that cannot be easily captured or measured will have to be left unobserved, in much the same way that the aesthetic beauty of houses and the quality of neighborhoods must be left unobserved in hedonic housing price studies.

[17] Auctions at PlayerAuctions.com follow standard English auction rules, with the highest bidder obtaining the item at the highest bid. The seller may specify a reserve price; no contract is implied if the highest bid is below the reserve. The seller may also offer a "buy it now" option, by which the good will be sold, and the auction ended, to the first buyer who accepts the "buy it now" price. Most auctions seem to terminate through the "buy it now" option. A successfully concluded auction does not necessarily imply a transaction occurs, and the implicit contract between buyer and seller is not necessarily binding in court. However, the reputation system, similar to Ebay's, seems to prevent frivolous listing and bidding. Fees for listings are paid by the seller. The basic fee is $0.29 for a listing, plus 2.25 percent of the sale price, but the entire schedule is much more complex (it includes extras for bold type, banner lines, etc.). The actual incidence of the listing fees is unknown, of course.

[18] The actual data collection procedure was as follows. At multiple points during the study time period, the site PlayerAuctions.com was accessed by internet from a personal computer in the United States. From the home page, a link to "Games Internet" was followed, from there, "EQ Characters" ("EQ" is a common abbreviation for "EverQuest") was clicked, to arrive at pages with active auctions for EverQuest accounts. On that page, a link to "Completed" was clicked, to retrieve all account auctions completed as of the date

study's database only if it met certain criteria.[19] The most limiting criterion was whether

the auction was successful. Beyond that, some completed auctions were rejected because

the listing did not indicate the race, sex, or server of the main avatar. The final data set

includes 611 avatar auctions.

The information obtained from each auctions included the auction price, the date

of the auction, the avatar level and sex, the avatar race and class, and the server. There is

no information about the characteristics of the buyers or sellers. Many auctions give

supplemental information about special equipment or attainments of the avatar, or the

amount of game currency included, but these descriptions are not systematically

comparable across accounts. It is undoubtedly true, however, that higher level avatars

have better equipment, more cash, and greater achievements; the level of the main avatar

is an accurate proxy for the overall capitalization of the account. As for the other

independent variables, multiple data points were obtained for each of EverQuest's 43

servers, 14 races, and 15 classes. These variables can be handled with dummy variables,

but they can also be bundled into sensible groups by characteristic to see if shared

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the database was being delved. All retrieved auctions were then reviewed and added to the study database if they met certain criteria (see below). This procedure was first done on November 11, 2002, and included auctions from October 1 forward. After that, at irregular but approximately biweekly intervals, the database was delved again in the same manner, and auctions that had been completed since the date of the last query were reviewed and possibly admitted to the study database. The last delve took place on February 10, 2003, and included auctions up to January 31, 2003.

[19] An auction was included only if the data were complete (including the sex of the main avatar) and there was at least one bid above the reserve set for the auction. Most auctions are flagged with a "buy it now" option price and many are completed with one buy-it-now bid. Any evidence of a failure in the auction, such as a re-listing at a later time with indications that the buyer reneged, also resulted in the removal of the original auction from the data. Successful, full-data auctions were rejected under further special circumstances. Auctions where there is more than one high-level avatar on the account were rejected because of the ambiguity about which one is the "main" account; in practice, accounts with multiple avatars above level 50 (a common marker for high-level versus low-level play in EverQuest) were not included. Accounts with characters advertised as "stripped" (devoid of all supplemental equipment and cash) were not included, in an effort to keep the value of equipment, which is not directly observable, as consistent as possible across all accounts in the data. Auctions for highly-equipped low-level characters (advertised as "twinks") were also not included, for the same reason. Finally, auctions for accounts that were bundled

characteristics carry a price effect. All servers carry the same physical world of EverQuest, but server age may still affect price, in that older servers tend to have a more ossified and top-heavy social structure; a few elite guilds (player clubs) will be calling the shots. Special server types include PvP servers, where players can use their combat weapons and spells against other players (on other servers they cannot); European servers, where the player base is mostly European as opposed to mostly American; and the Premium server, Stormhammer, where playing costs $35 per month instead of the usual $13, and the player gets extra services from the customer service staff (special dragons and so on).

