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Understanding "Gold Farming" and Real-Money Trading as the Intersection of Real and Virtual Economies

By Richard Heeks, University of Manchester, UK

Abstract

This paper has three purposes. First, it extends the range of economic ideas that have been applied to massively-multiplayer online games (MMOGs), drawing on scale economies, exchange rates, and information failure. It does this, as its second purpose, by deepening the analysis of one relatively-neglected aspect of virtual economies—gold farming (the production of MMOG virtual currencies, items, and services for financial gain) and trading—in order to understand in-game, out-game, and hybrid aspects of this activity. Third, the paper draws conclusions about two key real/virtual issues on which earlier literature has disagreed. One is the extent to which standard/real-world economic models are applicable to virtual economies. The paper argues a strong fit of standard models for analysis of gold farming and trading with little need for modification, but that MMOGs may be better understood through the lens of development economics rather than mainstream economics. The other issue discussed is the nature of the relation between the real and the virtual. On this, the paper concludes that gold farming is part of a dynamic that has eroded the real/virtual dichotomy. At the least, gold farming and trading represents the intersection and blurring of the real and the virtual. At most, it reflects their indistinguishability. Finally, the paper ends by identifying alternative systemic models for understanding gold farming specifically, and MMOGs more generally.

Keywords: gold farming; virtual economics; real-money trading; MMOG.

Understanding "Gold Farming" and Real-Money Trading as the Intersection of Real and Virtual Economies

By Richard Heeks, University of Manchester, UK

Virtual worlds have arguably existed since the dawn of human imagination (Bittarello, 2008), but those with their own currencies and economies are a much more recent arrival. Roughly, they began in very simple terms in the 1980s with the arrival of multi-user dungeons but really took off in the 1990s as massively-multiplayer online games (MMOGs) that had full currencies, banks, trading, etc. Virtual worlds such as MMOGs have attracted economic interest due to their increasing popularity and size (including their potential impact on the real economy) and their novelty, which has meant that they both exhibit new phenomena and offer new ways to investigate existing phenomena.

Research to date on virtual economies can be divided into two main approaches. Some work has sought to use economics to understand virtual worlds. This has looked at the microeconomics of play utilizing, for example, rational choice theory and ideas of utility and disutility (Castronova, 2003), transaction cost economics (Lehdonvirta, 2005), game theory (Smith, 2006), and cost/benefit analysis (Kelly, 2007). It has also studied the macroeconomics of whole virtual world economies employing, for example, gross domestic product equations (Castronova, 2001; Gudmundsson, 2007; Lehtiniemi, 2009), cost/benefit analysis of externalities (Castronova, 2006), welfare economics and supply/demand curves (Castronova, 2006), and the quantity theory of money (Castronova et al, 2009).

Other work has been the converse, seeking to use virtual worlds to understand economics. Such work is at an early stage, so papers identifying the potential and requirements (e.g. Bloomfield, 2009; Castronova et al, 2009) appear rather more numerous than those reporting use (e.g. Atlas, 2008 on economic decision-making).

Looking at the former body of work, two sets of viewpoints can be distinguished: sometimes expressed as premise, sometimes expressed as conclusion, as summarized in Figure 1. The first relates to the applicability of standard economic models to virtual economies. Viewpoints differ. Some see very limited applicability and the need for quite new principles and models: "Macroeconomic theories are not applicable in the virtual context. … Any analysis of a virtual economy carried out on the macro level must rely on its own concepts and models instead of borrowing from the ultimately dissimilar real economy" (Lehdonvirta, 2005, p.4) (see also Simpson 2000).

Others see the underlying principles of standard economics applying to virtual economies, but seek a requirement for some modification or redefinition of component parts. Castronova (2003), for example, speaks of the need for "slightly different tools and approaches" when analyzing virtual economies. Gudmundsson (2008), Castronova et al (2009), and Lehtiniemi (2009) similarly identify modifications they have had to make to standard models in order to get those models to work in a virtual economy. But finally, another viewpoint finds that the same models with the same components used to understand real economies can be used to understand virtual economies (e.g. Kelly, 2007).

The second set of viewpoints expressed in earlier work relates to the relationship between the real and the virtual. Some express a clear sense of separation between the two; this is a view also reflected by some players who want no intrusion of the real into the virtual (Yee, 2004; Castronova et al, 2009). Some maintain the dualism of real and virtual but see them as abutting; for example, Castronova (2005) speaks of the "membrane" between real and virtual which provides a limited permeability and the potential for osmotic transfer between the two. Others go further and argue for an overlapping or intersection between the real and the virtual such that at least some blurring or hybridity exists (Bell, 2006; Calleja, 2008). Finally, some argue that the real and the virtual are indistinguishable, and all part of the same (Shaviro, 2007).

