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THE DEVELOPMENT OF A PRICE CONTROL MECHANISM FOR MMORPGS

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ABSTRACT

In the recent past, the demand for massively multiplayer online role-playing games, MMORPGs, has rapidly grown. MMORPGs are complex software procuts with designed-for selfpreserving internal social and economic systems. Through the occurrence of MMORPG-related services and activities based on game-external interests, MMORPG-internal markets are destabilized in a way that even threatens the existance of the overarching MMORPG systems. In order to protect the market integrity within MMORPG economies and stabilize their internal markets, a mechanism is developed throughout this thesis that connects in-game market activities to mandatory system-internal investments, activities, and efforts...

ZUSAMMENFASSUNG

Die Nachfrage nach Onlinerollenspielen, MMORPGs, hat in jüngster Vergangenheit stark zugenommen. MMORPGs sind komplexe Softwareprodukte mit sich darin befindenden selbstlaufenden und -erhaltenden sozialen Systemen und Ökonomien. MMORPG-bezogene, jedoch auf spielexternen Interessen basierende Dienstleistungen und Aktitivitäten destabilisieren diese Systeme in einer Art und Weise, die sogar ihre Existenz bedroht. Um die Integrität von Märkten in MMORPGs zu schützen und um sie zu stabilisieren, wird ein Mechanismus entwickelt, der Marktaktivitäten im Spiel mit obligatorischem Aufwand und notwendigen Aktivitäten innerhalb des Spielsystems verbindet...

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Several people have contributed to the development of this thesis in their own way. Without your individual contributions, suggestions, support, advice, and music, the work of the last months would have been less worthwhile. My sincerest thanks to all of you.

While being deeply grateful to all supporters throughout my work on this thesis, there are three characteristics some of the above adressed personas inhabit that have not only been especially helpful during the work of the last months but throughout the last years and likely the years to come.

One of these characteristics is confidence. Confidence that whatever problems, hurdles, or obstacles you face, a solution, a way to overcome it, or a way to deal with it can and will be found. Confidence in your effort and that it will be worthwhile, not necessarily now but definitely sometime.

The second attribute is strength of character. The general understanding of and confidence in who you are. Acting in a way that suits to the according implications and limitations to your activities, your personal goals, and your way of how to handle things, to retain the basic shape and consistency of your personality.

Third, an analytic and simultaneously enthusiastic work ethic. The eagerness to accomplish set goals, while continuously questioning the actions partaken and the intermediate results achieved. To not only find a way to complete adressed tasks but also to be satisfied with and confident in the path chosen.

Thank you.

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1 INTRODUCTION

1.1 MOTIVATION

The market for MMORPGs, massively multiplayer online roleplaying games, is a rapidly growing market with a current user base of at least 17 million customers. While the market is currently dominated by *Blizzard Entertainment*'s *World of Warcraft*, the competition for market share grows more and more intense and many new MMORPG titles are currently in development. (Woodcock, 2008, Chart 4,7)

MMORPGs are first and foremost software products and thus complex systems. Their development and their maintenance require the investment of a substantial amount of money. For their users, it takes a substantial amount of time to adapt to them and learn how to use them. The acquired knowledge and system-related skills are usually intransferable and incompatible to other MMORPGs, which causes substantial lock-in effects, switching costs, and sunk costs for their users. (Shapiro and Varian, 1999, p.11) The lock-in effect is further increased by features provided by the systems, that is system-internal resources, belongings, and measures, which will be described in further detail in chapter 2.

In the recent past, so-called "'Real Money Trade"', RMT, services have emerged that offer relief for the individual sunk costs and switching costs for MMORPG users. To reduce the investment of time and effort required to obtain a certain system-internal status, they offer both system-related services and system-internal valuables. This is because their opportunity costs to acquire them are smaller than the opportunity costs of their customers. (Lehtiniemi, 2008, p.24) Imagine a company offering to increase your amount of skymiles so that you can fly first class whenever you finally have the time to air travel. These offered services, however, have an impact on the quality of the MMORPG systems.

MMORPGs are vast, diverse, and complex social systems. Via interaction and communication within and about the system, system-related and system-internal social networks and communities are formed, resulting in positive network effects for their users. (Shapiro and Varian, 1999, p.13) To strengthen and retain community bonds, meaningful individual contributions of the system users to their communities through individual investment of time into the system are required. RMT services adulterate the quality of the system-internal communities as they use and congest the communities' system-internal infrastructures without contributing to them. Imagine exclusive skymiles membership clubs in airports being unpleasantly overcrowded and noisy.

Within social systems, trade usually emerges with an according exchange of goods and services that are declared valuable within the system by its members through a commonly accepted means of payment

obtainable within the system. This also applies for MMORPGs. Within them, there are vast, complex, and realistic economies. Through the existance of RMT services, MMORPG users are no longer required to obtain system-internal funds for in-game trading by investing time and effort into the system as they may as well exchange system-external surplus for system-internal valuables. That way, system-internal valuables are no longer backed up by the aggregated individual contributions of the users to the system and its communities, and system-internal commodities and measures are significantly devalued. Imagine an internet forum where users pay others to increase their forum activity measure, e.g. their amount of submitted forum threads. To accomplish that task, the employed others spam the forum boards with generic messages. That way, the expertise of the web forum and overall content quality are reduced while actual expertise is drained away from them.

Last, MMORPGs are also games multiple users are simultaneously connected to. Activities within game systems are usually restricted by an overarching ruleset every user has to abide to to assure fair play, fair competition, and overall stability of the game system. This cannot be provided any longer if RMT services exist. RMT customers can acquire a competitive advantage over players not using these services, rendering the objective of fair competiton and the value of acquired achievements meaningless. Imagine playing *Monopoly* with a few other people of which one pays the player administering the bank $10 to get handed out 50,000 *Monopoly* money.

RMT reduces the quality, stability, and integrity of MMORPG system products. Investments made into the system by both their developers and their users are devalued. This leads to two problems which will be adressed within this thesis. From a business studies perspective, RMT causes additional costs for MMORPG operators as they have to perform and invest in activities to combat the negative effects of RMT on their products and services. That poses threats to their profitability and overall competitiveness on the MMORPG market. From an economics perspective, system-internal MMORPG markets are destabilized through so-called "'MUDflation"'. The utility of users of MMORPG-internal markets is greatly reduced as their investments and efforts into and within the MMORPG economies are devalued.

In order to find a solution for the above described problems, Castranova suggests a strategy of price control performed by the operators of MMORPGs as they have total control over their product's underlying software code and may thus freely regulate market conditions within their MMORPG's economy. (Castronova, 2002, p.4) Within this thesis, Castranova's suggestion will be analyzed and evalued. In the end of this thesis, a strategy will be presented that could solve the above described problems for both MMORPG operators and the market stability of MMORPG economies.

1.2 RESEARCH OBJECTIVES

Consequently, the main task for this thesis is as follows: to develop a price control strategy for MMORPGs that greatly lessens or even prevents the negative impacts of price instability and MUDflation within MMORPGs. Price control only works, however, if it is accepted by the

MMORPG users. Thus, the customers' system-internal economic interests are to be determined and respected. The MMORPGs are run by private enterprises bound to the profitability constraint. Hence it has to be kept sure that the applied price control strategy causes minimal costs for the online world developers.

Consequently, several objects are to be investigated. Typical MMORPG characteristics are to be identified and evaluated regarding their implications for MMORPG economies. In order to identify and measure investments made by MMORPG users into the MMORPG economy, the derived economic variables are to be aggregated into a production function applicable to online game world residents. It has then to be determined in which way this production function is interfered with through RMT and other system-external drivers.

It also has to be analyzed which effects these interferences cause to both the online game world inhabitants and their operators. It shall also be shown in which way MMORPG developers reacted upon the derived interferences so far and if those applied strategies lead to the desired results.

To generate a price control mechanism that is accepted by MMORPG citizens, the players' desires regarding production and consumption within online game worlds are to be put under consideration. Consequently, economic principles for MMORPGs are to be identified. Based on these principles, a price control mechanism is to be developed that meets both the financial interests of the MMORPG operators and the economic gameplay interests of the online game world citizens.

To achieve the above mentioned goals, the historical method is used. Available research on MMORPG economics is gathered, structured for the purpose of this thesis, reviewed, and analyzed. A substantial part of the resource material is contributed by professor E. Castranova who has been investigating the economies of online game worlds for several years now.

This thesis is focused on transactions of obtained in-game commodities between users within MMORPG economies and according in-game market prices. An additional thorough analysis of how in-game resources are provided would go beyond the scope of this thesis.

1.3 THESIS OUTLINE

This thesis consists of seven chapters. After arguing why the development of a working price control mechanism is crucial for MMORPGs, chapter 2 demonstrates the methodology of online game worlds. A MMORPG is a computer-simulated environment 2.1 in a persistent 2.2 multi-user space 2.3, where shared and cooperative tasks 2.4 are carried out by avatars, the players' self-representations 2.5. The implications of these characteristics regarding individual production and consumption are presented in the according sections. Out of these implications, a production function for MMORPG citizens is derived and explained in detail 2.6.

Disturbances of this production function are discussed in chapter 3. MUDflation, a combination of simultaneous inflationary and deflationary processes is described and available data on its severity given 3.1. Subsequently, motivations for deflationary 3.2 and inflationary 3.3 trade behavior are investigated. Sources of excess supply in money are classified and analyzed in detail 3.3.1 to 3.3.3. Section 3.4 analyzes the effects of MUDflation on the economic interests of and transactions between the players within MMORPGs. In section 3.5, the effects of MUDflation on the operators' competiveness on the MMORPG market will be adressed, consequences regarding operation costs 3.5.1 and operation revenues 3.5.2 described.

According to the suggested counter strategy, the central theme of Chapter 4 is price control. Section 4.1 gives an overview of price control in the real world and discusses circumstances in which price control was applied in the past. Subsequently, price control strategies executed in online games, significant differences to real world application, and their effects are described 4.2. All of them, however, cause undesirable side effects. Central planning is not accepted by the players 4.2.1. A system of supposedly balanced faucets and drains of commodities and resources at most delays the occurance of MUDflation 4.2.2. Last, customer service representative prosecution imposes a costly administrative burden on the MMORPG operators with only little to no effects 4.2.3.

To develop a price control mechanism that is generally accepted by the MMORPG users, their interests as in-game consumers and producers have to be respected. These interests are determined in chapter 5. MMORPG developers seek a solution with very low administrative costs and high efficiency to minimize their operation costs. MMORPG inhabitants demand the assurance of a few economic principles equally applicable to all players. Avatar diversity is required to allow every player the selection of a meaningful in-game societal role 5.1. Equality of opportunity is requested to exclude real life based and to glorify online world based economic power and achievements 5.2. That power is to be achieved by overcoming challenges imposed by and within the MMORPG 5.3. To prevent punishment of in-game supply and demand based inefficient choices for certain societal roles, the guarantee of minimum rewards is requested 5.4.

Based on the principles of economic design in MMORPGs and the theory of price control, a price control mechanism for MMORPGs will be compiled in Chapter 6. It is argued why invariably all player-to-player trade has to be mediated by an automated neutral authority 6.1. That mediation has to provide a minimum income level through a global formula that determines the minimum value of each in-game commodity 6.2. The actual market prices and all other significant trade data, however, should cyclically be generated by the producers and consumers within each MMORPG to warrant a monitored while still free market economy 6.3. To prevent adulteration of the player-generated market data, individual trade information has to be strictly limited to the trade participants while interpersonal trade information has to be kept undisclosed to all players 6.4. Section 6.5 illlustrates the deriving price control mechanism step-by-step.

Chapter 7 summarizes the results carried out throughout this thesis 7.1. Effects of the price control mechanism regarding welfare effects 7.2.1, effects on RMT 7.2.2, and player acceptance 7.2.3 are discussed in section 7.2. Suggestions for future research are made 7.3. Final thoughts of the author are provided at the end of this thesis 7.4.

1.4 ORIGINAL CONTRIBUTIONS

The original contributions of the thesis consist of the following key aspects:

1. Combinations that cause price instability in MMORPGs are identified. Their effects are described in a comprehensible way to demonstrate the urgency of a strategy that stabilizes MMORPG in-game markets.
2. Threats to the profitability of MMORPG operation and to the integrity of MMORPG economies are pointed out, limitations to circumvent those threats provided.
3. A price control mechanism for MMORPGs is established and illustrated that should
    - reduce MMORPG operation costs through easy and automated use,
    - enhance player-to-player trade,
    - guarantee efficient price allocation and first degree price discrimination,
    - protect individually obtained MMORPG system internal expertise and status, and
    - help to stabilize MMORPG in-game markets regarding price conditions.

2

METHODOLOGY OF MMORPGS AND ECONOMIC IMPLICATIONS

In this chapter, an introduction to MMORPGs will be made based on their typical characteristics. While available definitions, e.g. Bartle, 2003, p.2,4 and Castranova, 2005b, p.4,7 vary slightly, it is mutually agreed to that all MMORPGs share the following characteristics:

- computer-simulated environment,
- persistent world,
- multi-user space,
- shared competitive and/or cooperative tasks, and
- self-representation of each user through an avatar.

Those will be discussed in detail, combined with their individual contributions to in-game production and consumption, in the following sections 2.1 to 2.5. Based on the economic implications, an avatar production function will be demonstrated in 2.6.

2.1 COMPUTER-SIMULATED ENVIRONMENT

Most online roleplaying games[1] take place in environments that we are somewhat used to from our real life existence. There are trees, roads, wilderness, mostly dangerous natural wildlife, villages, cities, dens and lairs. Sometimes, trees are replaced by enormous mushrooms and instead of eagles and hawks, dragons and wyverns reign the sky.[2] Laws of physics and nature usually apply, albeit in a simplified way. If a player jumps from a cliff and does not land in water, he may suffer injuries he will need to recover from. If a steed or, well, a wolf, a rhino, or a dragon turtle are used for travel, a player will reach his desired destination faster. Scarce resources like herbs, ore, leather, cloth, meat, fruits, and other commodities may be found within the game world that can be used for production of goods and trading.[3] The game world is software-rendered textually, in 2D, or as mostly common today in 3D.

If the above described and to which degree it applies for a specific game world depends on the entrepreneurial decision of its creators, the MMORPG developers. This is because online roleplaying games are computer-simulated. Every interaction between the users and the MMORPG environment is computer-mediated by the underlying game code. If a player wants to craft a sword, program code and database

1 Exceptions may be space-based MMORPGs like *EVE Online*.
2 Currently, more than 94% of all MMORPG market share takes place in a fantasy setting, Woodcock (2008), Chart 8.
3 A more detailed description of initial gameplay, physics and resource interaction experiences within MMORPGs can be found at (Castranova, 2005b, p.34-40).

entries for its resource requirements, the process of production, game-related rights of ownership, visual representation, limitation of usage etc. within the game have to exist *ex ante*. Anything within the MMORPG is the result of the execution of software code based on database entries. (Bartle, 2004, p.22f.); (Castranova, 2005b, p.7)

MMORPG users may only perform actions that the software code and the hard-coded ruleset of the online world allow. This generally leads to the players giving up some of their real-world freedoms and, in exchange, being granted new freedoms and benefits. (Bartle, 2004, p.13) In the real world, players may freely interact with a chicken, e.g. they may try to chase it, lift it up, or imitate it. In a MMORPG, a chicken may not react at all upon being chased. But, given that the underlying code allows it, it may be attackable with e.g. very limited self-defense routines.

This is also the case for all economic-motivated actions within the MMORPG. In the above example, it might economic-wise only be a good idea to raise and sell chicken for an in-game living if the chicken raiser can protect his chickens from being attacked by other creatures and players. Consequently, any economic action is subject to an underlying hard-coded ruleset. All MMORPG users are bound to those coded restrictions. The restrictions can be of great variety. While a MMORPG may allow unlimited storage room for resources and commodities, another MMORPG may limit the amount one can carry by a certain attribute, e.g. the strength of the player's in-game character, leading to according economic consequences in terms of transportation costs for their carriers. Code may also technically allow, prevent, or outlaw theft, resulting in according economic implications for the protection and handling of in-game property.

In the real world, certain acts, e.g. theft or murder, are regulated by institutionally imposed and prosecuted law. They are technically possible, but severely punished upon detection. In MMORPGs, certain acts and behavior can *ex ante* be completely excluded by code, e.g. a player may only be allowed to try to pickpocket players from certain factions or computer-controlled characters. This issue will be of further importance in Chapters 4 and 6. For now it suffices to state that anything a player can do within an online game world is based on the code-wise allowance of its developers. This limitation of available interactions with system-internal commodities and activities accordingly influences their in-game evaluation.

2.2 PERSISTENT WORLD

MMORPGs worlds are not only computer-simulated, they are also persistent. In a single-player role-playing computer game, one can usually save the current state of the game world. Upon return, the previous state is loaded and the player can continue where he left the game. This is not the case for MMORPGs. Persistent means that the game world continues to exist and changes while a user is not connected to the game.

This is, in terms of economics, important since it ensures a more or less stable persistence of personal belongings. If the game only allows

theft of a player's belongings if that player is logged in to the game, a player can be sure that his possessions at the time of logging out will still be there when he relogs into the game.(Castranova, 2005b, p.80f) Accordingly, commodities acquired within a MMORPG retain emotions and in-game resources and effort connected to them and gain a long-term meaningfulness. Having things within the game results in personal value attached to them and thus the sense of personal accomplishment and evaluation.

The characteristic of persistence also leads to real-time interactions. If a certain commodity or resource within an MMORPG world can by code only be acquired at night and a user would like to acquire that certain commodity, he will need to log into the game at MMORPG night time.[4] This is likewise the case for certain transactions between the player and the computer-simulated environment: if a computer-controlled character[5] is only willing to buy certain ingredients harvested by the user at a certain time, the user will need to trade with that NPC at that particular in-game time if he wants to meet that specific game-side provided demand.

If a player decides to raise chicken, and the chicken have a coded rate of reproduction, the player may log out of the game having 15 chicken. Due to persistance, the chicken population continues to grow. Upon return a day later, his chicken population may have risen to 25. It may, however, also have vanquished because he forgot to lock up the hen house and all chicken were eaten by computer-controlled foxes. The chickens may also have vanquished because they were not fed within the last 12 hours, or because all his chickens were killed by other players. The later may be the case because MMORPGs are also multi-user spaces.

2.3 MULTI-USER SPACE

MMORPGs allow the simultaneous connection of multiple users to the persistent and computer-simulated game world. Due to different preferences concerning the use of their playtime, MMORPG users will spend their available time in a different way. Some may want to accumulate in-game commodities, while others prefer to communicate with other players. Some just wander around looking for adventures. (Yee, 2006, p.5)

Through their individual way of interaction with the MMORPG, through consumption of certain game content, and consequently accumulation of playstyle-related commodities, the users express their own personality. (Lastowka and Hunter, 2003, p.64) Through communication with other players and thus social relations, they will compare the outcome of their time spent with each other. (Lehtiniemi, 2008, p.36) That way, they can increase their relative social in-game status towards other players. If a player feels that he lags behind other players in general or players of his individual playstyle, he can set himself goals to catch up. Social value, relative comparison with each other, and societal evaluation are added to the personal value of acquired commodities.