As for races, there are four sensible groupings, based on the appearance of the race and its role in the lore of the game: Humans, Elves, Short People, and Monsters (Ogres, Trolls, lizard-like Iksar). Dark Elves and Vah Shir (cat-people) do not fall into these groups; the dark elves are evil elves, but not evil in the same way that an Ogre is evil (Ogres have a taste for other races). For classes, there are again four sensible groups, based on what the class does. Melee types attack enemies at close range with weapons. Magic-Users stand back and cast spells. Hybrids use melee attacks supplemented with weak spells. Priests rely on healing and shielding spells to help themselves and other people. Finally, a different grouping is based on play style: some classes (Druids, for example) can be played solo to good effect, while most others require teaming with other players to accomplish anything.

Table 2 defines the variables used in the analysis and gives summary statistics.

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with some additional service or item (for example, a second account, or an account or item in another game) were not included in the study data base.

V. Results

A. Descriptive data

There are no 'stylized facts' regarding accounts in virtual reality spaces, so it makes sense here to go over summary statistics from the account data. According to Table 2, about 20 percent of the auctions involve female avatars, a percentage that is consistent with the overall frequency of female avatars in the gameworld (Castronova, 2001). The typical account has a reasonably significant value in terms of Earth currency. The average final price among the 611 auctions is $333; the median is $275, with a range from $40 on the low end to $2,250 on the high end. The average level of the main avatar in the accounts is about 58, with an interquartile range from 55 to 60. These levels are substantial; it takes literally hundreds of hours of time investment to get an avatar to level 60.[20] The highest level of the avatars is 65, which is the highest level in the game.

Table 2. Definitions and Summary Statistics

Variable	Mean	St. Dev.	Description
Month	2.80	.110	Month of auction. Equals 1 - 4 for October 2002 to January 2003.
Price	333	235	Final auction price for the avatar, in $US
Level	57.7	4.6	Level of the avatar
Female	.201	--	1= Avatar is female, 0 otherwise
Server Age	1,088	368	Age of the server that hosts the avatar, relative to February 1, 2003, in days. The oldest servers have been running since February 1999, the newest since May 2002. Note: in regressions, this variable is divided by 1,000.
PvP	.028	--	1 = Avatar's server is enabled for player vs. player combat, 0 otherwise. (Rallos Zek, Tallon Zek, Vallon Zek, Sullon Zek)
Europe	.077	--	1 = Server is located in Europe (Antonius Bayle, Kane Bayle) or has a traditionally European player base (Ayonae Ro, Karana, Solusek Ro); 0 otherwise
Premium	.116	--	1 = Premium service server (Stormhammer), 0 otherwise. Players pay $35 monthly instead of the usual $12.95, and receive augmented services.
Human	.227	--	1 = Avatar is one of the human-like races (Humans, Barbarians, Erudites), 0 otherwise.

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[20] The author has often felt as though he has done nothing but play EverQuest for weeks on end, but his highest avatar is only level 39. Level 39 is laughable status among EverQuest users; however, the demands of research require the establishment of a large number of avatars of different races and classes, spread across many servers. Getting one single avatar to level 60 would be, for this writer at least, a part time job that would take about two years.

Elf	.257	--	1 = Avatar is one of the non-evil elf races (Wood Elf, High Elf, Half Elf), 0 otherwise.
Short	.162	--	1 = Avatar is one of the short races (Dwarves, Halflings, Gnomes), 0 otherwise.
Monster	.160	--	1 = Avatar is a monster race (Iksar, Ogre, Troll), 0 otherwise.
Dark Elf	.180	--	1 = Avatar is a Dark Elf, 0 otherwise.
Vah Shir	.013	--	1 = Avatar is Vah Shir, 0 otherwise.
Melee	.304	--	1 = Avatar is a close combat fighter (Monks, Rogues, Warriors), 0 otherwise.
Magic	.255	--	1 = Avatar is a primary magic-user (Enchanters, Magicians, Necromancers, Wizards), 0 otherwise.
Hybrid	.208	--	1 = Avatar is a hybrid fighter/magic-user (Bards, Beastlords, Paladins, Rangers, Shadowknights), 0 otherwise.
Priest	.232	--	1 = Avatar is a priest (Clerics, Druids, Shamen), 0 otherwise.
Solo	.226	--	1 = Avatar can play and advance well without teaming with other players (Bards, Druids, Necromancers, Magicians), 0 otherwise.

N = 611. Source: Account auction data from PlayerAuctions.com, October 1, 2002 – February 1, 2003.