4 Due to being computer-simulated, time of night within a MMORPG and in real time need not necessarily overlap.

5 Also called NPC, non-player character.

For example, upon raising 1,000 chickens a player is granted the title *the Chicken Breeder* that he may display to other players. In addition to the personal value and invested effort he connects to that title, he can now receive additional social value through the admiration of other players. Players who are not yet entitled the title are given a potential goal for personal in-game accomplishment.

Professor Castranova made an effort to convert the value of commodities obtained by *EverQuest*[6] players to an hourly wage. Based on dollar to platinum[7] exchange rates, he concluded that in 2001, *EverQuest* players made $3.42 per hour and respectively generated $14.15 of utility per hour. (Castronova, 2001, p.35f.) The accuracy of this wage, however, is arguable. Non-monetizable values are not factored in, e.g. the duration or challenge it took a player to obtain a certain commodity. It relies on self-reported, not factual data. Also, the exchange rate of platinum to dollar rather represents a grey or black market but a free market platinum price. Even the 2005 introduced official exchange platform for *EverQuest* currency and commodities, *StationExchange*[8], does not provide accurate information as the exchange rates do not account for the social costs caused by the exchange which will be discussed in further detail in chapter 3.

Up to this point, a MMORPG is a computer-simulated game that keeps running when a player is not connected to it. Players may acquire commodities through own means and brag about them to other players by the use of communication tools like chat or voice chat to further increase the personal valuation of acquired commodities.

2.4 SHARED COMPETITIVE AND/OR COOPERATIVE TASKS

In addition to the above characteristics, MMORPGs are also shared places where players can interact with each other real-time. While hunting deer or more dangerous beasts to obtain their hides that are used for e.g. crafting leather armor, a player may encounter another player who set out into the forest for the same purpose. Based on their personal desires and playstyle preferences, they can choose one of several options.

They can become competitors. They are both hunting for a scarce resource, as hides are only provided at a few places within the MMORPG world at a limited rate of re-appearance.[9] Through in-game use of force, annoyance, or other in-game means they can try to drive the other hunter away. Efficiency of hide hunting is maximized through domination of the area where scarce hides can be obtained. The players may try to drive away congestion of a common good before it even occurs.[10] Instead of using brute force within the game world, one of

6 A MMORPG released by Sony Online Entertainment in 1999.
7 *EverQuest*'s in-game currency.
8 http://stationexchange.station.sony.com, accessed 26.07.2008.
9 That term is also known as so-called respawn-rate, a common solution within MMORPGs to temporarily limit the availability of certain resources and thus induce and simulate scarcity. See Bartle, 2003, p.347 for further information.
10 If a deer is automatically provided by the game it is rivalrous, but not excludable and thus a common good unless there are means for players to claim its ownership within the game world.

the players may also try the use of economic force, paying the other player with in-game currency or commodities to leave the forest.

Second, they can try to find a solution through direct negotiation. An agreement can be made that Player A hunts deer south of the river within the forest while Player B moves to the forest north of the river. However, as soon as a third player enters the forest to hunt down deer, all of them will need to find a new agreement and re-coordinate their activities.

Last, they may as well cooperate. Hunting together, their pace of killing deer is increased, the hides and other commodities acquired during that time are shared. With combined strength, they may now even be able to delve deeper into to the forest and hunt down more dangerous but also more profitable creatures, e.g. bears. For certain tasks, the use of the cooperative method may even be required because a single player is not able to achieve a goal by own means. Cooperation is usually enhanced in MMORPGs. While accumulating MMORPG commodities or even before entering the game world, due to limited advancement opportunities, players specialize in certain skillsets to become specialized agents. (Castronova, 2001, p.11) Through computer-simulated restrictions, they again give up a part of their personal freedom to be granted new freedoms and certain skillsets. Through combination of the skillsets, previously unbeatable tasks can now be completed. Some of those cooperative tasks require the coordinated skillset combination of a large group of players. That has even lead to the evolution of completely player-enforced and -regulated currencies called DKP, dragon kill points, where players participating in certain cooperative tasks are compensated for the provision of their specialized skillset. The DKP can then be used during cooperative activities to buy cooperatively achieved in-game commodities of very high quality. (Castronova and Fairfield, 2007, p.4, 7f.)

The specialized skillsets can be combined real-time or subsequently. This results in division of labor and emergence of both social and business networks. For example a miner, a blacksmith, and a geologist may work together to increase their individual productivity and share the outcomes of their combined skillsets. The specialized skillsets and anything else players acquire during MMORPG gameplay, are aggregated into individual corporeal representations within the game world, the avatars.

2.5 SELF-REPRESENTATION THROUGH THE AVATAR

The avatar is the bundle of all tangible and intangible, environmental and bodily attributes that a player acquires while playing an MMORPG. (Castranova, 2003b, p.7f.) Tangible assets are anything one can visually demonstrate within an MMORPG world.[11] Intangible values are immaterial goods like social status, reputation, and knowledge about the game's mechanics or certain in-game locations. Other bodily and environmental attributes further enhance the avatar: the chosen game

11 e.g. rideable mounts, armor, weapons, raw materials, currency, MMORPG real estate etc.

world ruleset[12], level[13], class[14], gender, or attractiveness[15]. (Castranova, 2003b, p.23f.) All social, reputational, and personal accumulations are combined and aggregated into the avatar entity. (Castranova, 2003b, p.6) That way, the avatar becomes the proxy for all of the player's in-game actions performed by that specific avatar. (Manninen and Kujanpää, 2007, p.25)

That condensation of player-acquired values causes a lock-in effect: certain attributes and commodities are untransferable, especially to worlds of other MMORPG competitors but also to other avatars within the game. Migrating to a different online game world results in high switching costs, as all avatar capital, social status and reputation and all progress within and knowledge of the current MMORPG have to be re-acquired in the migrated-to online game world. (Castranova, 2005b, p.139f.) This lock-in effect is desirable for the game's operators as it reduces likeliness of a player switching to the MMORPG product of a competitor. (Shapiro and Varian, 1999, p.152)

To compensate parts of their switching costs, players but also RMT services often sell avatars or some of their accumulated virtual commodities for real money. Based on the prices, professor Castranova has tried to determine *Norrath*'s[16] average gross national product, GNP, that is the total amount of wealth an *EverQuest* avatar generated within a year. He concludes that as of 2001, an *EverQuest* player accumulated a total wealth of $2,266 per capita per year, making *Norrath* the 77th richest country in the world based on World Bank data. (Castronova, 2001, p.32)

That data is again questionable. As Castranova confirms, avatars are usually offered at a discount price as certain customization options, especially in terms of avatar appearance, are lost when a pre-made character is sold. Also, the social status, reputation, and system-related knowledge of an avatar cannot be included in the shadow price as the person connected to that avatar changes. (Castronova, 2001, p.32) Due to the shadow price, the calculations rely on external market data to measure internal econometrics. Because of the different activities performed in real life and within an MMORPG, the GNPs are rather contextual than comparable. Plus, only those activities that avatar buyers are willing to pay for are included into the measure. In addition, Castranova used the number of average concurrent users for the GNP determination whereas for real world measurement, total users are factored in. (Lehtiniemi, 2008, p.32f.)

Independent of the significance of the data, however, it is certain that avatars and all commodities acquired within a MMORPG do have a real economic value as other MMORPG users decide via in-game and game-external willingness-to-pay that the offered commodity is scarce and thus of value to them. That the virtual commodities can only be used within a game is irrelevant as far as economics is concerned.

12 Within some MMORPGs, players may choose to which degree they are attackable to other players.
13 The level is a numeric indicator for the amount of an avatar's in-game experience.
14 Classes are predetermined combinations of skillsets, e.g. warrior, wizard, cleric, necromancer etc.
15 Which is obtained through both character customization before entering the game and acquisition of in-game commodities like worn finely woven robes or rare armor.
16 The name of the game world in *EverQuest*.

(Castranova, 2006, p.4) The value of an avatar but also of any other single commodity is determined by several parameters which can be maximized for optimal individual allocation of scarce MMORPG play time. This leads to the avatar production function.

2.6 AVATAR PRODUCTION FUNCTION

According to Castranova, 2005b, p.187f., the production function of each avatar is:

$q = f(L, H, A, K, R)$.

In prose: objects q are acquired by a player f through the combination of his time L, his competence of play H, his avatar attributes A, his avatar's equipment K, and the number of obtainable[17] resources R provided by the game world.

A few factors from the previous sections, however, should also be considered. One of them is game knowledge. If a player finds out about certain game rule mechanics, e.g. how to maximize a certain avatar attribute for a certain skillset very quickly, he acquires an advantage compared to other players with the same skillset. For example, a player who inhabits the in-game societal role of a cook discovers that adding wine to his food increases the quality of his meals. None of the above mentioned factors are enhanced by this discovery.

Wealth in MMORPGs also means the accumulation of social status and reputation. (Bartle, 2004, p.13) A player can develop and enhance his social standing towards other players through actions that can not be determined by his equipment, his avatar's attributes, or his competence of play. For example, a player may be known as a charismatic player of great personality or as a tactically skilled commander, or other skills not or at most rudimentarily technically represented by available measurable numeric avatar skillsets. This system-internal social network can be included within the factor H of an avatar, as it increases availability of additional system-related knowledge and information. A measurable numeric value for that social network is hard to determine, though. In addition, the social network is bound to the according person behind the avatar and thus intransferable.

Users not only log in to a MMORPG for pure means of maximum avatar productivity. Playing MMORPGs is also a recreational activity where personal enjoyment is of importance. (Kaminski, 2006, p.4) Still, there are vast realistic economies within MMORPGs. In-game, players trade obtained commodities and raw materials with each other, specialize in trade skills and other professions, and sell their products to other users. The game economies are an essential part of each MMORPG world. As they are of economic significance, they are also susceptible to the same influences as real life economies. (Castranova, 2007, p.2) Those influences that regularly occur within MMORPGs have lead to severe in-game price instability which will be discussed in the next chapter.

17 The amount of obtainable resources may be restricted by skillsets available to the avatar, player congestion of a resource node, skillset limitations etc.

3

PRICE INSTABILITY IN MMORPGS

In this chapter, price instability within MMORPGs will be illustrated and analyzed. First, MUDflation, the phenomenon MMORPG in-game markets usually suffer from, will be explained and presented with available data 3.1. Second, the two aspects of MUDflation will be analyzed: excess demand in rare luxury and high-end goods 3.2 and excess supply in money 3.3. The later derives from discrepancy of inputs and outputs 3.3.1, non-profit intra- and inter-user transactions 3.3.2, and Real Money Trade 3.3.3. Following, the effects of MUDflation are demonstrated. Within the online game worlds, MUDflation leads to devaluation of in-game commodities and thus the value of time and effort invested into the game 3.4. This affects the game-external interests of the MMORPG operators and their competiveness on the MMORPG market accordingly 3.5. Subscription revenues are decreased 3.5.1 and service provision costs increased 3.5.2, which threatens profitability and competitiveness on the MMORPG market.

3.1 THE MUDFLATION PHENOMENON

MUDflation[1] is generally refered to as the devaluation of common low- to medium-quality in-game commodities combined with the simultaneous increase of prices for rare high-end and luxury goods. (Dibbell, 2006, p.89) The general price level within the MMORPG economy decreases even though more and more money enters the game's economy, which would normally result in inflation and a price level increase. (Castranova, 2005b, p.196f.) Instead, MMORPG players prioritize consumption of the scarcest goods within the online game worlds.

According to Castranova, Lehtiniemi, and Heeks, the rate of commodity devaluation within MMORPGs is significant. In 2001, the Everquest world suffered from a 29% deflation within one year due to the price collaps from items. To determine the decline in prices, Castranova chose a non-weighed basket of 29 medium quality commodities. The results are questionable as the actual standard bundle of items remaines undetermined, Castronova, 2001, p.34, and the actual cost-of-living is not factored in. (Lehtiniemi, 2008, p.34) Also, the data used by Castranova was provided by some, not all, players of the *EverQuest* game world to a game fanpage internet database. Therefore, data errors are very likely. Lehtiniemi's results, however, support the general tendency towards high deflation within MMORPGs. Lehtiniemi was provided with logged and thus highly accurate economic data by the operators of the sci-fi MMORPG *EVE Online*. He then used official UN econometrics to determine *EVE*'s inflation rate. Within 2006, prices deflated by 12%. For the first six months of 2007, the deflation of virtual commodities sold on *EVE*'s market went up to 8-10% per month, or 48-60% within 6 months.

1 The term origins from the combination of the two words MUD, abbrev. for "'multi-user dungeon"', the text-only predecessor of MMORPGs, and inflation.

(Lehtiniemi, 2008, p.63) Heeks compared in-game currency to dollar exchange rates from 2005 and 2008, using inofficial grey market prices for currencies of MMORPG titles with the currently largest subscriber bases. Within that timeframe, in-game money devalued against the dollar by roughly 75%. (Heeks, 2008, p.22) While more accurate and long-term data is required to varify and further validate MMORPG tendency towards high deflation, its existence is undeniable.

Deflation is a decrease in the general price level. It leads to reduced consumption and investment as consumers and producers delay purchases until prices fall even further. It usually occurs when the supply of money decreases. Within MMORPGs, however, the supply of money rather rises, which should theoretically result in inflation and increased consumption. Within online roleplaying games, both is the case: there is generally a high willingness-to-pay for rare top quality items whereas there is little to no demand for common low- to mid-quality products. Following, both excess supply in money and excess demand in rare high-end and luxury items will be analyzed and discussed in detail.

3.2 EXCESS DEMAND IN RARE LUXURY AND HIGH-END GOODS

Within MMORPGs, there is usually a great demand for rare high quality goods while players struggle in selling common low- to mid-end quality goods on the player-to-player trade market. Castranova argues that this is due to the ongoing gradual increase in avatar gear. (Castranova, 2005b, p.197) The increase of avatar attributes within MMORPGs usually unlocks access to items of greater quality. For example, as a result of practising in sword combat, an avatar's attribute for fencing rises above a certain value so that he can now not only use swords, but also broadswords. To show off his increased status, the player switches to the now accessible unlocked weapon type and gets rid of his old intermediate sword by selling it to an NPC or to another player. As available attributes are usually limited, e.g. by a maximum obtainable avatar level, the amount of acquirable improvements diminishes over time invested into the game. As a result, the amount of intermediate items within the game economy rises as they are provided by both advancing players and by the game world. Simultaneously, the competition for rare and high-end commodities intensifies and thus the prices for these items increase.

This results in an according distribution and high availability of intermediate commodities within MMORPG markets. In order to reduce supply of intermediate items, different strategies could be performed to reduce their availability and increase their meaningfulness and importance. In addition, players need not, like within the real world, invest a substantial amount of their in-game income on necessary expenditures like food, shelter, or health care. The cost of living and the urgence to meet basic needs is rather rudimentary within MMORPGs, e.g. in-game armor and weapon repair costs. This accordingly affects player consumption. In order to further increase price stability within online game worlds, in addition to the MUDflation problem both issues would need to be adressed by the game developers. A thorough discussion of these two issues would, however, go beyond the scope of this thesis.

For the individual player, demand in very scarce items is a reasonable strategy in terms of the avatar production function: while low- to mid-quality items only increase the avatar gear to a lesser extent, investing in highest quality commodities maximizes several factors. Avatar gear is boosted for the greatest available extent. Consequently, the outcome of time invested, game-internal reputation, and overall earnings are increased in the most efficient way. As competition for high-end commodities gets more and more intense, it is likely that the acquired commodity will increase in value whereas low- to mid-end quality items will probably rather decline. It is in a player's best interest to maximize his current gear status as soon as possible. That way, high prices for high-end goods are repeatedly approved by the player community. Through high overall equipment quality, the time and the effort it takes to acquire commodities is reduced.

Robinett argues that the players' willingness to prefer spending in-game money over spending in-game time on increasing avatar capital suggests that a lot of players rather judge the process of reaching the maximum available skillset as a necessary evil than an enjoyable experience. (Robinett, 2006)

3.3 EXCESS SUPPLY IN MONEY

Independent of the motivations for demand in high-quality goods, there apparently is an excess supply in game money as players are wealthy enough to invest in rare high-end commodities, even when their current avatar status in terms of available time, gear, and avatar skills is rather low. Wealth, of course, is a relative measure: in developed countries, a person is wealthy when he has significantly more income than the majority of the people. In a developing country, a person is wealthy when he has a regular income. Interestingly, in 2001 the poverty rate in *EverQuest's Norrath* was 33% based on median wealth and 68% based on mean wealth. (Castronova, 2001, p.36) While a substantial part of the players can apparently afford the best purchasable commodities within the game, there also seems to be a large amount of players that have no means whatsoever to catch up to the relatively wealthier MMORPG citizens. The range of goods and commodities the less wealthy players can produce and acquire does not surpass the in-game profitable quality level that would allow them to catch up. Prices for rare high-quality items are consequently unaffordable for them.

How come this large amount of money is available to certain players will be explained in the following subsections. Three different sources of excess supply in money within MMORPGs can be identified:

- excess supply acquired solely through avatar means,
- excess supply acquired and subsidized through in-game supporters, and
- excess supply acquired and subsidized through game-external means.

3.3.1 *Discrepancy of Inputs and Outputs*

In MMORPGs, wealth generally enters the economy faster than it leaves it. (Bartle, 2003, p.30of.) Burke argues that this is because raw materials, commodities, and other marketable items are so rapidly renewed within the game world that they are nearly infinite in supply. In addition, he states that only few commodities are taken out of market circulation, piling up the supply of goods even more. He also suggests that exploiters and powergamers, groups of players that seek the most efficient and fastest acquisition of commodities for the least or even no risk, outnumber the, as he calls them, moral economists. (Burke, 2002, p.5,8,9-13) Dibbell mentions that MMORPGs lack consequence and economic risk. (Dibbell, 2003), (Dibbell, 2006, p.103) If something goes wrong, players may just loose some of their time to recover but not loose their previous acquisitions.

A person solely driven by economic rationale would usually stop acquiring commodities if sale prices and thus his wage were too low. The avatar production function however, as explained in the previous chapter, does not only consist of the acquisition of better equipment and wealth. Activities that generate albeit inefficiently monetizable commodities often also increase other avatar-driving factors like avatar attributes, game knowledge, social networking, or non avatar-related enjoyment for the player behind the avatar. (Dibbell, 2006, p.89) Especially the gradual increase of avatar attributes, the accumulation of avatar power alongside the accumulation of in-game financial power, is a common objective in role-playing games. A blacksmith may not only craft armor and weapons to make a living from it, but also to increase his blacksmithing skill to be able to produce commodities of even greater quality and value. To become a master swordsmith, a smith may first need to produce many common swords of lower and medium quality to raise his blacksmithing skill above a certain skillset value. Only after surpassing that value, he may forge swords of the finest and highest available quality. This can similarily apply to the acquisition of raw materials: to learn mining of silver and gold veins, a miner may first need to advance to that proficiency level by mining a lot of intermediate copper, bronze, and iron.

In addition to increasing avatar attributes, a steady increase in wealth can indicate to a player that he is performing well. Dependent on the gameplay features, he can determine if his business within the MMORPG is running smoothely or if he makes use of his chosen skillset in an efficient way. In terms of economics, this form of generating surplus income is completely fine as it rewards efficient use and allocation of available resources through good individual performance. As long as the outcome of one's personal work within an online role-playing game solely derives from investment of time and personal labor of that specific avatar, there is no need of regulation or interference through the game operators.

3.3.2 *Unbalanced Intra-Economy Transactions*

Besides wealth solely acquired through own avatar means, however, a player's avatar may also receive monetary support and subsidies from

other avatars. It can be distinguished between inter-player transactions and intra-player transactions.

As demonstrated in section 2.6, players support each other through their social network within the game. If a player acquires a commodity he cannot or does not want to use, he may as well donate it to a player of his social network to reinforce his social status. That way players enhance each other based on mutual social connections. (Burke, 2002, p.7) Tangible and monetizable gear is exchanged for intangible and non-monetizable social status. While this kind of inter-player transaction may but does not need to be balanced through social connections, it is hard to acknowledge and validate it technically as player-based motivations for donations cannot be acquired and tracked. Solely technically speaking, when a player donates an in-game commodity to another player, the receiving player gets something in return for technically nothing.

Intra-player transactions, on the other hand, can rather be classified as the redistribution of a player's general wealth between his in-game personifications, his avatars. Players are often allowed to have multiple avatars within an online roleplaying game. A player may, for example, want to use another avatar for storage purposes. These so-called "'mules"' are sent items that the so-called "'main character"' of a player does not need on a daily basis to clear up or organize limited storage room. (Burke, 2002, p.8) A player may also want to swap to another predetermined skillset when he wishes to try out another skillset or in-game role and previously obtained avatar attributes are intransferable. He can then support his new avatar with the wealth acquired by his previous avatars.

But MMORPGs are usually designed in a way that the outcome of invested time gradually increases through avatar progression. For example, an expert alchemist can produce potions worth of at least 50 in-game gold pieces per hour while an apprentice alchemist may at most earn five gold pieces per hour. If a new avatar is supported by a further developed avatar, he is subsidized with sufficient funds to acquire commodities within the MMORPG economy that he could not afford by own means and he can progress through the ranks faster than an unsupported player. (Burke, 2002, p.7)

The above described intra-economy transactions allow the, in comparison to non-subsidized avatars, very easy acquisition of items, commodities, and even skillsets without being backed up by time and effort invested into the game by the receiving avatar for a gradual individual progression. Subsidized avatars acquire resources, avatar skillsets, and wealth based on others', not their own avatar production function. If these transactions are allowed by the game, subsidies Z would have to be added to the avatar production function, with the according externalities caused by them, that is welfare losses. Through these unilateral unbalanced transactions, certain economic principles which will be discussed in chapter 5 are violated and thus have to be regulated. The last source of excess supply in money, real money trade, RMT, will be illustrated in the following subsection.

3.3.3 *Real Money Trade*

RMT is the "'direct consequence of the scarcity of the users' time"'. (Lehtiniemi, 2008, p.19) It is a process where players who lack the time, ability, or patience for MMORPGs invest real life surplus to acquire virtual surplus. (Dibbell, 2006, p.12) This has lead to the emergence of services where companies employ people with a low opportunity cost on time to perform certain tasks within MMORPGs. (Lehtiniemi, 2008, p.24) These employees are generally refered to as "'Chinese gold farmers"'. They work in 12-18 hour shifts in-game, continuously acquiring resources, in-game money, and commodities provided by the game world, and then sell the obtained system-internal valuables via resellers to MMORPG players for real money.[2]

The range of provided RMT services is very broad. All tangible in-game goods are traded: weapons, armor, real estate, and other commodities, MMORPG currency, accounts, and avatars. (Bartle, 2004, p.3) Many other services are provided. Players who want to change the game server[3] or switch to another MMORPG can have their previous in-game wealth transferred to the new server or game. (Dibbell, 2006, p.173) Platforms have been implemented where players can, outside the game, exchange in-game commodities between each other for a fee. There are platforms where players interested in RMT services can compare the prices of the different RMT sellers; and platforms where players can compare prices of in-game commodities across game servers. (Castranova, 2005b, p.164) Within year one of the officially tolerated RMT platform *Sony Station Exchange*, 58% of expenditures were spent for acquiring in-game money, 38% to have one's own avatar skillset increased by others, and 3% for in-game item sales. (Robischon, 2007, p.5)

Ebay's market volume of virtual item trade between April 1st to April 14th 2004 was $156,857. (Bartle, 2004, p.2) In 2006, the RMT market leader IGE estimated the overall RMT market to be worth about $900 million and projected a growth to $7 billion in 2009. (Kaminski, 2006, p.2) The Chinese government claimed in 2006 that in China alone the RMT market volume was $901 million. (PlayNoEvil, 2007) Heeks states that the current gold farming market volume exceeds at least $500 mio. per annum. (Heeks, 2008, p.9f.) As of 2006, the *World of Warcraft*[4] currency traded at a rate comparable to the Russian ruble, the *Lineage II*[5] exchange rate was on par with the Turkish lira. (Dibbell, 2006, p.12f.) *EverQuest II* introduced *StationExchange*, an official RMT service for two of its game servers in 2005. According to official data provided, 1,500 of 9,042 registered players used that service, generating a transaction volume of $2,588 per day. (Robischon, 2007, p.3f.) Independent of the actual market volume, it is safe to say that the size of the RMT market is significant. If there is a significant market volume and a demand for the provided services, a supply side will arise and meet that demand to generate real-life profit.

2 For more information on the term and on the life of a "'Chinese gold farmer"' see Dibbell, 2007.

3 Dependant on the game's success, multiple copies of the game world are provided by the MMORPG's operators. Players are generally allowed to have multiple characters on any of the game's servers.

4 Released by Blizzard Entertainment in 2004.

5 A MMORPG by NCSoft, released in 2003.

Motivations for that demand are various. Robischon states that most players used *SonyStationExchange* to fulfill an immediate desire, increase their in-game status, short-cut to content for in terms of avatar skills highly progressed avatars, or to stay aligned with friends who had more time spare. (Robischon, 2007, pp.18-20) Bartle states that players also buy and sell virtual goods to make profit and to get things they could usually not get due to the resource domination of gold farmers. (Bartle, 2004, p.17) Based on Yee's player motivations (Yee, 2006, p.774) Lehdonvirta analyzed player perceptions of RMT. He adds that RMT buyers also want to examine different avatar skillset configurations, gain a competitive advantage compared to other players, and assign tasks they do not personally like to perform within the online game worlds to other labor forces. (Lehdonvirta, 2005a, p.6)

While some of those motivations may seem individually reasonable, RMT greatly enhances the excess supply in money and MUDflation in general as game-external interests with a substantial monetary volume enter the MMORPG in-game markets. Due to its large volume, RMT can be declared as a main driver of MUDflation. Its effects on both the game-internal economy and on the operation of MMORPG services will be described in the following sections.

As described above, through the occurrence of gold farming and real money trade, a new industry has emerged. This industry currently employs several hundred thousand workers. Most of them work in China where the opportunity cost of time and workforce is low compared to wages in industrialized nations. (Heeks, 2008, p.14f.) One might argue that due to that new industry and the hundreds of thousands of new jobs, gold farming and RMT are beneficial to the global economy. Welfare analysts may argue that RMT leads to a welfare increase as producers and consumers generate surplus by trading available time for available real life surplus income. RMT however also generates significant social costs within the game and for the game operators that have to be taken into account to determine its overall effect. (Castranova, 2006, pp.6-8)

Profiteers of gold farming and RMT enterprises understandably support the existence of these markets. On the other hand, both regular players, that is players who do not participate in RMT and gold farming on the producer or customer side, and MMORPG operators argue that MUDflation and its main driver RMT lead to an overall distortion of the in-game economy 3.4. MMORPG operators claim RMT causes increased costs of service provision 3.5.1 and revenue losses 3.5.2.

3.4 IN-GAME EFFECTS ON STATUS AND WEALTH

In-game wealth, as explained in chapter 2, is accumulated by the steady increase of the factors that constitute the avatar production function $q = f(L, H, A, K, R)$. A player can accumulate more than he spends through efficient use of his play proficiency and game knowledge. Those two values cannot be acquired through other than an avatar's own means. Thus, this form of acquired wealth is backed up by personal commitment and skills. The free transfer of valuable in-game commodities to members of a player's social network increases the social status of the sender and the gear of the recipient. Non-profit

intra-economy transactions between player avatars are backed up by previous mutual interactions. As the time of acquisition and the time of reception do not overlap, however, the commodity may socially but not technically be allocated to that inter-player connection. While this behavior is certainly kind and strengthens social bonds, it also violates certain economic principles which will be demonstrated in chapter 5.

RMT, especially due to its large monetary volume, greatly deteriorates the value of all elements that are factored in the avatar production function. Gold farmers continuously harvest resources and commodities within and provided by the MMORPG worlds. They regularly occupy the most efficient resource spots within game worlds to gain wealth and items in such a way that they are able to claim those areas as theirs. (Blizzard, 2008), (Castranova, 2006, pp.17-19), (Jagex, 2008), (Kaminski, 2006, p.5) That reduces space and opportunities for in-game economic gameplay for regular players. (Millard, 2006) As resource nodes are occupied by the gold farmers, the stock of in-game materials and items obtainable through personal commitment and investment of scarce available play time remain constantly low. To acquire materials, regular players are driven to buy them from the RMT sellers with either in-game or game-external means, the later being real money. Through that in-game behavior of resource domination, gold farming enterprises generate their own in-game and out-game customers. As the game world resources required to increase avatar attributes are harder to obtain, it also becomes harder for players to advance their skillsets and thus to increase their in-game profitability and acquisition of wealth and status. (Castranova, 2006, pp.17-19)

As the gold farmers sell their obtained commodities on the in-game market, more and more money and items are pumped into the in-game economy. Regular players cannot compete with the non-stop working profit-driven farmers and are thus pushed out of the market through further deflation of common comodities and inflation of avatar upgrade costs. (ArenaNet, 2008), (Bartle, 2004, p.18), (Blizzard, 2008) This devalues previously obtained avatar gear, game knowledge and proficiency of play as players cannot make optimal use of their individual skillsets against gold farmers they cannot compete with. As prices for common goods steadily decrease, the players' returns of invested scarce playtime and thus the value of effort put into earning in-game things are diminished. More time is required to gather money for personal in-game needs. (Drescher, 2008), (Castranova, 2007, p.11) Consequently, time and effort invested into the game is less rewarding, overall earnings and the value of the player's in-game representation, the avatar, decrease.

In addition, the gold farmers make use of in-game communication tools like the public chat to advertise their services. (ArenaNet, 2008), (Blizzard, 2008), (Castranova, 2006, pp.17-19) That way, the players' experience of communicating with other players, especially at densely populated trading spots, is reduced. It is harder for regular player craftsmen to market their in-game wares as the communication channels for trading are spammed by RMT service advertisers. Hence, the opportunities for players to raise their social status, exchange game knowledge, and make an in-game living are deteriorated. That way, it is harder for system-internal interest groups to strengthen and retain community bonds.

As it is easier for RMT customers to obtain in-game commodities, play proficiency and game knowledge are devalued. The avatar gear is no longer associated with a player's in-game ability to play but rather with a player's out-game ability to pay. This is also refered to as cheating. (Lehdonvirta, 2005a, p.2), (Millard, 2006) To stay competitive with RMT customers, regular players have to either participate in gold farming activities, increasing congestion of resource nodes even more, or use RMT themselves. Through occupation of resource nodes and communication channels, RMT generates its own customers. This leads to frustration of regular players who may thus come to the conclusion that their time invested into the online game is not valuable enough any longer and quit the game. (Castranova, 2007, pp.11-13), (Jagex, 2008)

Heeks argues that the players who suffer from RMT and the players that oppose it do not overlap and that players themselves farm gold. (Heeks, 2008, p.19) As explained above, however, the social costs of RMT are solely born by the users who do not, do not want to, or cannot participate in gold farming activities. Second, regular players are driven to participate in RMT activities by the existance of RMT. RMT buyers and sellers get an increase in utility while the regular players' utility is decreased. (Castranova, 2006, p.7)

To summarize the above: RMT degenerates MMORPG in-game markets and their economic integrity, devalues the effort and time players invest into the online game world, and thus drives players out of the game. The value and outcome of the players' time invested is diminished as the overall social costs and negative effects on in-game trading greatly outnumber the individual benefits for RMT users. The overall quality of the MMORPG system is reduced which increases the required effort and thus investments for MMORPG operators to retain and increase the quality of their service.

3.5 GAME-EXTERNAL EFFECTS ON MARKET COMPETITIVENESS

MMORPGs are system software services run by private companies[6]. The service of operating online roleplaying games underlies the profitability constraint. Revenues are generated through the regular return of the customers to the service. For most MMORPGs, the payment of a subscription fee is required in order to be able to log into the game. In the recent past, other payment methods have been brought up, e.g. content update fees, in-game advertisements, or microtransactions. All payment methods, however, rely upon a substantial, steady, and healthy user base that continuously and regularly returns to the online game world.

This results in competition for subscribers by the game operators on the MMORPG market. In order to attract customers to their service and retain their current customer base, the developers have to continuously invest in the quality of their product. They have to maintain, update, and create additional game content to satisfy and entertain both their current and potential subscribers. It is in the developers' best interest to keep their players continuously busy and satisfied with the game. (Castronova, 2002, p.25f.) The lower they can keep the churn rate, the

6 In case of MMORPGs, that is usually the publisher or developer of the game.

rate at which people leave a virtual in-game community, the stronger the bonds within the player community become and the less likely players will switch to another MMORPG product. (Bartle, 2003, p.224)

The maintenance costs of MMORPGs are significant. MMORPG operators have to provide game servers, according server bandwidth, and employ according technical staff for server maintenance. Additional workforce for billing, customer service, and in-game issues has to be provided. A development team for the live service has to be maintained that continuously updates and overhaules existing game mechanics and game content and fixes software bugs. A second team is usually employed that develops additional large content updates. (Castranova, 2006, p.9f.)

Like with any other provision of a service, the operation revenues from subscriptions, microtransactions, or advertisements have to exceed the operation costs to remain profitable and competitive on the MMORPG market. The lower a MMORPG operator can keep his operation costs, the more likely he will remain in the market and the more money he can invest in increasing the quality of the provided service to attract additional and retain current customers. MMORPG operators that cannot remain profitable and competitive will consequently have to shut down their MMORPG service. The MMORPG that can provide the highest service quality and that can keep its operation costs low, will acquire a competitive advantage on the MMORPG market.

RMT increases MMORPG operation costs 3.5.1 because the game operators have to invest in combatting its negative effects. It also decreases subscription revenues 3.5.2 as customers frustrated by its existance leave the game by cancelling their subscriptions.

3.5.1 *Increased MMORPG Operation Costs*

As explained in section 3.4, RMT degenerates the quality of MMORPG systems, which damages the provided service's quality. (Castranova, 2006, p.13) To reduce the according negative effects for MMORPG economies, the game operators have to take actions to combat them. As it is hard to differentiate between a gold farmer and a farming player who tries to stay competitive to RMT customers, each case has to be examined individually by according personnel. Complaints have to be investigated and according action has to be taken. This takes away time from processing other game-related issues and from the development and update of game content, which endangers the satisfaction of the customers.

RMT sellers not only use cheap labor but also technological exploits like in-game software code bugs, trojan viruses and keyloggers. This further increases the required activities MMORPG operators have to perform to fight the negative effects of real money trade. MMORPG operators have to develop tools to fight and counter the use of game exploits and automated bots. Account fraud is also becoming a major issue where the online world operators have to help regular players to recover their lost avatars and items. (ArenaNet, 2008), (Blizzard, 2008), (Castranova, 2007, pp.14-16), (Jagex, 2008) In the recent past, several trojans were developed that steal MMORPG account login data and

send that data to RMT companies who then rip off all belongings of the account's avatars to then sell them on the in-game player-to-player or game-external RMT market.[7]

The workforce dedicated to fighting RMT is significant. For *Dark Age of Camelot*[8], 20% of the customer service personnel were assigned to that task. (Drescher, 2008) *Jagex*, developer of browser-based MMORPG *RuneScape*, describes the technological competition with RMT sellers, exploiters, and bots as an "'arms race"'. From 2006 to mid 2007, *Jagex* has seen a 250% growth in RMT sales. During that time, RMT accounts worth of 725 billion in-game currency units were banned, a real world value of over $4 million. For 2010, *Jagex* expects a banned amount of 8 trillion in-game money, that is $40 million. (Jagex, 2008) In April 2006, *Blizzard*, developer of *World of Warcraft*, banned 5,400 accounts and suspended 10,700 and another 30,000 accounts worth of 30 mio. in-game currency units in May 2006. (Blizzard, 2006a), (Blizzard, 2006b) In an interview, *World of Warcraft* game director Jeffrey Kaplan stated that *Blizzard* has an "'entire team dedicated to combatting people who cheat"' without revealing more specific info to keep according information undisclosed to RMT sellers. (Worldofwar.net, 2008)

This leads to a dilemma: the MMORPG operators need to keep their customers satisfied, which is costly. Fighting RMT and MUDflation further increases costs. To sustain or increase profitability of MMORPG service provision and thus overall competiveness, however, it is in the online game operators best interest to keep direct workforce-intensive control of the provided running service low. To avoid some common problems *ex ante*, players are expected to accept and abide to general gameplay-related rules imposed by the End User License Agreement, EULA, and Terms of Service, ToS. The world operators only intervene in-game if really necessary, with the result that within MMORPG environments many player-to-player issues are rather spontaneously regulated by the players.[9] (Burke, 2002, p.33), (Castranova, 2005b, p.208f.) If the world operators intervene, they usually do so with an act of oppressive tyranny to make an example of their omnipotent power.[10] (Castranova, 2005b, p.206-208)

RMT and MUDflation increase the amount of required oppressive acts, as they have to be looked into case-wise to avoid frustration of non-cheating players. They take away time and thus money from the MMORPG developers that could be used more constructively for the provision of the MMORPG service, for example the update of existing game features, the creation of new content to increase user satisfaction, or the reduction of customer service response time for other game-related issues.

7 e.g. http://www.symantec.com/security_response/writeup.jsp?docid=2005-073115-1710-99, Accessed 19.09.08.

8 A medieval fantasy MMORPG released by *Mythic Entertainment* in 2001.

9 E.g. if a player is harassed by another player, a common solution within MMORPGs is to call in reinforcements of allied players and use force of arms instead of calling in customer service personnel.