The data also reveal that there are comparatively few auctions for avatars on PvP (4 of 44 servers but only 2.8 percent of auctions) and comparatively many for the Premium server (1 of 44 servers, 11.6 percent of auctions). It seems that many players tire of the game at high levels and decide to try out the premium server for awhile, but then quit and sell off their accounts. As for races, Elves and Humans seem popular as auctionable avatars, although Dark Elves, as a single race, make up 18 percent of the auctions. Again, this can be explained through the culture of the game; auctions seem to be dominated by what is known as the 'powergaming' group of players, those whose interest is mostly in dominating game after game as quickly as possible. These gamers are often attracted to playing evil character types; among the evil race types, only dark elves are pleasing to the eye. Compared to the racial groupings, class groupings are much more evenly distributed.

Table 3 gives the percent female within different groups, as well as the average avatar price. At first cut, male avatars seem to sell at a significant premium ($346 vs $281

for female avatars), but of course this may be due to sex differences by level, server, class, and race. Level seems to have a very strong impact on price, in fact. Avatars in the highest quartile of the level distribution sell for three times the price of avatars in the lowest quartile, even though the difference is only a few levels (55 to 61). This is testimony to the fact that, in the 50s and 60s, it can take very many hours of play to attain even one level. At the same time, female avatars are generally at a lower level than male avatars.

As for servers, older servers seem to have lower prices, perhaps due to social ossification, but also because an older server is more likely to have a population of high-level players who are getting bored with EverQuest. There is no substantial price difference for PvP or European servers, but avatars on the premium server generally are more expensive – consistent with the theory that there are more high-level avatars on that server. There seem to be slightly fewer female avatars being sold from the premium

Table 3. Sex and Price Differences Among Avatars, by Avatar and Server Characteristics

Characteristics	Percent Female	Average Price ($)
All Avatars	20.1	333
Male Avatars	0.0	346
Female Avatars	100.0	281
Level		
Level 55 or below (lowest quartile)	27.4	149
Level 56 to 60	19.7	340
Level 61 and above (highest quartile)	12.0	541
Server Age		
927 Days and younger (youngest quartile)	19.3	395
928 - 1431 Days	20.2	313
1431 Days and older (oldest quartile)	21.2	301
Server Characteristics		
PvP Server	5.9	319
European Server	19.1	355
Premium Server	15.5	423
Races		
Human Races	**19.4**	**319**
Barbarian	25.0	260
Erudite	16.0	364

Human	17.9	332
Elven Races	**29.3**	**346**
Half Elf	22.9	404
High Elf	30.0	389
Wood Elf	31.9	288
Short Races	**10.1**	**337**
Dwarf	2.2	319
Gnome	11.5	318
Halfling	22.2	388
Monster Races	**1.0**	**315**
Iksar	2.1	340
Ogre	0.0	288
Troll	0.0	296
Other Races		
Dark Elf	33.6	352
Vah Shir	25.0	198

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server, and not many at all from the PvP server. A game-culture explanation would be

that PvP is an activity steeped in testosterone, and an image of masculinity may matter in

that environment.

Table 3 Continued. Sex and Price Differences Among Avatars,
by Avatar and Server Characteristics

Characteristics	Percent Female	Average Price
All Avatars	20.1	333
Classes		
Melee Classes	**13.4**	**326**
Monk	14.5	312
Rogue	22.7	359
Warrior	6.8	319
Magic User Classes	**25.6**	**360**
Enchanter	48.3	463
Magician	0.0	402
Necromancer	33.9	333
Wizard	12.5	323
Hybrid Classes	**11.0**	**308**
Bard	21.1	404
Beastlord	40.0	256
Paladin	16.7	290
Ranger	6.9	235
Shadowknight	0.0	341
Priest Classes	**31.0**	**333**
Cleric	29.3	410
Druid	41.7	272
Shaman	19.4	288
Solo Classes (Bard, Druid, Magician, Necromancer)	31.2	329

N = 611. Source: Account auction data from PlayerAuctions.com, October 1, 2002 – February 1, 2003.

Race groupings tell a slightly different story. The most expensive races are Elves, which also happen to be female most frequently. Very few of the Short race and Monster avatars are female, however. Again, this may have a cultural explanation; female elves (including Dark Elves) have what is, in essence, a highly sexualized look (refer to Figure 2), while Dwarven and Ogre females are less sexualized, to say the least.[21]

As for classes, magic users seem to command the highest prices, and hybrids the lowest. Magic users also seem to be female more frequently; priests are often female as well. Druids come closest to gender equity; some 41.7 percent of Druids are female.