10 E.g. a player is banned for several days or even permanently.

3.5.2 *Loss in MMORPG Subscription Revenues*

As dedicating a substantial part of the workforce to fighting RMT and MUDflation costs money, the service operation revenues for online game developers are decreased. The revenues are further reduced by players that are frustrated by the negative effects of RMT on their in-game achievements and status.

For users, the subscription model presents a marginal choice environment: each user decides on a monthly basis if he wants to continue his subscription. (Castranova, 2006, p.10) As described in Chapter 2, however, the longer a player keeps his subscription running, the larger the avatar lock-in effect and switching costs grow as the personal evaluation of acquired commodities, MMORPG system-related knowledge, and community bonds gradually increase over time. Consequently, the less likely a player will want to switch to another MMORPG service to retain the previously acquired avatar value or to increase it even further. (Castranova, 2003b, p.6), (Castranova, 2005b, p.139) The devaluation of in-game wealth through MUDflation, as described in section 3.4, gradually reduces avatar value, the value of the time invested into the game and consequently the willingness-to-pay for the MMORPG service. (Castranova, 2006, p.19)

Both the lock-in effect and the devaluation effect gradually rise. As explained in 3.4, the devaluation effect diminishes all factors of the avatar production function. The lock-in effect, however, only affects the intangible elements of the avatar production function: the player's in-game social network as social connections with other players grow more and more intense and game knowledge with increasing time spent within the online game world, and to a lesser extent emotional connections to the avatar belongings acquired through investment of scarce playtime. If a player leaves the game because of devaluation of his system-bound investments, all his previously acquired in-game belongings are lost or at least frozen and thus taken out of the in-game economy. Also, the social bonds of his in-game social network are compromised, as social connections within the game are left behind. It is thus safe to say that the system-based avatar lock-in effect can at most partly absorb the external costs of the devaluation effect.

Therefore, Castranova's assumption that RMT leads to an increase in supply costs and a decrease in the demand for MMORPG services should be accurate. (Castranova, 2006, p.24) Castranova made a precautious calculation on the external costs of RMT based on that assumption. Presuming low elasticities of loss in subscriptions and increased MMORPG service provision costs, he came to the result that under careful calculation, RMT causes annual costs of $1.8 million per 100,000 users. (Castranova, 2006, p.29f) As RMT has grown rapidly within the last few years, it is safe to assume that, at a current subscriber base of 15-20 million MMORPG users, Woodcock, 2008, chart 4, the overall damages caused by RMT for the MMORPG operators and the MMORPG player-base add up to at least, but likely significantly more, 300 hundred million dollars per annum.

The simultaneous increase in service provision costs and decrease in demand for MMORPGs caused by MUDflation and RMT threaten the profitability of MMORPG operation. As Andrew Gower, *RuneScape*'s

lead developer, stated: "'There has been a significant increase in the amount of real-world trading this year. If we don't find a solution to RMT now, it will ruin RuneScape."' (Jagex, 2008) If the online world provider is not profitable any longer because the operation costs exceed the operation revenues, the online game has to be shut down. In that case, everything within the game world, all system-bound valuables and investments, community bonds, and individual system-bound reputation and status are irrevocably lost. The MMORPG and its overarching internal social and economic system collapse. Any investment and effort ever put into the MMORPG becomes useless, and any opportunity for RMT companies to generate real world profits from MMORPGs at all is annihilated. Gold farming gnaws at its own paw.

To prevent the threat of extinction through RMT and MUDflation for online game worlds, a viable and working solution has to be found that keeps system-external real money trade interests out of the game and that stabilizes MMORPG in-game markets. Castranova suggests that, due to their omnipotent power that allows them to change and adjust any in-game commodity at virtually no cost, price control may be a good policy for the online world operators to counter in-game price instability. (Castronova, 2002, p.4)

4

THEORY OF PRICE CONTROL IN MMORPGS

Price control has been performed both within the real world and within the virtual worlds of online roleplaying games. After discussing circumstances and goals of price control applied in the real world, 4.1, price control strategies performed within MMORPGs will be illustrated, 4.2. Within online game worlds, central planning 4.2.1, faucet / drain system 4.2.2, and customer service representative, CSR, prosecution 4.2.3, have been established. Their known outcomes within the game worlds are demonstrated in the corresponding subsections.

4.1 REAL WORLD PRICE CONTROL

According to Butterworth, price control is a "'policy used by governing authorities to restrict prices"'. He argues that it was used to deal with crises, monopolistic practices, and inflation. (Butterworth, 1994, p.1,3) The Romans used it to fight inflation. It was used in medieval times to enforce reasonable profits for guild members. During World War I and II, and in the Soviet Union, it was used to control the major elements of the cost of living index. (Butterworth, 1994, pp.4-20)

The overall purposes why price control was applied that are mentioned by Butterworth are questionable, though. The Romans were in a constant state of war, expanding and occupying territory through oppressive force. The overarching institutional and governmental system was organized in a way that matched that general focus on conquest, control, and expansion of power. Occupied territories were administrated, resources available within them were subordinated to the general goals of the Roman Empire. Free market prices and conditions at least within markets critical to the war and expansion efforts would have been harder to subdue to the overarching Roman Empire's interests. This similarily applies to the Soviet Union as well as governing authorities in general that are or were highly involved in military conflicts, e.g. a World War or a civil war; or authorities that, in terms of power, are or were reliant on the oppression of the civilian population. It is safe to assume that within the real world, price control was and is primarily used to exercise authoritarian control on the according markets and to subordinate them to the goals of the controlling authorities.

Thus, Butterworth's proposition that the popularity of price control greatly depends on the attitude of the people towards it is also questionable. He states that if it is seen necessary and effective and if it is appropriate for the current circumstances and objectives, price control is generally accepted by the people. (Butterworth, 1994, p.187)

Within the real world, consumers have or had no or very limited means to avoid price control policies. Emerging black market prices generally exceed prices set by the controlling agency. Emigration to other systems is either impossible because emigrants are declared enemies by either

the migrated-to or the migrated-from country or because emigrants have to face substantial costs of relocation.

On the producer side, price control has so far proven hard to maintain within the real world. Fixed prices reduce incentives for the producers to efficiently allocate resources. As the prices for goods are set by the government and not their manufacturers, the producers often circumvented price control by reducing product quality or by justifying price increases through cosmetic product changes.[1] (Butterworth, 1994, p.47)

4.2 MMORPG WORLDS PRICE CONTROL

The problems caused by price control within the real world that were described in the previous section are greatly reduced within MMORPG worlds. In-game producers cannot alter the quality of their products or apply cosmetic product changes. Resources and activities required for the production of a commodity are usually hard-coded as the game world is computer-simulated, 2.1. In addition, consumers within MMORPG internal markets are also consumers of a service provided within the real world. If they are not satisfied with the in-game market and price conditions, they may freely make use of an exit option by discontinuing their subscription. They still face switching costs or sunk costs through abandoning their avatars and in-game accomplishments. They do not, however, face threats of oppressive controlling authorities to their real life existance if they deny their approval to policies applied by the authorities.

Still, as shown in chapter 3, the necessity of a strategy to fight MUD-flation and the occurrence of RMT and to stabilize in-game markets is undeniable. Whichever strategy is carried out by the game operators, it is crucial that players do not get frustrated by it as only returning customers provide a steady income stream for the MMORPG operators. Second, it should not pose a high administrative burden on the developers to keep their operation costs low.

Several strategies of price control were and are still executed by MMORPG operators. The following approaches to in-game price control have been tried in the past by MMORPG developers: central planning 4.2.1, faucet / drain economy 4.2.2, and customer service representative prosecution 4.2.3. Following, the strategies and their known effects on the MMORPG economies and their in-game market prices will be described in detail.

4.2.1 *Central Planning*

Central planning is a strategy where the planning authority tries to presume and to match the input-output ratio and the production-consumtion market equilibrium for each commodity. (Butterworth, 1994, p.149) Applied to MMORPGs, a closed economy is laid out within the MMORPG world that is internally consistent. An MMORPG economy is designed where raw materials, currency units, and other economy-related quantities are fix. Upon destruction of commodities, their base

1 A strategy that pharmaceutical companies are still accused of today.

resources are returned to the economy to keep the fixed resource pool within the online game world stable. (Bartle, 2003, p.265)

A working closed MMORPG economy achieved through central planning could, according to Bartle, lead to several benefits: prevention of inflation, control of the prices by the market forces, and an economy-driven gameplay. (Bartle, 2003, p.266) If the amount of available resources within a central planned in-game economy is fix, every change in prices should then solely be based on supply and demand changes within the player community.

Central planning was attempted in *Ultima Online*[2]. Any in-game commodity consisted of a fixed amount of basic resources. Upon decay or breakage, the item's resources were returned to the economy. Raw materials could be acquired by harvesting resource nodes or by hunting certain creatures within the *UO* game world. Players could sell their crafted and obtained commodities to other players through non-player character vendors for prices set by themselves. The NPC vendors charged a fee for each transaction and quit the game world if they were not paid enough. Gold entered the economy through sales to NPC vendors and looting creatures. Gold and items left the economy through decay, consumables[3], NPC shopkeepers, and botched manufacturing. The overall economic design was completely based on basic macroeconomic rules. (Simpson, 1999, Ch.4, cf. figure 1)

The anticipated player behavior, however, turned out to greatly differentiate from the actual economic behavior of the *Ultima Online* users. *UO*'s economy was soon highly deflated due to large overproduction of goods. Regardless of market existence, players kept crafting and acquiring raw materials. The players did not only craft and adventure to sell their goods but, as skills improved through use, rather to expand their avatar capital. Independent of flooding the market with acquired goods and thus reducing prices, the users even expected to make a profit for their labor regardless of the market conditions. (Simpson, 1999, Ch.5)

Consequently, the shopkeeper economy failed. Designed as budget-constrained supply and demand simulators in the beginning, the NPC vendors ended up buying everything. They basically printed gold as they bought and sold commodities that were not backed by in-game market demand. That way, NPC vendors went broke, as they had no money left for actual market demand. The supply of the few items players really wanted was soon controlled by few but very powerful player guilds. Instead, players used the NPC vendors as safe deposits for their acquired commodities. (Simpson, 1999, Ch.5)

The in-game markets were also highly deflated: resources were stored by the players, instead of floating back into the economy through decay and usage. Raw resources thus dried up in availability and were very scarce. Consequently, players focussed on crafting could not further expand their avatar capital, got bored and complained about their economic situation within the game. They, however, also showed

2 Released in 1997 by *Origin Systems*.
3 Commodities with a limited amount of uses, e.g. healing potions, bandages, or hunting traps.

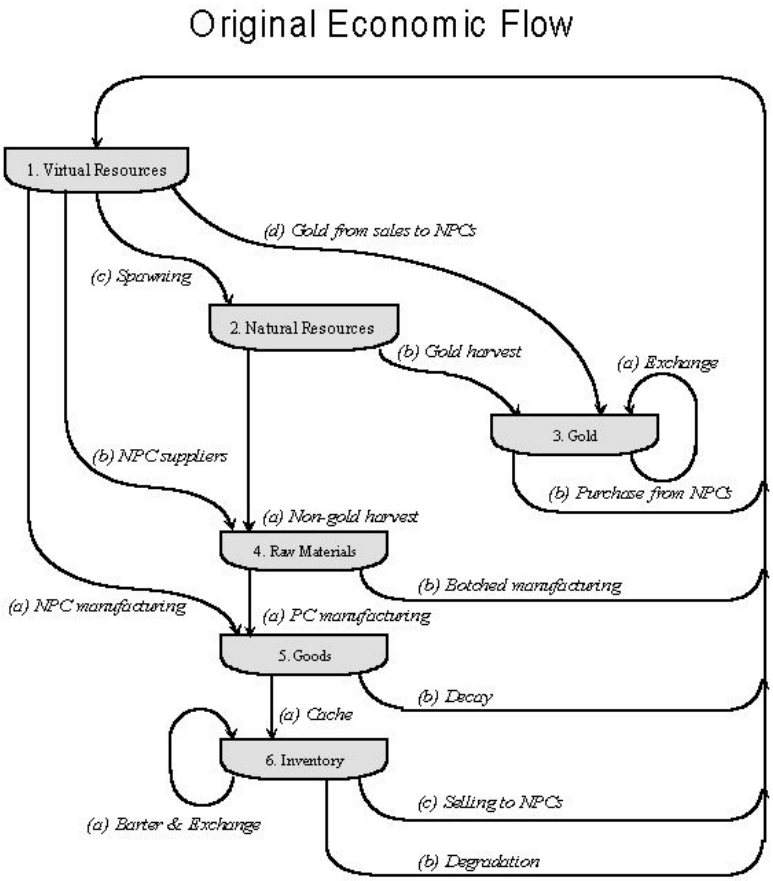

Figure 1: UO Original Economic Flow. (Simpson, 1999, Ch.4)

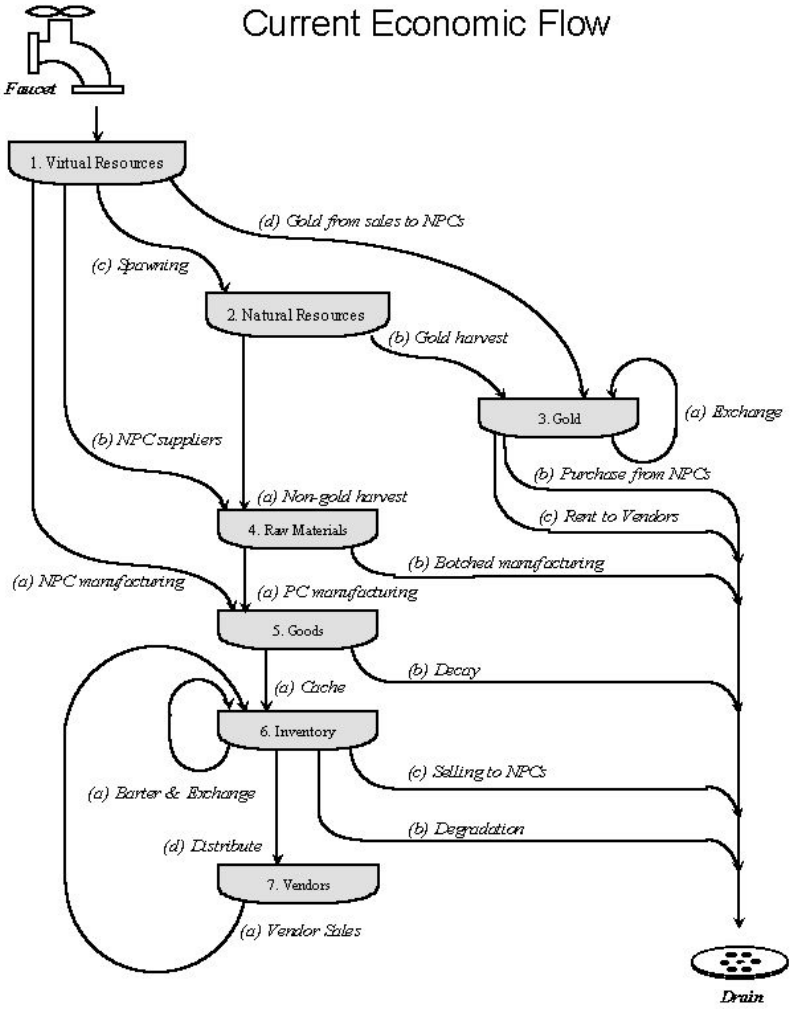

Figure 2: UO Revised Economic Flow. (Simpson, 1999, Ch.5)

high resistance towards anti-hoarding[4] policies like taxation or capital good depreciation. Even though it endangered the health of the closed economy, players apparently liked hoarding and used their obtained goods for decoration, speculation, or status symbol purposes. (Simpson, 1999, Ch.5, cf. figure 2)

UO's economy was further devastated through the exploit of counterfitting bugs, program code errors that, if abused, allowed duplication of in-game commodities. The market was flooded with in-game money, which caused hyperinflation. After the bugs were fixed, many players migrated to new non-inflated *UO* servers. Even the hyperinflated servers were not completely devastated economic-wise, however, because the highest quality items obtainable within the game were not purchasable with gold. (Simpson, 1999, Ch.5)

Overall, the central planning strategy to enforce price control in *Ultima Online* did not work at all. Central planning is very hard to balance, highly sensitive to bugs, and instead of accepting it, players will rather try to gouge this economy model. (Bartle, 2003, p.266) Butterworth adds

4 The massive accumulation, collection, and storage of in-game resources, materials and commodities, preventing their circulation within the player-to-player economy.

that direct control in general is impossible to implement. Due to too much information problems, uncertainty and unforseeable eventualities, the previously arrayed plans become infeasible, and shortages will arise. (Butterworth, 1994, p.148) The *UO* designers anticipated a certain player behavior and adapted their economic ruleset to those assumptions. When they found out that their users did not abide by that economic system, it was already too late to react.

4.2.2 *Faucet / Drain System*

As a closed economy model within the game did not lead to the desired results, an open economy has been established within *Ultima Online* and many other MMORPGs. This is an economy where in-game resources enter and leave the system with no prescribed relationship between each other. A certain amount of raw materials and in-game commodities regularly pours into the game world via the resource faucet, and a certain amount leaves the economy via the drain. (Bartle, 2003, p.265) That way, the MMORPG economy is based on a system of automated inputs and outputs. The in-game economy is designed in such a way that an average player can accumulate a reasonable amount of in-game commodities within a certain amount of time. The design effort for such an open economy is significant. (Castranova, 2007, p.7) For example, the rates for resource reappearance have to be carefully adjusted to retain at least a simulated time-based scarcity of raw materials and goods.

The players' equipment usually gradually increases over time spent within the game world. To retain a meaningful balance of faucets and drains, new ways have to continuously be found, developed, maintained, and implemented to gradually absorb the players' gradually increasing income. A common solution is to adjust avatar maintenance costs[5] to the avatar or gear level. (Schubert, 2006) Within faucet / drain driven economies, however, it is only a matter of time until players adjust to the game and find ways to increase the faucet and decrease the drain, a strategy where their in-game income vastly exceeds their regular in-game expenditures. Thus, new incentives have to be developed and given to the players on a recurrent basis to maintain a steady money and resource drain. For example, *World of Warcraft* refreshes its rated player vs. player[6] arena content roughly every six months, introducing new gear and resetting the previous arena season's standings.[7] This similarly applies to the introduction of other game content.

A system of soulbound items has also often been used in recently released MMORPG titles. As soon as a player picks up or equips an item, he is granted exclusive ownership and can only resale it to NPC vendors, not trade it with other players. Bind on pick-up items require the presence of the obtaining player at the time of acquisition within the game world, e.g. when a dangerous creature is killed through cooperative effort. That way, bind on pick-up items make personal investment of time mandatory to acquire certain high quality goods.

5 e.g. armor repairs, stable fees, costs for regularly used consumables, or in-game bank account charges.
6 Game content which is focussed on combat between player-controlled avatars.
7 cf. http://www.wow-europe.com/en/info/basics/arena/, Accessed 23.09.2008.

This strengthens social bonds as certain items can only be acquired through collaboratory effort, increases avatar lock-in effect and thus retains subscriptions. There are also bind on equip items that become bound to the equipping avatar when the item is used for the first time. Genender argues that this even enhances gold farming as valuable bind on equip items are preferably sold for in-game or out-game currency than being used by their finders. (Genender, 2006, p.1f.) This argument is questionable, though, as supply and demand per se enhances and enforces trading of goods between players. Player-to-player trade is rather threatened by certain unintended kinds of income, see chapter 3, than in-game supply and demand of commodities.

The faucet / drain system is regularly beaten by the players through increasing game knowledge. Players gradually learn how certain in-game goals and resource hurdles can be met at ease. Thus, drains have to be balanced very cautiously. If the required amount of money is too large for certain in-game goals, especially new players may even be encouraged to make use of game-external money sources like RMT services if they do not wish to, do not know how to or just do not like to overcome certain hurdles they personally receive as being too high. If the amount, on the other hand, is too small, players may take a certain commodity as a given by design and refuse to work efficiently at all for that particular goal.

Overall, resource and money drains can help to reduce the amount of money within a MMORPG's economy. Thus far, however, they have at most delayed the appearance of MUDflation and RMT and their negative effects. Some time, players will find ways to acquire money at a pace faster than it is drained from them. If not implemented carefully, drains may even enhance participation in RMT and other unbalanced transactions if the drains set by the game are too hard to overcome. Another performed strategy to fight MUDflation is prosecution of game rules by customer service representatives.

4.2.3 *Customer Service Representative Prosecution*

As design-based solutions thus far did not lead to the desired result, that is in-game price stability, regulation by contract has been imposed on the players of MMORPGs. Through the End User License Agreement, EULA, and Terms of Service, ToS, the MMORPGs are declared private property of their developers. Upon entering the game world, the users have to accept the EULA and ToS, contractual laws, and are to abide to the restrictions of their limited license of usage. (Pollitzer, 2007, p.22f.) By EULA and ToS, unfair competition, RMT, and cheating within the MMORPG are prohibited. (Dibbell, 2006, p.14f.) The MMORPG operators claim total authority. Through acceptance of EULA and ToS, players agree to a service provision with specific and explicit limits to their in-game activities. The developers claim total control over their game and the service's development, adjustment, and policing. "'Players pay for the privilege of access and their continued access is dependent on their agreement to abide by the code of conduct the developer lays out."' If the players are unhappy with those restrictions, they may still make use the power of their wallets and quit playing the game. (Drescher, 2008)

The validity of EULA and ToS was confirmed by US jurisdiction. Players are granted a limited license by the contracts which rightfully limitate the player's actions. The games can only be used for play, running a real world profit-generating business through accessing the game world was declared as violation of the game license. (Campbell, 2008, p.8f.) Consequently, anything a player acquires within a MMORPG should, in terms of rights of usage, be bound to the rules imposed by EULA and ToS, the underlying game mechanics, and the rule and game world modifications of the MMORPG operators.

By accepting the EULA and ToS, the users waive substantial rights: within the game world, they do not own the fruits of their labor, cannot assemble freely, and their freedom of speech is limited. (Castranova, 2004a, p.196) This particular distribution of property rights, however, is disputed. The game world operators justify that strong limitation of the players' rights stating that they need to maintain the control over the game world's environment; that the commodification of virtual objects interferes with the game enjoyment; and that the propertization of game items threatens the health of the community. (Fairfield, 2006, p.1097) There are both authors that support, e.g. Bartle, 2004, pp.5-8, Lastowka and Hunter, 2004, pp.306-310, and oppose, e.g. Fairfield, 2006, pp.1098-1101, the MMORPG operators' claims.

German law is quite helpful concerning this issue as it clearly distinguishes between property and possession. Property by German law is the legal right to conclude contracts about it, including legal sovereignty, legal estate and liability. Possession, on the other hand, means that a commodity's user has actual sovereignty over the item, but does not held any property rights and liability to it. (Theil, 2001, p.4) The possessors of virtual commodities thus by German law may freely transfer their items between each other and make use of them. They cannot, however, claim any property right to them as the MMORPG operator only grants possession of them, but no property rights.

The main problem that arises regarding limited usage of the MMORPG service by abiding the EULA and ToS is its prosecution. Prohibition of certain player actions is ineffective as it are hard to enforce. (Lehtiniemi, 2008, p.21) Players engaging in certain forbidden actions, e.g. RMT, access the game for unintended purposes. (Grimmelmann, 2005, p.9) Technically, though, those actions are still possible within the game world. There are contractual rules that outlaw RMT. The underlying hard-coded game rules and mechanics, however, do not prevent or exclude participation in it.

Many actions players perform within an MMORPG are checked and balanced by underlying software procedures. When e.g. an avatar shoots an arrow within the game, unavoidable routines are performed that determine the arrow's chance to hit based on e.g. the avatar's and the target's attributes. Social issues are, as stated in section 3.5.1, often solved by the players themselves through making use of the rather hostile environment of the game. The game operators only rarely intervene. Demanding a lawful behavior of the players by contract in a wild and very hostile environment with nearly non-existant authorities is inconsistent, opportunistic, and picky. The MMORPG designers request being free of unwelcome but also protected by favorable laws. (Grimmelmann, 2005, p.13)

The game world operators could prosecute undesired activities *ex ante* through hard-coded game mechanics. Instead, they seek costly and scarce *ex post* EULA and ToS prosecution through their customer service representative, CSR, staff. The CSR staff is opposed by a highly organized profit-driven RMT industry with a market volume of at least several hundred million dollars per year. It is not hard to predict which of the two will win that rat race.

So far, we can conclude, price control strategies applied by MMORPG developers within their products did not successfully counter MUDflation and RMT. Central planning was especially opposed by the players, while the other two, faucet / drain and CSR prosecution had and still have little to no effect on the existance of MUDflation and RMT. In the end, there is still a real world profit to be made. If a MMORPG developer wishes to prevent the significant externalities caused by MUDflation, a solution has to be developed that prevents their negative effects and existance *ex ante*. That mechanism, however, should not violate the basic economic principles that players demand being granted within the game through the game operators which will be adressed in the next chapter.

5 ECONOMIC DESIGN PRINCIPLES FOR MMORPGS

As explained in section 2.1, MMORPGs are computer-simulated. Any activity performed is thus based on the underlying game code. The game world operators have total control over their intellectual property and can alter anything within the MMORPG at any time. While the operators are almost almighty in terms of power, the players are rather powerless within the game world: they are bound to the EULA and ToS and cannot alter the game or its mechanics.

Real world circumstances, however, greatly limit the power of the MMORPG developers and compensate the players for their limited in-game power. MMORPG operators are private enterprises that provide a service bound to the profitability constraint. They need to invest in the development of new content, refinance their game development costs, and refund their service provision costs. Consequently, they are dependent on the regular return of their customers to the game world to generate continuous subscription, advertisement, or microtransaction revenues.

MMORPG players are customers paying for a service, and can freely make use of an exit option. If they are not satisfied with the game any longer, they can quit the game. If too many players leave an MMORPG for a certain reason, e.g. because they disapprove the occurance of RMT and the general price instability within the game's economy, this poses a threat to the revenue streams of the game world operators, forcing them to react with a viable solution to that issue.

Within the game world, MMORPG operators are almighty dictators. That power is, however, limited through the customer-power of the players. Reasonable complaints of the players have to be investigated and must not be ignored. (Castronova, 2002, p.32) An issue can especially be declared reasonable when it interferes with the interests of a significant fraction of the customer base, not only a single player or certain small in-game interest groups. Reasonable issues are especially violations of the principles of fair competition and economic participation that apply to MMORPG in-game societies and social structures: avatar diversity 5.1, equality of opportunity 5.2, demand for challenges 5.3, and demand for minimum rewards 5.4.

5.1 AVATAR DIVERSITY

As explained in section 2.4, MMORPGs are also characterized through shared and cooperative tasks. Consequently, certain societal roles are relatively scarce and valuated collectively. (Castranova, 2003a, p.14) If, for example, there are very few healers on a MMORPG game server, they grow in societal importance and may be wooed by certain player communities, e.g. powerful guilds. If, on the other hand, there are a lot of hunters within a game world, only those who prove an outstanding

play performance will be valued by the in-game player society. This leads to player competition within the available roles and skillsets. Through relative comparison between each other, players with a similar skillset can exchange information and discuss strategies and tactics, which further enhances the game's community bonds and social networking within the game.

The selection of a certain role or skillset is an individual decision. All career choices are completely self-determined. (Castranova, 2005b, p.71f.) This also has the positive side-effect that each user can pick an appearance and career that he is emotionally comfortable with. (Castranova, 2005b, p.108f.) Real life looks are, in theory, not an issue in terms of social bonds any longer, as discrimination of bodily characteristics can be masked through constructive social engineering of one's avatar. (Castranova, 2003a, p.17) If, for example, a MMORPG user prefers looking at a female body during gameplay, he may choose to be a female character within the game. That also applies for users who are unhappy with their real life job and who may now choose a career within the online game that suits their individual preferences more. While a low-wage call center worker in real life, within an MMORPG a player may become the leader of a large guild or a master in the fine arts of weaponsmithing. Bodily discrimination is however still an issue in MMORPGs: visually more appealing and male characters and certain skillsets usually sell for more in RMT based avatar sales. (Castranova, 2003b, p.28f.) Still, every user can choose in which particular way he wants to contribute to the game's society.

Those various individual choices induce a community of specialized avatars. Healers, wizards, armorsmiths, warriors, scouts, and enchanters share the same game world and provide each other with a large social and economic diversity. This consequently leads to interaction and enforces scarcity of certain skillsets, development of social and business networks, cooperation, and shared labor within the game. (Castranova, 2005b, p.115f.) Through using synergies of individually provided gameplay values and inter-skillset collaboration, be it for economic or other gameplay reasons, community bonds are strengthened and lock-in and network effects of the players to the MMORPG product increased.

This diveristy can provide a rich and complex social environment. It should also automatically move towards balance of skillset distribution among the players as long as every role has something unique to provide to the in-game society. (Castranova, 2005b, pp.154-156) If a certain skillset does not or cannot contribute to the MMORPG world in an important and meaningful way, it will loose its appeal and its in-game societal meaningfulness. A weaponsmith that cannot sell his wares because more powerful weapons can be obtained elsewhere for very limited effort will have to close his shop. An armorsmith who cannot produce goods because the required raw materials are too expensive or unavailable on the in-game market due to RMT activities will be forced to perform other personally undesired activities. If a miner cannot make a living because RMT farmers block and prevent access to resource nodes and sell the ore for a price he cannot compete with, the in-game labor invested to acquire his mining skillset is rendered worthless. (Ming, 2001a,b) For each societal role provided by the game, incentives have to be given by the MMORPG to perform it or they will be abandoned by the players.

5.2 EQUALITY OF OPPORTUNITY

While free in chosing their societal role within a MMORPG, players also demand being granted equality of opportunity. Equality of opportunity in the context of MMORPGs or games in general means that all players are granted equal starting and progress conditions and thus an equal potential in outcome. (Castranova, 2003a, p.18f.) In terms of the avatar production function, avatar capital, gear, general gameplay ruleset, and resources have to be equally provided for all avatars at their individual game start. (Castranova, 2005a, p.8) This does not mean that each societal role should solely by own means make the same earnings within a certain amount of time. Due to the diverse skillsets and according strengths and weaknesses, as explained in the previous section, collaboration is a vital part of the gameplay within shared MMORPG environments. Consequently, different strategies to maximize one's individual avatar production function can be provided by the game. All characters that discover their optimal in-game strategy of income generation, however, should be granted an equal or comparable wage.

For example, an avatar choses to become a highly proficient geologist that can identify and find valuable ores within the game world. In order to maximize the outcome of his skillset, he cooperates with a miner and an armorsmith. It is mutually agreed to that the earnings of their collective labor are equally shared. As all three of them are not very proficient in terms of self-defence, they also hire a few player-controlled warrior mercenaries in exchange for crafting them all new valuable armor upon return to the safe city walls. Without this combination of the individual skillsets, the geologist would have been killed in the wilderness or may at most have found a few low- to mid-quality resource nodes that he could not have exploited by own means. Instead, all parties participating in the cooperative activities could make use of their individual skillset in an efficient way as they were collectively combined to obtain high quality in-game commodities.

As equality of opportunity is very hard to assure, skillsets and content within MMORPGs are continuously updated and balanced by the game developers. Due to the high switching and sunk costs for their avatars, the continuous process of balancing and skillset readjustment often leads to a loss in well-being of individual players without compensation. (Castranova, 2003a, p.25), (Castranova, 2005b, p.152) In the long term, however, Castranova argues that avatar wages will automatically equate through population shifting: if one skillset proves to be more profitable than other skillsets, players will shift over to that career. That increases the supply of that specific career's skillset, reducing its price and societal importance. Consequently, other skillsets are more scarce and thus become more rewarding in terms of avatar wage. (Castranova, 2003a, pp.22-24)

Equality of opportunity is especially important as it prevents claims of the customers against the authorities and thus the MMORPG operators. If equality of opportunity is provided, players are responsible for their own well-being. If they are not happy with their individual earnings, they will need to work harder or find strategies to maximize personal avatar efficiency. If grotesque inequality still occurs it is sufferable as

the opportunity to close the gap to other players exists for all players. (Castranova, 2005a, p.8f.) Within MMORPGs, that sort of inequality is even glorified. (Castranova, 2005b, p.113f.) As avatar capital, gear, resources, general earnings, and chances to advance and prosper were equal upon entering the game world, personal in-game wealth can be used to compare one's relative personal status, skill, and game knowledge to other players. If said geologist someday wanders around in the MMORPG's in-game capital city dressed in the finest available raiments and equipped with the most proficient geology tools, apprentice geologists can gaze at him in awe and are even provided a goal to work for within the game world. Equality of opportunity also provides an escape clause: if a player's previous avatar struggles for acceptance within a MMORPG in-game community, he may create a new avatar for a fresh start. (Castronova, 2001, p.17)

This is, of course, only the case if equality of opportunity is, at least to a certain degree, guaranteed. If e.g. RMT occurs, an avatar's wealth is no longer a viable indicator for a player's success within the MMORPG: it is intransparent to other players whether that wealth was acquired by in-game or by out-game means. Ironically, even gold farmers demand equality of opportunity within MMORPGs as they see their 'regular' business threatened by exploiters of game bugs and macroers. (Dibbell, 2006, p.126, 197, 291), (ConcernedEQ, 2006)

It is important to not mix up equality of opportunity with equity or egalitarism. The later is incompatible with efficiency, Butterworth, 1994, p.48, and would thus remove all incentives of efficient gameplay. Those incentives for play are also critical for the players. While they demand equality of opportunity in terms of the different available skillsets, they insist on seizing that opportunity by own means.

5.3 DEMAND FOR CHALLENGES

As online game worlds are computer-simulated, they could, in theory, provide an utopian environment where anything can be acquired at little to no effort. Those game worlds, however, were rejected by the players in the past. As long as equality of opportunity is provided, MMORPG users prefered constraining game worlds over those that set them free. (Dibbell, 2006, p.41)

This preference does not correspond with real life behavior. In the real world, people cannot have everything they want. To maximize their utility function, they pay to have constraints removed. Alleviating their limitations increases their happiness. The demand for gaming time differs in that matter. Within games, people pay to have reasonable constraints imposed on them. Consequently, utility and demand within MMORPGs have to be modified compared to real world utility and demand assumptions. People do things that make them happier. Within games, that is confronting and overcoming challenges. (Castronova, 2002, p.16f.) Those challenges not necessarily have to be set by the online game itself, e.g. through quests or encounters of dangerous monsters. (Dibbell, 2006, p.150) As described in the previous geologist example, goals and challenges can also be set by the players, e.g. the collaborative planning of activities or trying to catch up to friends in terms of avatar capital and gear within a certain amount of time.

Overcoming a challenge indicates to a player that he has become more powerful. For each personal goal accomplished, the continuous sense of achievement adds up to a gradual advancement of the player's avatar. Consequently, avatar capital, proficiency of play, gear, and game knowledge are gradually increased the more challenges are mastered. (Castranova, 2005b, pp.110-112) Challenges set goals for the players. If there are no goals, there are no incentives for the players to strive for advancement and thus to take part in the game world. The gradual accumulation of power is a central MMORPG aspect as it unlocks access to even harder challenges. (Burke, 2002, pp.2-4) It also gives a sense of domination as obstacles that were previously too hard to accomplish can now be completed with ease. Within MMORPGs, players experience the archetypal hero's journey: they progress towards acceptance by the game world and its society by some stated in-world measure, e.g. avatar experience or level. That way, they are told how they stand in the virtual world, to other players, and to their past and future in-game selves. (Bartle, 2004, p.14) As explained in 5.2, all players start with very meager equipment and a rather underdeveloped skillset. Through overcoming challenges and advancement, they can undergo a satisfying rags-to-riches journey.

The evolving achievement hierarchy between the players can further be validated through the implementation of risk and danger within the game world. (Castranova, 2005b, p.114f.) Risk of loss of commodities, valuable time, or even the avatar's life are usually enforced through the provision of a wide-spread anarchy and social instability, e.g. through wartime scenarios and an overall dangerous environment. Besides logging off the game world, only a few spots within the MMORPG, e.g. cities and encampments, provide shelter to the players. (Castranova, 2005b, p.212) That way, other variables of the avatar production function than available time grow in importance as they provide a measurement on the efficiency of play of a MMORPG user.

That players demand solvable problems also implies that they resent impersonal restrictions they cannot overcome. (Dibbell, 2006, p.89) The protection of the overall achievement hierarchy is crucial to them. For example, both in-game and out-game taxation of virtual commodities would pose a threat to the players' avatar production function with a variable they cannot influence by own system-internal means. This is also the case for game-external real money trade and other unbalanced transactions. Any transaction of MMORPG valuables that is not backed by an in-game investment and effort violates the achievement hierarchy between the players. The avatars, as illustrated in section 2.5, are representations of the virtual self, they bear all achievements of an individual player within the MMORPG. If they or parts of them are sold for real money, the achievements of the single avatars are undermined, and individual successes are cheapened. (Bartle, 2004, p.15) If RMT exists within a MMORPG, the avatar status does not solely represent the in-game achievements and thus in-game wealth accomplished by the player, but also the game-external real world wealth of the user behind the avatar. That way, equality of opportunity between the players is violated, and in-game achievements and advancements devalued.

Players demand challenges under the conditions equality of opportunity and free choice of diverse skillsets. They, however, also demand that

they are at least to a certain degree rewarded for overcoming challenges, independent of the economic relevance of their in-game activities.