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[21] Many dwarven women have beards.

Druids are also one of the best solo classes, which explains why the Solo grouping seems to have many females. There is, again, a cultural explanation for these patterns: Suppose I am a 23 year old male (typical in the EverQuest user base), and suppose I would like to run around as a highly sexualized female for awhile, without anyone finding out that I am cross-gendering my avatar. A Wood Elf Druid is a natural choice: the avatar is highly sexualized and can be played solo. With solo avatars, there is no need for extensive grouping and teaming with other players, and therefore no need for extensive communication; short cross-gendered conversations are undoubtedly much easier to sustain credibly than long ones.[22]

Overall, the simple statistics suggest that the auction market pays attention to the amount of time invested in an account, pay offering high premiums to high-level avatars. It also seems that the culture of fantasy worlds has an impact on the distribution of male and female avatars across social roles. It is not clear, however, whether labels of 'Man' and 'Woman,' and the roles with which they are associated, have any impact on prices. For this, we would need to turn to regression analysis.

B. Regressions

Table 4 shows four hedonic regressions of avatar auction price on avatar and server characteristics. Consistent with the hedonic pricing literature, three specifications of the base regression are shown: linear, semi-log, and log-log. These first three regressions attempt to tease out effects of server, race, and class characteristics, while a

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[22] In these games there is a distinct sub-community of players known as 'roleplayers,' who make the effort to act out their characters consistently in the game world. Many report that such play-acting is difficult to sustain for any length of time. Since the game requires hours and hours of time commitment, role-playing often breaks down. EverQuest does have one server dedicated to the role-playing community; interestingly, there were no account auctions from this server in the database. This suggests that roleplayers are at the opposite end of the spectrum from powergamers in their approach to the gameworld.

Table 4. Hedonic Regressions of Avatar Price on Avatar and Server Attributes

Independent Vars.	Dependent Variable			
	1. Price	2. Ln(Price)	3. Ln(Price)	4. Price
Level	33.46 (2.74)**	.117 (.006)**	--	33.73 (2.82)**
Ln(Level)	--	--	6.245 (.372)**	--
Server Age	-33.99 (49.52)	-.082 (.088)	--	--
Ln(Server Age)	--	--	-.077 (.099)	--
Female	-40.94 (21.22)*	-.088 (.040)**	-.096 (.043)**	-55.42 (18.52)**
Month	-28.03 (8.87)**	-.082 (.017)**	-.076 (.018)**	-28.19 (7.21)**
PvP	-15.24 (24.73)	-.047 (.063)	-.052 (.065)	--
Europe	-17.23 (32.16)	-.038 (.093)	-.039 (.101)	--
Premium	-7.31 (32.16)	-.038 (.074)	-.053 (.118)	--
Human	16.39 (32.00)	-.047 (.062)	-.038 (.064)	--
Dark Elf	37.12 (28.74)	.005 (.067)	.003 (.072)	--
Elf	39.55 (35.96)	.034 (.067)	.049 (.071)	--
Short	-.72 (28.75)	-.035 (.057)	-.029 (.060)	--
Melee	-2.16 (25.07)	-.096 (.045)**	-.094 (.049)*	--
Magic	45.98 (22.18)**	.100 (.061)	.102 (.067)	--
Priest	55.84 (32.95)*	.154 (.057)**	.147 (.060)**	--
Solo	-32.46 (28.33)	-.088 (.053)	-.091 (.054)*	--
Constant	-1509.83 (173.48)**	-.798 (.354)**	-19.475 (1.512)**	-1458.58 (134.18)**
Server Dummies	No	No	No	Yes
Race Dummies	No	No	No	Yes
Class Dummies	No	No	No	Yes
R^2	0.4332	0.6690	0.6454	0.5235

N = 611. Source: Account auction data from PlayerAuctions.com, October 1, 2002 – February 1, 2003. Asterisks indicate statistical significance: * indicates the 90 percent confidence level, ** indicates the 95 percent confidence level (two-tailed tests).

fourth regression uses dummies to account for all server, race, and class effects. For each regression, robust Huber-White standard errors were calculated. In addition, since there were different numbers of observations for the different servers, and each server represents a replicated micro-community of EverQuest players, it seemed sensible to consider the data as clustered data by server; this clustering also affects the calculation of standard errors. Test regressions showed that robust, clustered standard errors are substantively larger than typical standard errors, suggesting that the usual methods do overestimate the accuracy of the results. The regressions seem to explain the variation in prices fairly well, with R^2 values ranging from 0.4332 to 0.6690.