5.4 DEMAND FOR MINIMUM REWARDS

Sections 5.1 to 5.3 thus far lead to the assumption that MMORPG players desire a free market economy as that market structure in theory provides diversity, equality of opportunity, and a challenge. Within a free market, everybody has to deal with the challenging necessity to survive. Also, everybody can strive for economic wealth through free choice of profession. Equality of opportunity, in theory, is provided as everyone starts with very limited skillsets. As in the real world, however, certain skillsets are judged more valuable than others by certain in-game communities. E.g., some game servers are in the particular need for healers, alchemists, or cartographers while there is excess supply in other professions or skillsets.

Aside from that, a free market would not comply with the players' real life background. MMORPGs are typically played by citizens of industrialized nations, the majority of the players are employees. Their jobs are so specialized that their particular contribution to the production and sales of their employer's products can only vaguely be determined. Instead, they receive a regular income which amount is dependent on the evaluation of their workforce through their supervisors and their employment contract. Within MMORPGs, the players have almost total and self-determined control over their activities, their acquisitions, their products, and their added value. All MMORPG in-game economy participants are basically entrepreneurs. Due to their real life background, most players are not capable of handling that entrepreneurial risk. This was shown when *Ultima Online* was introduced with a free market economic design. Independent of the actual market conditions and the supply and demand based market equilibria, players expected making a profit for their labor. (Simpson, 1999, Ch.5)

A completely free market also interferes with several other player goals. If players find out that they cannot sell their subjectively undervalued crafted and obtained wares, this causes economic frustration. Dependent on the gameplay preferences of the according players, they may quit the game and emigrate to other game worlds or game servers where their skillset is more valued. They do not accept the economic reality, which basically states that they are selling things with no in-game market demand. Instead, they try to gouge the economy and exploit it to their own well-being. It does not matter to them if what they do is economically useless and inefficient. If they think that their activities are poorly rewarded, they complain that the economy is 'broken'. If they are not paid an honest day's pay for an honest day's work, they feel cheated for the investment of their valuable play-time. A free market will only be accepted by the players if it works in their individual favor. (Bartle, 2003, p.304f.)

This attitude is further supported by the consequence-free nature of the game. As players can make use of their exit option within a MMORPG at any time, the severity of consequences in terms of economic participation and risk is limited. (Lehtiniemi, 2008, p.16f.) If a player screws

up, he may as well change his in-game identity or migrate to another game or game server for a restart.

Also, MMORPG citizens are, unlike within the real world, not bound to spend a major part of their income on inevitable expenditures, e.g. for food, rent, electricity, or insurances. There is no cost of living that absorbs their income to a great extent. (Hastings, 1999) If avatar maintenance costs are imposed on them, they usually find a way to increase their in-game income to an extent that greatly outnumbers their daily expenditures, 4.2.2. Consequently, consumption within MMORPGs is predominantly used for social aspects, for increasing one's social standing in relative comparison to others. (Lehtiniemi, 2008, p.36)

The conversion of completed tasks into one comprehensive measurement, a characteristic that currency serves, is very helpful to compare the outcome of the players' activities between each other. That way, achievements and advancements can be measured through an observable global rating. (Castranova, 2005b, p.177f.) If players cannot convert the outcome of their invested time into a comparable and precise measure like currency, it will be hard for the player community and for the developers to determine which activities are currently over- and underrated. Thus, provision of equality of opportunity would be harder to enforce.

For the development of a workable price control mechanism for massively multiplayer online roleplaying games, the above described principles should be put under consideration. Equal opportunity for all MMORPG inhabitants levels the playing field for participation in ingame trading. Guaranteed minimum rewards ensure that albeit economically inefficient but self-determined choices of avatar diversity are respected. Posing solvable challenges sets goals to the players and gives incentives to return to the game. On the other hand, the externalities caused by MUDflation, RMT, and unbalanced intra- or inter-player transactions should be prevented to retain the system-internal achievement hierarchy and the overall stability, integrity, and quality of the MMORPG economy and MMORPG system. To reduce operation costs for the MMORPG developers, the required workforce for the price control strategy should be kept minimal. A price control mechanism that meets these conditions will be presented in the next chapter.

6

A PRICE CONTROL MECHANISM FOR MMORPGS

To warrant that all prices within MMORPG economies solely derive from in-game resources and that they are backed up by investments made into the system, a clear separation between MMORPG in-game and game-external monetary resources needs to be achieved. Dibbell, however, states that any MMORPG economy will immediately interact with the real world economy. (Dibbell, 2006, p.43) Lehdonvirta adds an if-condition, noting that an embargo of RMT and other undesired activities will very likely not be successful if the online game world's economy makes a secondary RMT and Ebay market possible. (Lehdonvirta, 2005b, p.8) Genender argues that untainted money is unavoidable unless trading is not allowed at all. (Genender, 2006, p.2) Castranova and Farmer mention that within MMORPGs, there are only markets that were intended by the designers and that it is the designers' job to close the unintended marketplaces. (Castranova, 2004b, p.91), (Farmer, 2004, p.2)

Playing MMORPGs generates commodities within the game world that are of real value to their inhabitants, real values that the users are willing to pay real and not only play money for. If real money enters the equation, however, as has been shown in the previous chapters, the quality of the play money, the MMORPG in-game markets and hence the overarching system are affected in a negative way. While there are indeed reasonable individual motivations to perform intra-avatar, inter-avatar, and RMT transactions (Lehdonvirta, 2005a, p.6) the negative effects caused greatly outweigh the positive. Game-external solutions like prosecution through EULA, ToS or law, are highly suspectible to fraud, contempt, and ambiguous concerning court of jurisdiction and overall effectiveness. Independent of the law or the contract, they will be ignored by RMT enterprises as long as there is a profit to be made.

Thus, an internal solution has to be found that excludes undesirable game-external trade activities by design *ex ante*. Simultaneously, trade activities should not be hampered as 60% of the players think that having a robust crafting system is important, and 57% of the players enjoy making money within the game. (Yee, 2008) Also, trading should not be complicated, as players are more likely to participate in trading when trade usability is ensured and easy to understand. (Bartle, 2003, p.308) A price control strategy that meets these criteria, the economic in-game interests of the players and the financial game-external interests of MMORPG operators will be laid out in this chapter.

According to Bartle, four different kinds of MMORPG economies can be identified. The first is an officially non-existing economy. As players want to exchange goods and services, instead of a formal economy with market transparency, an informal market emerges. This is of further importance in section 6.4. Second, there are markets with fixed prices where objects retain their worth. If the general level of wealth within an MMORPG increases, the relative value of items decreases, whereas

the absolute prices are kept stable. Fixed prices however provide a minimum income and will thus be readressed in section 6.2. Third, there are free market economies. In this kind of economy, prices reflect how much the consumers are willing to pay and how much the producers are willing to be paid for. A free market economy is most desirable as it establishes variable supply and demand player-based in-game market equilibria. This is reconsidered in section 6.3. Last, an economic system may be provided that the designers decide to use. If the later works as intended depends on the appreciation of the applied market model through the players. (Bartle, 2003, p.299f.) The last approach is taken in this thesis, including characteristics of all above mentioned economy models. Following, the economic design of an automated, easy-to-use player-to-player trade system is presented. The deriving price control mechanism is then illustrated step-by-step 6.5.

6.1 MANDATORY MEDIATION OF ALL PLAYER-TO-PLAYER TRADE

As shown in chater 3, the biggest threat to price stability within MMORPG markets is posed by unbalanced intra- and inter-player transactions. They flood in-game markets with large amounts of in-game currency and commodities causing damages to both the players and the MMORPG operators worth of several hundred million dollars per annum. To adress this issue, the procedure of the according transactions has to be looked into closely.

To perform an intra-player transaction, the use of a mediator is required as a player can only be connected to the game with one avatar at a time.[1] To complete a transaction between two of his avatars, a player has to ask another player for help or use a transfer service provided by the game. A common transfer service is an in-game mailbox where players can write letters to each other and attach money or commodities. To perform an intra-avatar transaction, player A can that way send money or commodities from avatar A1 to avatar A2 and log to his other avatar upon in-game reception to obtain the goods. This can easily be prevented code-wise by limiting the mailbox service to letters without monetary and tangible attachments; or by limiting the use of mailbox attachments to non-utilizable actions.[2] If the help of another player is used, two subsequent inter-avatar transactions are performed where avatar A1 hands out the according commodity to player B, then relogs with avatar A2 to pick up the temporarily deposited commodity from player B.

Inter-player transactions are required for all unbalanced inter-avatar transactions, be it in-game donations or RMT based transactions. Concerning RMT, the customer of such a service *ex ante* transfers real money to the seller outside the game upon acquiring a commodity *ex ante* by outside-game means. To complete the delivery, an avatar of the seller hands over the according commodity to the avatar of the buyer at the arranged meeting place within the online game world. (Castranova, 2005b,

1 Unless he is multi-boxing, a process where one player controls several avatars at the same time connecting to the game via multiple accounts and multiple computers and input devices. Even then, however, a player needs to use mediation of his own avatars for trading.

2 e.g. the recipient can inspect the commodity, but is not allowed to equip it, use it, or transfer it to another player.

p.44), (Lastowka and Hunter, 2003, p.48f.), (Grimmelmann, 2005, p.7) The *ex ante* payment does not apply for non-profit transactions based on social bonds, whereas the delivery procedure does. For RMT, real money has been transfered in advance, non-proft inter-avatar transactions are backed up *ex ante* by the mutual emergence of social relations. The actual transfer is completed by one trade party giving the other valuable commodities in return for technically nothing. (Castranova, 2005b, p.151) Handing over in-game items can be regulated by code, as players have to make use of game mechanics to perform a transaction. Farmer calls this process "'gifting"' and correctly states that allowing this kind of transaction is a design choice. (Farmer, 2004, p.2f.)

Several design choices for inter-player transactions are available. One option might be the complete removal of all player-to-player trade. To convert a commodity into money that is not of use to a player, the player would have to sell it to an NPC vendor who then resells the bought goods to the players. This, however, would lead to several undesirable effects. An NPC vendor does not and cannot know the actual current market demand as it lacks the according information. Mandatory player to NPC trade would also reduce incentives for crafters to participate in in-game trading as their customers are then computer-simulated, unwilling to socialize, bargain for better prices, or accept variable demand-based profit margins. The complete removal of trade based on the players' supply and demand would violate the economic design principle of avatar diversity and is thus not an option.

Another design choice could be to remove currency from the game. Farmer argues that this could discourage hoarding and other anti-social trading schemes, and emphasize on subjective relative value over economical numeric objective value. (Farmer, 2004, p.6) A pure barter economy would emerge: a sword may sometimes exchange for three chicken or a rugged leather vest in-game, but handing over a rugged leather vest to a weaponsmith would not guarantee the reception of a sword. This would lead to insecure transaction conditions as for every transaction both trade parties' material needs have to renewedly be satisfied. The according process of finding a mutual agreement is usually time-consuming and tedious. Currency greatly facilitiates transactions, makes them more objective and more efficient. (Bartle, 2003, p.298) It enables the conversion of an item's worth to a unit generally accepted by all trading parties as a means of payment. (Castranova, 2005b, p.47) The existence of an official currency is also desirable as it provides the opportunity to transparently compare wages of the different avatar skillsets and prices of sold goods within the game. Due to a currency's benefits, in the end something will act as a currency, even in an illicit way, and will be exchanged for other, e.g. real, money. (Butterworth, 1994, p.4) Hence, both player to player transactions and the means of transaction, currency, need to persist.

Yamaguchi argues that by design MMORPG currencies are local currencies, where a trading network is supported by its own internal currency. The money supply is self-regulated by the users of the local exchange trading system, LETS, within the boundaries of the network. Its implementation requires implicit binding power of the community. (Yamaguchi, 2004, p.6) The overarching economic design has to ensure that the binding power of both the game's player community and the

MMORPG'S in-game boundaries are protected. Its alteration by interests external to the local community have to be prevented. It has to be kept sure that the in-game currency can only be acquired by in-game means and that an exchange rate and an exchange trade between the MMORPG's currency and any real world currency cannot be established. The boundaries of MMORPGs are porous though as players are free to enter and leave the online game world at any time. Consequently, both the composition of the community and the economic interests continuously change. The LETS community is not fix, its binding power has to be repeatedly renewed.

To ensure that all transactions between players are backed up by personal in-game effort of both trading parties and solely based on system-internal resources, a validation routine for every in-game transaction has to be implemented. This task is performed by an automated neutral middleman, a mandatory to use player-to-player trade platform.

To allow the validation of transactions, a general measure for trading, a currency, has to be provided. (Bartle, 2003, p.308) In order to verify every transaction, unmonitored player-to-player transactions are technically made impossible. Each player who wants to exchange obtained in-game valuables with other players has to put up the according item for sale on a community-wide trade platform. The actual trading partner is determined by an automated brokerage procedure. Technically, direct trading between a producer and a consumer still occurs, but the process of negotiation and determination of each transaction's parties and each commodity's price is performed by an automated neutral negotiator.

This reduces information costs for both the producers and consumers, but also renders the transaction process more impersonal. The importance of consumer-producer relationships is reduced. Trading based on social connections and direct mutual interaction is hampered. On the other hand, this is desirable in terms of the economic design principle of equality of opportunity, 5.2. That way, all players have the chance to purchase any commodity offered for trade within the game via the player-to-player market platform. In addition, the quality of any in-game commodity is hard-coded, as shown in section 2.1, and commodity characteristics are usually transparent to all users.[3] Thus, it is technically of no major relevance to the consumers who they are trading with as long their demand is met. Likewise, it need not matter to producers who the buyers of their offered goods are as long as they can sell their offered commodities for a profit.

The mediation of all producer to consumer trade actually corresponds with the trading process citizens of industrialized nations are used to. Within the real world, consumers usually do not personally know the producers and production conditions of their clothes, their food, their tools, and other personal belongings. The exchange of goods and services for money through retailers is a common and widely accepted practice in industrialized and developing nations.

Exceptions to the mandatory mediation of all player-to-player trade will be abused and gouged to either illicitly acquire competitive advantages within the game or to illicitly generate real world profits. If players are allowed to transfer commodities to mule characters, factual

3 Players can usually inspect a ware and are given transparent information on its quality, item statistics, bonuses, durability etc.

normal secondary or main avatars will be declared as mules and can be provided with intra-avatar transactions. If avatars are allowed to send commodities to other players on their friendlist or to guild members, short-time mutual RMT friendships and RMT guilds will emerge. If MMORPG operators subdue to the players' request to enable supposedly "'cute trading of commodities for glade flowers"', glade flowers will become the new inofficial currency of the online game. Shortly after the introduction of glade flower trade, players will complain that they are unable to acquire glade flowers because all glades within the game world are occupied by RMT flower farmers and request new glades to be implemented into the game to cover their, due to MUDflation, rising flower expenditures.

As all trading parties and final trading conditions are determined by an automated neutral middleman, the according procedure of mediation has to be looked at closely. To meet the minimum reward principle and guarantee minimum earnings, a minimum price determination formula is provided.

6.2 MINIMUM PRICE DETERMINATION FORMULA

As explained in chapter 5, MMORPG users demand being granted minimum rewards for their in-game activities. To satisfy this request, minimum prices for crafted objects, services, and other commodities are usually paid by NPC merchants controlled by the game. (Bartle, 2003, p.306f.) To guarantee that all activities, independent of an actual demand, are at least to a certain degree rewarded, NPC vendors perform consumer tasks without a budget constraint and without an actual demand for them. Goods bought by NPC vendors do not re-enter the MMORPG's internal economy. That way, trade NPCs function as vendor machines that erase virtual goods for the exchange of in-game currency and are economic-wise comparable to a large foreign sector. (Lehtiniemi, 2008, p.27)

The NPC vendor market functions as a first layer of price control. The vendor prices warrant a minimum wage and thus a safety net for all producers of in-game commodities. Opportunities to generate additional profits are provided by the second layer of price control, where player-to-player transactions based on free market supply and demand are encouraged while still checked by a neutral automated middleman concerning transaction validity.

Within the real world, all price control policies require a means of fixing prices and enforcing their application. The objective of fixing prices is to control inflation and to prevent undesirable side effects like social instability and unfair distribution of welfare. Price control policies have thus far proven to be at most efficient in the short run, while ineffective in the long run. In the short run, they also cause negative side-effects in terms of economic efficiency and social stability. Efficient resource allocation is discouraged through fixed prices, and social stability is endangered as people with more available income are favored. (Butterworth, 1994, pp.186-188), (Whiteman, 1978, p.1,5)

These two real world short run side effects are not an issue in MMORPGs: efficient resource allocation for the production of commodities is hard-

coded, there are no economies of scale or optimum production quantity levels as the production of any good requires the in-game execution of a hard-coded crafting procedure. Second, social inequality is glorified within online roleplaying games provided that equality of opportunity is assured and the acquired wealth derives from in-game activities exclusively. The short term efficiency of price control policies will be of further importance in the next section.

Price control enforced by law within the real world has thus far been a failure in history. To effectively enforce and control prices, additional measures to procure supply and demand have to be found. (Butterworth, 1994, p.186) This helps to explain why EULA and ToS regulation within MMORPGs have so far been rather ineffective. The additional measures within this price control mechanism are the profit and utility maximization strategies imposed by this mechanism. The lower a producer is willing to be paid for, the greater the potential outcome may be. The higher a consumer is willing to pay, the greater his chance to actually acquire the desired commodity but also the greater his chance to overdo and not get anything at all. This will be explained in further detail in the following sections.

Fixing prices for authority-regulated vendors generally leads to the emergence of a black market where the official fixed procurement price becomes the inofficial minimum price. (Butterworth, 1994, p.85f.) Relating to MMORPGs, the NPC vendor price becomes the minimum market price for all player-to-player transactions. As all inter-player transactions are automatically mediated, the player-to-player markets are formally declared as informal black markets. The fixed NPC vendor prices guarantee a minimum wage to all players, thus the condition of minimum rewards is satisfied. The competitive informal but still supply and demand driven black market, on the other hand, sets no upper bound on sales prices apart from the bounds exercised by the market supply and demand. (Butterworth, 1994, p.90) Any point on the supply or demand curve can be established as the market equilibrium point. According to Butterworth, this form of fixed procurement with unrestricted supply to the black market is the most powerful price control system. (Butterworth, 1994, p.192f.)

It can, however, also become a disaster if the planners of the fixed prices are incompetent or ill-informed. If the planned price control equilibrium exceeds the modified competitive equilibrium, all are worse off as the marginal cost of production exceeds the price and thus the marginal benefit to consumers. (Butterworth, 1994, p.192f.) This threat is not an issue in this price control mechanism for two reasons: one, there is no reason for the players to complain about the minimum price level as it assures them of one of their basic economic requirements, a minimum wage. Two, the mechanism enforces the generation of a market equilibrium that is equal to or exceeds the NPC vendor price. Why that is so will be explained in the next sections.

To calculate the NPC vendor price of any commodity, a general formula has to be used. This eases the development costs for the MMORPG developers as they do not need to consider vendor prices for every single item. As previously explained, MMORPGs usually have a general measure of progress, e.g. an avatar's level or experience. This can also be applied to commodities within the online game world and modified

by other significant indicators like item quality or item bonuses.[4] A minimum price determination formula is also less exposed to inaccurate item value assessment as it is equally applied to all commodities throughout the game world.

A minimum price of course does not limit or control the money supply within an online roleplaying game. Instead, availability of in-game money is collectively determined by the players through the aggregated effort they put into the game world. Dependent on the age of a game world server and the churn rate[5] of its community, the players gradually progress in accumulation of money, commodities and general wealth. Consequently, the relative scarcity of money and items declines. That way, the value of virtual currency decreases compared to the value of real currency and is thus destined to depreciate against real money. (Yamaguchi, 2004, p.5) This however is only an issue if an exchange rate between the MMORPG and real world currencies can actually be established.

So far, all inter-player trade is mediated by an automated broker on an officially tolerated and encouraged black market with a fixed procurement that guarantees minimum in-game earnings for the vendors of MMORPG commodities. The minimum rewards principle of economic design is satisfied. The fixed NPC vendor prices calculated by a universal price determination formula establish a solid first layer of price control. An equally robust second layer of price control for the inter-avatar market will be introduced in the following two sections.

6.3 PLAYER-GENERATED CYCLICAL TRADE DATA

The constitution of any market requires a market equilibrium, an intersection of the supply and demand curve. There are two ways to generate that intersection: supply and demand market data is either provided by a central agency or by the participants of and within a competitive market.

The first option is feasible within MMORPGs. The game operators have total power as they control the underlying game code. They can create and destroy virtual goods at zero to very low costs and thus can also attempt to control prices. (Castronova, 2002, p.4) To avoid the anger of the players and accusations of bias and favoritism, however, the game operators have to precisely know what they are doing to succeed in getting the users' acceptance for market conditions deployed by them. (Bartle, 2003, p.306f.) Usually, central agencies work on a very large scale with very crude tools and very unreliable information. (Butterworth, 1994, p.161) To achieve accurate trade data, the central agency has to invest in gathering information, which increases the administrative burden and discourages efficiency as it raises administrative costs. (Butterworth, 1994, p.23f.)

The costs for the acquisition of trade data can be greatly diminished within MMORPGs as the game developers can implement datamining

4 cf. http://www.wowwiki.com/Item_level, Accessed 14.08.2008.
5 The rate at which elder players leave and new players enter a MMORPG. (Bartle, 2003, p.224)

tools that track and evaluate trade data. The resulting increased precision of trade data does not prevent two things, however. First, even market equilibria that are based on past sales data and forecast are still constructed. Independent of its accuracy, predicted trade data need not correspond with the actual trade data. Equilibria provided by a central agency are at most somewhat correct.

Second, once prices are controlled centrally they become political variables that producers will try to use at their advantage. (Butterworth, 1994, p.20, p.43f.) If players are not satisfied with their in-game earnings, they can pose political pressure on the MMORPG operators, e.g. by restricting in-game supply and demand or by threatening to cancel their subscriptions. As the online world developers are financially dependent on the satisfaction of their customers, they may feel forced to comply to the players. Consequently, prices have to be controlled by an entity that cannot be blamed for bias, favoritism, or distortion of market prices, a neutral entity that in fact knows best. Within this price control mechanism, this entity is the automated player-to-player trade platform mediator, fed with precise supply and demand data mandatorily provided by the players.

Efficient price control requires complete knowledge to construct the supply and demand curve of each commodity's market. This normally leads to several implementation problems for price control. It is not in the interests of the producers to reveal accurate information to the controlling authority as this makes them subject to regulation and indirectly informs their competitors about their cost and profit structure. (Butterworth, 1994, p.33, p.167) If this information is not revealed to the controlling agency, however, supply and demand have to be estimated and are thus suspectible to prediction errors. Hence, incentives have to be given to the producers to reveal their actual prices. The incentive of this mechanism is the prospect of making profits compared to fixed price sales to NPC vendors that are based on the minimum price determination formula.

Within MMORPGs, 100% accurate information on player demand and supply can be gathered. This can be achieved by saving all trade information to a database and its subsequent evaluation. On the web and even in-game, very transparent information on prices of MMORPG commodities is already assessed. (Castranova, 2005b, p.43) For *World of Warcraft*, game interface addons can be downloaded and used within the game that gather and reveal precise data on each commodity's average price in official player-to-player commodity auctions and inform the user of bargain buys.[6] Similar data is shown on web-only game databases like *Allakhazam*.[7]

This data can be acquired because for any given good, instead of a single price there is a chaos of prices. (Dibbell, 2006, p.152) Dependent on personal preferences, the consumers' willingness to pay and the producers' willingness to be paid for greatly vary. Through horizontal aggregation of the individual preferences, the supply and demand curve are deduced. This process is also performed within this price control mechanism.

6 e.g. http://auctioneeraddon.com/, Accessed 15.08.2008.
7 e.g. http://wow.allakhazam.com/db/price.html?witem=22854, Accessed 15.08.2008.

Any user who wants to sell a commodity acquired within the MMORPG to other players puts up the item on the mediated player-to-player trade platform and then specifies the minimum price he is willing to be paid for. Ditto for consumers: if an offered item is of interest to them, they place and deposit the maximum price they are willing to pay at the broker. Following, the automated mediator calculates the market equilibrium for any offered good and then delivers all acquired goods to their purchasers and the deposited money to the according item vendors. Consumers whose demand was not satisfied are sent their deposited money back at no costs. Producers who did not sell their commodity can either retrieve the good or reauction it. Anybody who has ever participated in an *Ebay* auction should immediately comprehend the player-to-player trade procedure.

Meanwhile, the second layer of price control is automatically carried out in the background. As Lusk & Schroeder state, the willingness to part with cash is higher when making choices versus bids because choosing provides an actual certainty of getting the good. (Lusk and Schroeder, 2006, p.26) If the consumers are forced by the mandatory mediation of all player-to-player trade to participate in auctions rather than immediate purchases, this should, according to Lusk & Schroeder, result in a lower general willingness to pay. In regard to price control and price stability, the use of bids instead of immediate purchases is thus desirable. The uncertainty of getting a commodity also complies with the player demand for challenges as it increases uncertainty and simultaneously rewards acquisition of in-game market knowledge. It also gives incentives for the players to relog to or remain within the game until auctions periods for commodities of personal interest are expired.

Expiry of an auction requires the initiation of a timed period. If a fixed auction period exists, a timeframe for the automated mediator is provided to calculate supply and demand, market equilibria, and determine actual completed transactions. It is vital to the automated mediator that the immediate satisfaction of personal needs is impossible. The individual preferences of the consumers and producers within an auction period are required to accurately determine the market equilibria. Thus, the opportunity to place buyout prices like on Ebay or current MMORPG auction houses has to be excluded. This is also helpful to prevent RMT and intra-avatar transactions because RMT sellers and players cannot arrange events where the seller places an auction at an arranged time for a low buyout price which the buyer immediately pays.

As buyouts are prevented code-wise, the delivery of an item cannot be guaranteed. (Farmer, 2004, p.11) Instead, all acquired goods and the deposited money are sent to their buyers and sellers not until a trade cycle has expired. As the expiry of a trade period is required for any trade to take place, equality of opportunity is assured and enforced: anybody interested in buying a certain commodity has the chance to actually acquire it. As all player-to-player trade has to be performed via the trade platform, 6.1, that equality of opportunity applies to every commodity traded between two players.

As explained in section 6.2, price control is, if at all, only efficient in the short run. (Butterworth, 1994, pp.186-188) This is actually achieved

through time-limited trade cycles. After a trade cycle has expired, the market for each commodity is reset to its initial status, the controlled first layer of price control, an NPC vendor price automatically calculated through a global formula. To determine the next market equilibrium, each offered commodity has to be newly fed by players' supply and demand data. Data of previous equilibria has technically no influence whatsoever on the subsequent trade cycles. This further asserts equality of opportunity as participation in previous trade activities is technically irrelevant to the renewed trade cycle. Previous participation in player-to-player trade via this price control mechanism, however, increases a player's in-game market knowledge, further improving his avatar production function value and his chance to acquire desired commodities based on trading experience.

6.4 INTRANSPARENCY OF INFORMATION

As explained throughout section 6.1 and 6.3, a neutral mediator gathers the relevant trade data within a limited timeframe and susequently distributes the deposited goods and money to the determined trade partners. All transactions are based on the individual preferences of the producers and consumers that are aggregated to a market equilibrium for each commodity. To ensure that the designated prices are accurate, it has to be kept sure that they are not, or not significantly, alterated.

Subjects draw inferences about the quality or other characteristics of a commodity through the acquisition of new information about it. (Harrison et al., 2004, p.130) For example, a thief player within a MMORPG is looking for a new cloak. The "'Cloak of Shadows"' raises his attention, as it supposedly provides bonuses for pickpocketing his fellow in-game citizens. Telling a guildmate about the offer, he learns that the cloak's color is bright red and rather helps to detect thiefs than remain undetected. Accordingly, the thief player's willingness to pay for the cloak rapidly drops. Affiliated beliefs about the characteristics of a commodity can be excluded *ex ante* by revealing all available information on the characteristics of a product, e.g. item quality, rarity, looks, item bonuses, and durability. As all items and their characteristics within MMORPGs are hard-coded, fix, and can at most be altered by visible enhancements[8], this can easily be accomplished. Through transparent provision of item characteristics, players can then base their offers and bids on exact and unadulterated product information.

Individuals also tend to adjust their valuations of commodities when their price confidence is changed or when they learn about the willingness-to-pay of other users. (Harrison et al., 2004, p.129) For example, a smith avatar needs a "'dragon scale sledgehammer"' because it would allow him to craft very valuable dragon scale armor. The monopolist supplier of the according sledgehammer learns about this and places a highly overpriced offer for this rare item on the mediated player-to-player market platform. The smith yields to the price even though his initial willingness to pay was at most half of the demanded price. Affiliated beliefs about other players' or own preferences can at least partly be excluded. To avoid effects of affiliated beliefs, sealed bids can be used to keep producer prices and player bids undisclosed to the traders.

8 e.g. enchantments, talismans, or armor kits.

(Harrison et al., 2004, p.136) Therefore, as players do not know about the producer prices or the willingness to pay of other users, they instead place prices that are primarily based on their personal evaluation. Players may still exchange information on personal bids and prices between each other via communication channels. It is unlikely, though, that a player can acquire all trade information on a desired commodity as collecting the according information would be very time-consuming and unreliable.

The second layer price control mechanism reveals all product information to the producers and consumers. Information on prices, bids, and quantities based on the individual preferences of other users, on the other hand, is kept undisclosed. Instead, producers and consumers are told the NPC vendor price determined by the minimum price determination formula. That way, the consumer bids and producer offers become affiliated with the NPC vendor price. Both the minimum price of each supplier and the bid of each consumer have to be equal to or greater than the NPC vendor price, else the offer or bid is not accepted by the automated mediating player-to-player sales auctioneer.

This is backed by Lusk & Schroeder and Bettmann et al.: prices become affiliated with information available to bidders, e.g. store prices of similar goods or posted prices of multiple bidding rounds. The consumers are affected by these framing effects, tend to accept them and adjust the decision on their individual preference accordingly. (Lusk and Schroeder, 2006, pp.17-20), (Bettman et al., 1998, p.208) By revealing the NPC vendor price to the producers and consumers, the decision of the trading parties is limited to a simple choice, that is how much their personal willingness to pay or willingness to be paid for exceeds the first layer price control market conditions.

As the individual prices and bids of the trade partners are kept undisclosed, there is also no need to reveal the avatar identity of the consumers and producers. It does not matter to the neutral mediator who sells what to whom, as it automatically distributes the commodities and money to the determined trade parties. It need not necessarily matter to the producers and consumers who they are trading with:

- their trade partners are automatically designated by the mediator,
- all valid transactions are performed in a way that conforms to their individual preferences,
- validated consumers get their desired item, validated producers at least obtain their set price.

More and detailed information on how the validity of a transaction is determined will be given in section 6.5.

Certain information remains unknown to all players until the trade cycle is complete when the actual trade partners and individual offers and bids are kept undisclosed. As long as the auction period lasts, noone knows if their offer or bid will be fulfilled and how many offers and bids were placed in total. (Farmer, 2004, p.12) After trade cycle completion, trade participants with invalid offers and bids vaguely know that their individual preference was either too pretentious or too greedy. Consumers of valid transactions are revealed their personally paid price, but not who they traded with and to which prices other

validated transactions were executed. Producers of valid transactions are informed about their actual profit. No producer receives less than he was willing to be paid for and no consumer pays more than he was willing to pay. Consequently, no validated trader is worse off. Players with invalidated bids and offers are also not worse off as their deposited money and goods are retrieved at no costs.

Two groups of persons, however, are worse off. One, customers and suppliers of RMT and intra- or inter-avatar unbalanced transactions. According to Farmer, the completion of this kind of transaction requires that the seller can guarantee and confirm the delivery of a commodity, that both the seller and buyer believe the above can be met, and that the commodity's value exceeds the transaction costs. (Farmer, 2004, p.11) There is no way to *ex ante* guarantee the delivery of an *ex ante* agreed-to player-to-player transaction within this mechanism because the trading parties do not know who they are trading with and to which trade conditions the transaction will occur. A transaction may be confirmed after the expiry of a trade cycle, but then there is no need for the buyer to pay real currency units for its completion *ex post* as the transaction was already validated within and by the MMORPG, backed up by personal in-game effort that was required to place and deposit the according validated bid.

Two, real world governments. As previously explained, by guaranteeing a calculated minimum NPC vendor price but enabling player-to-player trade, an inofficial black market is constituted. Black markets have a high level of secrecy. Many isolated trade events at concealed and different prices are performed. Due to the lack of information on the market equilibria, an official market is not constituted. Because individual transactions cannot be influenced, market analysis is nighly impossible and irrelevant. Nevertheless, black markets are stable and well-organized. The dispersion of information on prices is as good or even better than in a free market economy. (Butterworth, 1994, p.43) Still, in-game prices reflect the actual preferences and valuations of the MMORPG inhabitants. As these values are real, governments may become interested in the taxation of virtual items and currencies. Therefore Yamaguchi urges "'to better denominate values in virtual worlds in a unit that is unique to the virtual world"'. (Yamaguchi, 2004, p.7) Due to the black market structure and the composition of the second layer price control mechanism, trade data has only short-term and no long-term validity and is immediately negligible after each trade cycle completion. There is no way to calculate a commodity's value over a time period greater than the trade cycle's length. The actual equilibria are not revealed and previous trade cycles technically have no influence whatsoever on the current trade cycle's price. Item values cannot be denominated into a real-world based measurable unit. An e.g. RMT-based currency exchange rate cannot be established as official supply and demand driven markets for commodities are not constituted. At most individual, no general trade information, can be gathered. What cannot be denominated cannot be taxed.

6.5 STEP-BY-STEP DEMONSTRATION OF THE MECHANISM

What so far remains unclear is how the mediator determines the validity of a transaction and how matching trade partners are found. This procedure will be described in this section step-by-step.

Every recurrent procedure requires an initialization. Within this price control mechanism, this is the start of each trade cycle. Each trade cycle lasts 24 hours to make sure that all players can, independent of their usual day-to-day playtime, participate in an auction. All auctions are started simultaneously, e.g. at 3 a.m., to make sure that users cannot link a certain auction to a certain seller through the timestamp of trade initilization. That way, intransparency of information is maintained. While a trade cycle lasts, a commodity can only be added to its market if a copy of it was already listed upon trade cycle initiation. This is to prevent last minute RMT sales where a seller lists a commodity for auction very shortly before a trade cycle ends to increase certainty of acquisition by an *ex ante* agreed-to buyer.

If a player wants to sell an item that was not listed for sale upon initialization of the current trade cycle, it is temporarily stored by the mediating trade platform and automatically put up for sale at the start of the next auction period. Producers can tag any commodity they offer for resale. If an item is not sold within the trade cycle it was put up for sale, it is then automatically reoffered in the subsequent trade cycle. This should ease individual management of an avatar's player-to-player transactions and overall trading usability.

During the auction period, producers and consumers may freely modify their undisclosed prices, bids, and quantities. Any price and bid must be greater than or equal to the minimum price determination formula based NPC vendor price. This enforces economic rationale: no vendor would usually sell a commodity if he could acquire a higher price elsewhere at no entrepreneurial risk. Traders can only place one price or bid for each offered commodity. If a thief player wants to sell two stolen wizard hats, the said price applies to both hats. Likewise, a weaponsmith's bid applies to all desired iron bars, not just one. That way, players have to reveal their individual per unit preferences. Price diversification and gambling is impossible.

Upon trade cycle completion, the trade mediator computes the supply curve, the demand curve, and the market equilibrium p_{opt}, x_{opt} for every auctioned commodity. This is accomplished by sorting all offers in ascending, and all bids in descending order. Following, supply and demand are aggregated by the linear regression method. After aggregation, all bids and all offers are dislocated horizontally until they intersect with the derived demand or supply curve. This is to determine a discrete and sorted order of all placed offers and bids for each marketed commodity. As linear regression is used, the overall horizontal adjustment is minimized.

After the market equilibrium for each commodity is determined, all prices above and all bids below the equilibrium price are declared invalid. The according consumers are refunded their deposits, the excluded producers are informed that a valid transaction could not be

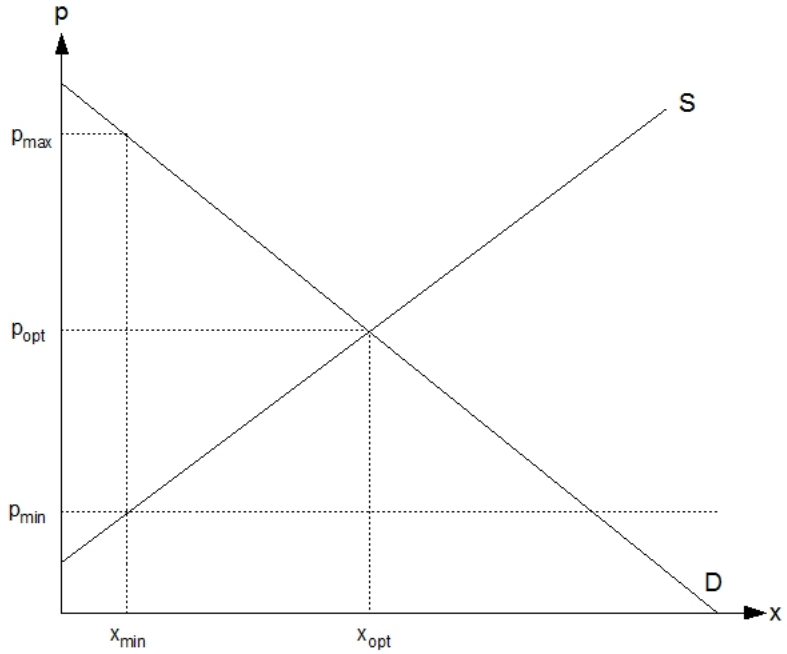

Figure 3: Validation of Player-to-Player Transactions

established. This accords with standard economic theory: if the consumers' willingness to pay is lower than the producers' willingness to be paid for, their individual preferences cannot be met by the commodity's market.