The simple linear regression suggests that the sex of the avatar seems to matter. All else equal, a female avatar sells for about $41 less than a male avatar, which is about 12 percent of the mean price of $333. It is also comparable to the effect of an avatar level: all else equal, each increase in level adds about $33 to the avatar price. It makes sense that customers are willing to pay for the increase in effectiveness, cash, and equipment that each new level brings; their willingness to pay more for male avatars than female avatars, however, does not have an explanation in terms of what the avatars actually can do in the game. For some reason, the tastes of this population tend to discount the label 'female' relative to the label 'male' by as much as it discounts an avatar with 57 levels relative to one with 58 levels. As to whether the difference is substantively significant, it should be remembered that attaining a level in the 50s and 60s does take a substantial time investment. The equivalent variation of being switched

from 'male' to 'female' would be the loss of a level, which is to say, dozens of hours of time.[23]

The regression reveals a number of other substantive effects. Avatars were losing value over time at a fairly rapid rate in this period; each month, the price of equivalent, typical avatars dropped by about $28, or about 8 percent of the average price in the sample. This is probably the effect of the increasing competition for player time in the market for shared virtual reality spaces. In October, EverQuest was competing in this space with a few other seasoned games, including Dark Age of Camelot, Ultima Online, and Anarchy Online. By February, three new games had entered. One of them, The Sims Online, was an extension of one of the world's most popular games into EverQuest's multiplayer online market space. Another, Asheron's Call 2, was a next-generation update to Microsoft's entrant in this market. Moreover, several powerful new worlds were expected to be released in Q1 2003: A Tale in the Desert, Shadowbane, and especially Star Wars Galaxies, a title expected to attract millions of users. Sony itself had been announcing preliminary details of its own sequel, EverQuest II, slated for later in 2003 or 2004. Perhaps many players, especially powergamers, decided to sell their accounts in EverQuest I, to open up their time to try out these other entrants.[24]

Other than this, there does not seem to be any evidence of price differences by server type or race. Given the willingness to pay for differences in appearance and social

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[23] It is important to note that, at these levels, gaining levels itself is not inherently fun. It is time investment and labor supply, at least according to most players. Gaining experience points, and hence levels, in the 50s and 60s, is an exercise in repetitive chain-killing of static, mundane monsters. Most players describe it as agonizingly boring. The entertainment value of playing at that level is in the social aspects of play: talking to guild members and going on large-scale dragon raids of 50-200 players (which in themselves do not help players level to any great degree). The raids are fun; you need levels to do better raids; the levels themselves are no fun at all; hence the willingness to pay for levels.

roles based on sex, it is perhaps interesting that there is no apparent affect of appearance

and social roles based on the races of the avatars. It is also interesting that there is only a

substantively moderate, and statistically insignificant, effect for the PvP servers. The vast

majority of EverQuest players avoid these servers, apparently because the culture there is

so Hobbesian. Nonetheless, these tastes do not show up in the prices of avatars.

Classes, on the other hand, do seem to exhibit an impact on price. The omitted

class is the Hybrid melee/magic classes, and we see that, relative to them, users are

willing to pay more for both Magic Users and Priests. This may be driven by the

mechanics of advancement, in that Magic Users and Priest classes are somewhat harder

to play in the middle levels (20-50). Mid-level Clerics, for example, are almost entirely

dependent on grouping to advance and can often barely defend themselves if caught

alone in the open. The same can be said of Enchanters. At high levels, however, Clerics

and Enchanters are extremely powerful. Users with a taste for Clerics and Enchanters at

high levels may want to skip the hard levels by buying an advanced avatar.

The results for the first regression are largely mirrored in the other specifications.