Next, the intersection of the NPC vendor price and the supply curve p_{min}, x_{min} is determined. As all bids and prices have to be equal to or exceed that price, it is kept sure that $p_{min} < p_{opt}$. Consequently, the threat of incompetent or ill-informed planners of a procurement level is prevented. The intersection of x_{min} and the demand curve p_{max}, x_{min} is declared as the valid maximum price of the according commodity's auction. All bids $p_i > p_{max}$ are excluded. This prevents price rigging and certainty of acquisition through market domination by financial power. The maximum price is also beneficial to the goal of price control because it keeps sure that all valid transactions do not exceed the general price frame set by the completely player-generated aggregated free market equilibrium. Hence, all consumer bids between p_{max} and p_{opt} and all producer prices between p_{min} and p_{opt} are valid, cf. figure 3.

All remaining valid prices are now sorted in ascending order. Valid bids are ranked in descending order. The highest valid bidder and the lowest valid price are served first, second highest bidder and second lowest price follow, and so on until a valid transaction cannot be established any longer. If the offered quantity exceeds the desired quantity of an assigned trade partner, the subsequent buyer is served by the currently selected vendor as well. The validated producers are always served for the matched bidder's price and will thus usually get more than they were willing to be paid for. Vendors with a relatively low valid willingness to be paid for and consumers with a relatively high valid willingness to pay are privileged. Frugal producers and reasonably generous consumers are rewarded.

Frugality, however, also poses a financial risk to the sellers. If too many producers quote a price close to the NPC vendor price, the gradient of the supply curve and thus the market price will drop. Since information on the actual demand is kept undisclosed to them, quoting a low price may both increase and decrease their profits. This similarly applies to the consumers. If too many of them are too generous, the gradient of the demand curve will rise, decreasing the number of customers served and increasing the overall average price. Placing very high bids also imposes the risk that their bids exceed the maximum price and become invalid. No matter how the traders decide, the market and price conditions are collectively determined by the commodity's trade community during each trade cycle. If they perform relatively well compared to the other participants of the current trade cycle, their individual preferences will be met.

The players' acceptance and effects of the above described step-by-step procedure will be discussed in section 7.2 in the following final chapter of this thesis.

7 EVALUATION AND CONCLUSION

This chapter summarizes, evaluates, and discusses the analysis carried out throughout this thesis. After a short summary of the previous chapters 7.1, the suggested price control will be evalued 7.2. Its accuracy and its efficiency regarding their welfare effects 7.2.1 and the provision of stable in-game market conditions 7.2.2 and player acceptance 7.2.3 are discussed. Following, prospects for future research are identified 7.3. Final thoughts of the author are provided in 7.4.

7.1 SUMMARY

Throughout this thesis, a strategy was developed with the goal to combat the severe price instability markets within massively multiplayer online roleplaying games, MMORPGs, are suffering from. Chapter 2 introduced MMORPGs to the reader, laying out their typical characteristics and the according implications for MMORPG-internal economies. MMORPGs are computer-simulated environments 2.1. Any activity performed within online game worlds depends on its allowance by the underlying game code. That way, certain acts can not only be declared illegal but also excluded *ex ante*. This accordingly applies for any in-game economic activity. MMORPGs are persistent 2.1, meaning they continue to exist when users are not connected to them. That way, valuables obtained within them retain emotions, in-game investment and effort connected to them and thus a long-term meaningfulness and value. As multiple users can be connected to the online game world at a time 2.3, players can compare the outcome of their in-game labor between each other and acquire status and reputation within the game world. As the MMORPG places are shared 2.4, trading, competition, and cooperation for scarce resources provided by the game world occurs. Anything a player acquires within the online game world is condensed into the avatar entity, a player's in-game self-representation 2.5. As tangible and intangible goods acquired within the game system are related to the according avatars, an avatar production function 2.6 was derived that includes all obtainable in-game valuables in one general formula.

This production function however is adulterated by the negative effects of MUDflation, which was introduced in chapter 3. MUDflation is a process where in-game prices for rare high-end and luxury goods greatly rise while the value of rather common low- to mid-end and intermediate in-game commodities greatly declines 3.1. While that tendency can be justified by maximization of the avatar production function 3.2, a major portion of the according required high in-game expenditures derives from illicit sources. A portion of the paid in-game money is obtained by efficient economic in-game performance 3.3.1. Resources for in-game expenditures are also, however, obtained through in-game supporters, be it members of a player's social network or further developed avatars of a player, resources unsupported players

cannot access 3.3.2. As the obtained commodities within MMORPGs are of real value to the players, real world enterprises have emerged that sell in-game commodities, currency, and other game-related services for real money to the players 3.3.3.

RMT activities lead to undesirable negative effects within the game worlds economies 3.4. In-game, time and effort invested by the users into the game and system-internal valuable acquired by are greatly devalued, the quality and integrity of the game system decrease. This leads to economic frustration, price instability and complaints of the players not involved in RMT activities. The game developers are forced to respond to the RMT-related issues, 3.5. According activities increase their MMORPG service operation costs 3.5.1, lowering their competiveness on the MMORPG market. Instead of investing into the quality of their product to attract and retain subscribers, MMORPG operators have to invest in RMT-related counter activities. If the executed strategies do not prove successful or frustration of the regular players grows too large, players quit the game, which further reduces operation revenues for the game operators, 3.5.2. Carefully calculated, the negative effects of MUDflation and RMT cause damages of at least $300 mio. per annum. If the added costs and losses in subscription revenues grow too large, the provision of the MMORPG is no longer profitable and the game world has to be shut down, leading to an irreversible loss of all valuables ever obtained within the according game world.

The suggested counter-strategy to fight MUDflation, price control, was examined in chapter 4. Price control strategies performed in the real world and the challenges and circumstances of their execution were illustrated 4.1. Price control in the real world was mostly performed to allocate resources to the goals of the dominant system they were applied within. Their application could not or not easily be circumvented by the consumers. Producers regularly adjusted their product quality to the prices set and administered by the authorities.

These issues are negligible within online game worlds. Consumers can make use of an exit option, and product quality is hard-coded. The challenge online game operators face instead is the mandatory acceptance of the executed price control policy through their playerbase 4.2. Within the MMORPG *Ultima Online*, central planning was tried 4.2.1, with a fixed amount of simultaneous resources within the game world. As a result, the in-game economy collapsed because certain player behaviors were not put under consideration, e.g. the investment in the production of in-game commodities without in-game demand in order to acquire avatar skillset increases. Another price control strategy executed in MMORPGs was and still is the implementation of a more or less balanced system of money, commodity and resource faucets and drains 4.2.2. These systems, however, have to be balanced very carefully in a way that encourages economically efficient performance of economic gameplay while at the same time not frustrating players. The intended overall balance of faucets and drains has thus far regularly been beaten by the players and RMT service enterprises and at most delayed the occurance of MUDflation. Last, rules are imposed on the players upon entering the game world which they have to abide to. Adherance to these rules is supervised by customer service representative personnel 4.2.3. This causes additional costs for the MMORPG operators and only provides rudimentary procedures for combatting the negative

effects of MUDflation and RMT *ex post*. Overall, a workable strategy to efficiently stabilize and control in-game market prices has thus far not been found.

In order to develop a price control strategy that is accepted by the users, the players' in-game economic interests have to be respected. These interests were adressed in chapter 5. To ensure a diverse in-game society, a broad variety of meaningful societal in-game roles should be provided 5.1. While individual optimization strategies may vary, every player should be granted an equal opportunity to perform economically well within the game 5.2. That way, different outcomes are bearable as they solely depend on each player's individual skill and effort invested into the game. In contrary to the real world, where people invest in releaving their constraints, within MMORPGs players want to have manageable constraints imposed 5.3. If they overcome those challenges, they request being granted minimum rewards from and within the game 5.4.

A price control strategy that obliges to both the players' and the game operators' needs was established in chapter 6. All unbalanced player-to-player transactions, the main drivers for MUDflation, require an in-game transfer procedure. It has to be kept sure that each transaction is backed up by individual effort invested into the game by both trading parties. This can be achieved by a mandatory neutral mediation of all player-to-player trade that automates and monitors the process of finding matching trade partners 6.1. While this reduces individual customer-producer relationships, it enhances equality of opportunity for all players to acquire a desired commodity. A formula that determines the minimum value of each in-game commodity guarantees a minimum income for the in-game producers and reduces development costs for the game operators 6.2. As market conditions cannot be accurately predicted, it was argued that the market data for each commodity should be generated by the actual aggregated individual supply and demand of the players. To provide a means to determine market conditions, a recurring cyclical timeframe for according data acquisition was proposed 6.3. As market conditions are compiled through aggregation of individual trade data, it has to be kept sure that information given regarding personal supply and demand is as unbiased and unadulterated as possible. Individuals tend to affiliate their personal beliefs with the beliefs of others and available price information, information on the producers' prices and other consumerss' willingness-to-pay. Thus, information on the supply and demand data of other players is kept undisclosed to all trade participants 6.4. This should increase accuracy of trade data revealed to the automated trade mediator. The mechanism's procedure was described in 6.5: prices and bids for each commodity are sorted in ascending and, respectively, descending order. Linear regression for supply and demand data is used to determine the market equilibrium for each commodity. The minimum and maximum price for each commodity are determined to specify bounds for the validity of in-game transactions. Valid bids are then satisfied in descending order, granting additional profits for validated producer offers that are sorted in ascending order.

7.2 EVALUATION AND DISCUSSION

In order to evaluate the effectiveness of the price control mechanism laid out in chapter 6, its effects on in-game welfare 7.2.1, RMT services 7.2.2, and social-based unbalanced transactions 7.2.3 will be discussed.

7.2.1 *In-Game Welfare Effects*

The automated assignment procedure of offered goods and commodities described in chapter 6 could lead to some economically very desirable effects. Market domination through monopolists generally leads to welfare losses. If this mechanism is applied, the amount of producers and consumers is kept undisclosed to all trade parties. That way, monopolists do not know that they are the only provider or consumer. Even monopolists should thus be coerced to reveal their personal preference instead of the monopoly price or bid.

Another important factor in welfare economics is pareto-efficiency, a term defined as a situation where after a change in allocation of goods some are better off while noone is worse off. Within this mechanism, after trade cycle completion

- invalidated deposits of in-game money or valuables are refunded at no costs,
- validated transactions successfully satisfy individual preferences,
- and producers get paid at least or even more as requested.

Thus, in theory, Pareto-efficiency should be achieved when the price control mechanism is applied.

All producers and consumers reveal their individual preferences to the automated trade negotiator. As the according information is kept undisclosed to all other trade participants, individually valuable system-bound knowledge is protected, increasing likeliness that the information given is accurate. That way, very accurate supply and demand data and information can be collected by the automated mediator exclusively.

Prices for all validated transactions vary by customer as evaluation of offered commodities is revealed and served individually. All market surplus for each commodity is captured by the validated sellers while consumers still get the utility from having their individual preferences met. Within the validated trade frame, there are no allocation inefficiencies. Thus, first decree price discrimination should be established by this mechanism and thus welfare maximized.

This, of course, is only the case if system-external interests, e.g. RMT, can be excluded or at least greatly diminished and if the mechanism is accepted and judged necessary and effective by the players.

7.2.2 *Effects on Real Money Trade*

By the proposed mechanism, every transaction inevitably requires game world internal investments and effort by both trading parties before the transaction is performed. Every player-to-player transaction has to surpass the collective acknowledgement of the commodity market's participants within the according trade cycle. RMT transactions, however, are usually based on two one-directional transactions. The transfer of the commodity occurs in-game while the detached transfer of the agreed-to price is performed outside the game. Through the proposed price control mechanism, the exchange of goods and services for money has to completely occur in-game. In order to acquire a sword from another player, the buyer has to invest and deposit resources obtained within the game. The exchange of real life surplus for in-game commodities thus looses its appeal because in-game surplus is required for the acquisition of any commodity desired within the game.

This applies for both commodities and money within the game. Paying real money to be allowed to pay an interest rate based on free market money supply and demand is pointless as the debitor already has to pay the interest rate in-game. It can also not be guaranteed that the borrowed money is actually provided by an *ex ante* agreed to creditor as the actual trade partners are determined by the automated mediator. In *Sony Station Exchange* 61% of expenditures were spent for the acquisition of in-game money and commodities. (Robischon, 2007, p.5) The implementation of the price control mechanism described in chapter 6 would render these transactions unnecessary as for all in-game player-to-player transactions according in-game investments of time and effort are required for a transaction's completion.

A service the proposed price control does not prevent is paying others real money to have them play one's avatar to increase avatar skillsets or acquire in-game valuables. That kind of service accounted for 38% of *Sony Station Exchange*'s first year RMT transactions. (Robischon, 2007, p.5) Making use of this kind of service, however, causes high opportunity costs for their customers. In order to have others play one's avatar, customers of these services have to reveal the login name and password of the according MMORPG account. That way, suppliers of these services can get access to very sensitive personal data players usually have to reveal to the game operators to have their subscription fees paid, e.g. name, adress, bank account or credit card information. This data is highly suspectible to fraud and abuse. Aside these game-external opportunity costs, in-game problems are also caused. While having others powerlevel[1] their avatar, according RMT service customers loose their control over their in-game reputation, status, and social network. They may log back into the game with the agreed-to tasks fulfilled. But they may also log back into the game after service completion and payment, completely ripped off and with all their in-game money and belongings and even parts of their in-game social network gone. The accessed RMT service would need to be completely reliable and trusted within the community, which is hard to achieve by RMT service providers because their powerleveling actions are declared illicit by the

1 The term usually used for that kind of service.

game operators through EULA and ToS, and because they are socially not accepted within the game's community.

Overall, the mechanism described in chapter 6 should thus greatly reduce incentives and opportunities for RMT companies to offer and guarantee the execution and completion of their services.

7.2.3 *Player Acceptance of the Mechanism*

The mechanism, however, also renders in-game gifting, the asynchronous transfer of goods and services based on social connections and interactions, impossible. This form of transaction, however, is very important and widely accepted and expected in social systems, especially in structures of strong social bonds, e.g. one's partner, families, or close friends. These structures generally support each other with something valuable without expecting something specific, something measurable, in return.

The proposed mechanism prevents asynchronous gifting. For example if a player acquires a valuable commodity in-game that he thinks a friend's avatar that is currently not logged into the game might need, he cannot transfer it to him. He might at most offer the item on the player-to-player trade platform and inform the friend about all personally available information, e.g. the price he put it up for. Producer-consumer relationships also become less meaningful, e.g. an avatar cannot contact the smith of his recently obtained helmet to craft a visually fitting chestpiece at a discount due to previous trade experiences. A smith, however, may still advertise his services at appropriate in-game locations, e.g. at the smith guild memberhall in a MMORPG's capital city. While this reduces direct asynchronous trade interaction, it also enhances equality of opportunity. Every player has the chance to obtain a desired in-game good or service as player-to-player transactions cannot be performed secretly and exclusively if the price control mechanism described in chapter 6 is applied. All offered goods and services are transparent and accessible to, but not directly transferable between all users.

While asynchronous gifting is made impossible, synchronous gifting is still feasible. Several players may still cooperate for the individual goal of one player, not a mutual goal. For example, a geologist avatar may ask a few members of his social network if they can accompany him to a rather dangerous location and protect him while searching for minerals. If they find a valuable commodity while protecting the geologist from attacking creatures, the geologist may, for example, leave it to his companions because of their help. That way, gifting would require the active nearby presence of both the donor and the donee at the appearance of the commodity, e.g. the unlocking of a treasure chest, within the game world. That way, synchronous, simultaneous, and active cooperative interaction could be enhanced because other methods to collectively share the outcome of time end effort invested into the game were unavailable. This could further strenghten social bonds within the game world as in-game experiences and efforts to obtain commodities are shared.

In which way players will in fact respond to the implementation of the mechanism, however, remains unknown until according data is collected.

7.3 PROSPECTS FOR FUTURE RESEARCH

The actual realization of the price control mechanism laid out in chapter 6 could determine if the proposed solution leads to the desired goals, that is increased competiveness for the game operator through decreased costs of service provision and increased stability and quality of the in-game economic system and price stability within the game's economy.

In order to obtain comparable and significant data, two different game servers could be set up. The price control mechanism is activated on one server while not activated on the other. That way it is ensured that all else but how player-to-player transactions are executed is equal and other factors are minimized. Subsequently, trade data of both game servers is collected and compared with each other. If MUDflation occurs on the server where the price control mechanism is not activated while in-game market prices remain stable on the other server, the effectiveness of the suggested price control strategy could be confirmed.

This general procedure of compairing collected data of two game servers where all but one system condition or structure are equal can be reapplied for numerous other tests. For example, different rates for the provision of resources and raw materials could be compared to identify a rate of re-appearance that enhances economic gameplay. The impact of increased NPC vendor prices on basic resources could be determined. Different models of resource provision could be compared. Opportunities for the collection of very unbiased empirical data are innumerous.

Overall, the comparison of different models via the use of two online game worlds where all but the examined condition are equal could provide a very powerful tool for research in many different branches of economics, business studies, and social science. It has to be prevented, however, that the according acquired data is as unbiased as possible. A solution how the integrity of the according system regarding game-external economic interests could be preserved, was presented throughout this thesis.

7.4 FINAL THOUGHTS

Many other questions remain unanswered. A potential solution to stabilize economies within online game worlds has been presented throughout this thesis. This mechanism may achieve a politico-economic goal: price stability, the main goal of monetary policy within the European Union in order to prevent the negative effects of inflation and deflation within an economic system. There are, however, no politics involved within this mechanism, just clear rules of trade participation within MMORPG economies. The political agents who could be blamed for undesired and subjectively broken market conditions are the participants

of each commodity's market within a limited trade cycle timeframe. Which system-internal political structures would emerge from this standoff?

All in-game market conditions are determined by the people who are, within a limited timeframe, interested in the sale or acquisition of the according commodity. There is no way for the participants of these short-term markets to identify their individual market power until trade cycle completion where their power is rendered meaningless again and has to be reacquired. Still, both consumers and producers are empowered: they both have the collective means to change market conditions towards their will while at the same time individual power has to be renewedly collectively acknowledged. Long-term market power cannot be acquired, but each market participant's individual contribution is actually meaningful as it is counted in the determination of the actual market and price conditions. There is no power but the power of the collective evaluation of each time-limited market. In which way would this impact market organization, market structure, invidivual market participation, and the importance of measurable power?

Within markets where this mechanism is applied, people will not always get what they want, because they bid too high or too low, or their subjectively determined minimum profits were not accepted by their potential customers. If the individual preferences of the players are repeatedly rejected by a market's community, will they adapt and readjust their preferences? Or will they rather try to bend the will of the market to their individual interests?

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Ilmenau, December 2008

Jan Stephan Pontzen