Regressions 2 and 3 express the dependent variable in terms of logs, so that coefficients

on dummy variables can be interpreted as percentage impacts. Regression 3 expresses

continuous independent variables as logs in order to capture elasticities. According to

these specifications, the discount for 'Female' is estimated as about 9 or 10 percent (-8.8

and -9.6, respectively). Regression 2 indicates that the increment in price per level is

about 12 percent (11.7), while regression 3 estimates that the elasticity of price with

respect to level is very large, 6.245. With each one percent increase in level raising price

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[24] The effects of growing competition are also documented in two indices, the Avatar Index and the Virtual
World Currency Index, both maintained by the author. These are indices of avatar and currency prices from

by more than 6 percent, it seems reasonable to conclude that level is the single most important factor determining avatar price.

The log-based regressions continue to show significant monthly price declines, but no substantive impact of server or race attributes. There is some impact of classes, albeit in a different pattern. Priests still command a premium, but Melee classes now show a substantial price discount of about 10 percent. Magic Users have positive coefficients at about the same absolute value as the Melee discount, but the effect is not statistically significant. The only message that is consistent across specifications is that Priests are more valuable.

Regression 4 can be viewed as a maximum-information regression, in that it eschews aggregating servers, classes, and races into categories and instead includes them as dummies. This holds as much variation constant as possible, to focus attention on the effect of level, sex, and month on price. Relative to Regression 1, the results for Month and Level are about the same, but the Female effect is significantly larger. At -$55, the price of 'Female' is equivalent to the price of losing about 1.5 levels.

The server, race, and class dummies do not show especially interesting patterns for the most part, and are not shown. There are some exceptions, however. Among classes, Enchanters and Shamen show substantive and statistically significant premia, with Enchanters costing about $180 more than other classes, and Shamen about $63 more. Among races, Ogres sell at a substantive and statistically significant discount of -$143. Perhaps most interesting is an even larger discount for another race, the Erudites, which sell at a discount of -$157. Ogres are evil-aligned, limited to a few class choices (Warrior, primarily), and, to this eye, they are monstrous and ugly. Erudites, by contrast,

a weighted basket of all the gameworlds in the market. Both indices fell from Q2 2002 to Q1 2003.

are good, neutral, or evil aligned, they are highly intelligent, they have many different class types to play, and, to this eye, they are human-like and attractive. They do have brown skin and facial features that resemble Earth Africans, however (see Figure 2).

In addition to the results in Table 4, a further series of regressions were run, using linear, semi-log, and log-log formats with different mixes of server, class, and race dummies. None of these regressions produced results that were significantly different from those already reported, so they have not been included here.

VI. Conclusion

Auction data for accounts in the gameworld of EverQuest reveal a number of sensible patterns regarding the value of various attributes of the accounts. A series of hedonic regressions suggests that there is a significant discount among EverQuest auction buyers for the label 'Female,' all else being held equal. The effect is equivalent to the loss of as much as 1 to 1.5 levels of experience, which is itself equivalent to the loss of many hours of time. There is nothing in the game mechanics to explain this discounting, since male and female avatars have exactly the same capabilities. Female avatars may be discounted because of assumptions about the effectiveness of the player; perhaps it is assumed that the players of female avatars are just not as good as the players of male avatars. This itself could stem from discrimination on Earth, through the positive, though imperfect, correlation between avatar sex and player sex. Alternatively, it may simply be the case that the EverQuest player base, which is primarily single, male, and aged 18-29, prefers to have a male external appearance rather than a female external appearance. This

may be a matter of taste, or it may relate to differences in the way males and females are treated in social relations.

The results show, however, that 'male' and 'female' labels are not as important in determining price as the in-game effectiveness of the avatar. In the data, the avatar Level is by far the most important determinant of avatar value. The avatar's occupation (Warrior or Wizard) also seems to make some difference. This suggests that the value of a body is primarily related to what the body does, not so much what it looks like. Appearance matters, but, in a world where appearance can be chosen at birth, effectiveness in later life matters quite a bit more.

Finally, the results shed some light on the role of avatars as durable assets. The asset value of an avatar seems critically dependent on the state of the market for alternate reality spaces. As new worlds emerge, the value of assets in old worlds falls. This makes perfect economic sense, and, in this study, appeared in the form of price discounts for EverQuest avatars as their owners emigrated from EverQuest to other synthetic worlds. A broader implication appears when one thinks of Earth as just another alternative reality world in this market. If humans spend more of their time in synthetic worlds in the computer, they will have less interest in whatever assets they have on Earth. The data here suggest that the value of Earth assets is likely to fall substantially as human consciousness melds gradually into the machine.

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