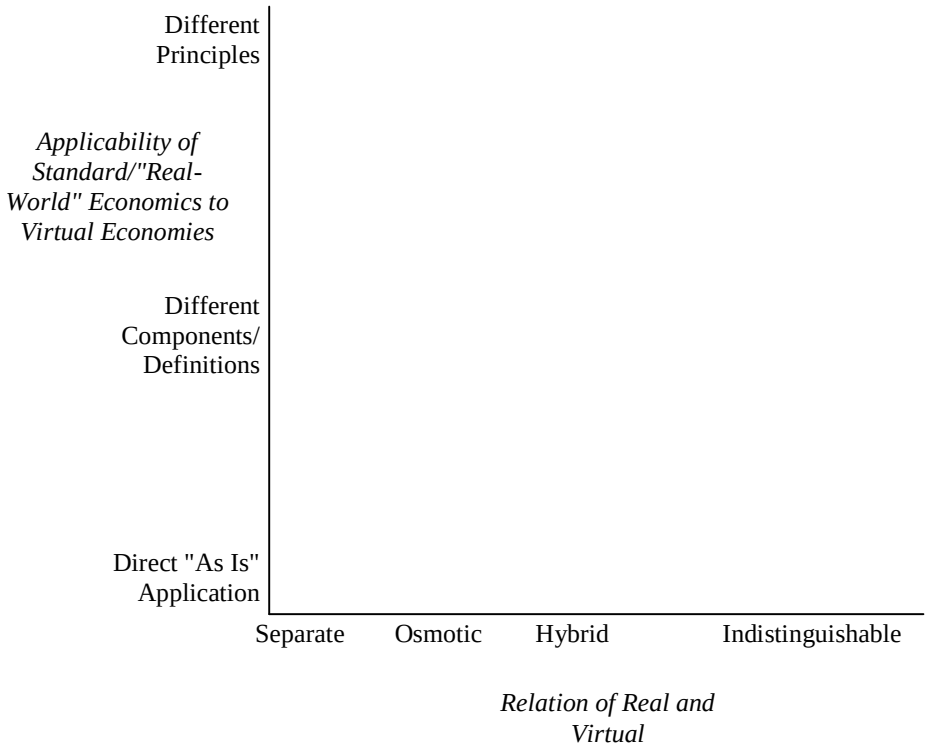

Figure 1: Viewpoints about Real and Virtual Economies

On the basis of this background, the current paper has three purposes:

- To extend the range of economic ideas that have been applied to MMOGs. To do this, it will select scale economies, exchange rates, and information failure. None of these has particularly been used to date but each of them has relevance to the topic under investigation.
- To extend the range of virtual world activities to which economic ideas have been applied. To do this, it will select gold farming—the production of MMOG virtual currencies, items, and services for financial gain—and its associated real-money trading (RMT). Gold farming is of intrinsic economic interest given its trade and employment size but also because it draws together real and virtual elements (Heeks, 2008). This has occasionally been studied (e.g. Castronova, 2006; Huhh, 2008), but gold farming and trading has not had the same degree of scrutiny as other aspects of virtual economies such as utility/disutility of play and macroeconomics. The paper will cover a range of issues associated with gold farming from those which are largely in-game (impact on utility and prices) to those that are largely out-

game (the process and structure of currency trade) via those that straddle both arenas (scale and strategy of production).
- To provide its own view on the basis of this analysis about the two dimensions identified in Figure 1.

To fulfil these purposes, the paper undertakes a review and analysis of current evidence about gold farming and real-money trading using economic tools. The next section provides an overview of what is known about gold farming and trading. The paper then moves to a deeper understanding of the economics of gold farming and trading. It reviews existing evidence on utility/disutility and inflation/deflation before moving to application of scale economies, exchange rates, and information failure. Finally, the paper will analyze these findings; seeking particularly to reflect on the viewpoints expressed in Figure 1.

Gold Farming and Real-Money Trading

Gold farming is a more recent sub-component of the longer-standing activity of real-money trading (RMT): the trading of virtual world currency, items, and services for real money. RMT can be traced back to at least 1987 and the first cash payments between players for items or for improving characters within text- and basic graphics-based multi-user dungeons (Hunter, 2006). It can be divided into two elements: primary RMT that takes place in-game or beside-game as part of the sanctioned design of the game by the game company, and secondary RMT that takes place partly out-game and is not sanctioned by the game company (Lehtiniemi, 2007). Gold farming and secondary RMT are often used synonymously (as sometimes in this paper). However, in a strict sense, they form two parts of the same value chain: the former being the production and the latter being the trade.

The origins of modern gold farming can be traced back to three key events of 1997:
- The launch of *Ultima Online*, which became the first true massively-multiplayer online game.
- The launch of eBay, which provided a low-cost mechanism for the offer and sale of virtual items.
- The Asian currency crisis in which Asian governments sought to spend their way out of the crisis by investing heavily in broadband infrastructure. Some of those who became unemployed set up new businesses such as PC kiosks in which games could be played, and others among the unemployed turned to games playing to fill their empty hours. As a result, a strong games culture including gaming skills and entrepreneurship took root in East Asia.

Respectively, these three events put in place the demand, trading channel, and supply that led gold farming to take off as a mass service activity.

As noted, some form of gold farming – perhaps better called "gold market gardening" – had existed for at least ten years prior to this point. After 1997 it first emerged as a cottage industry; a typical model being an individual US gamer – sometimes assisted by a friend or two – making currency or items in their spare time; that "spare time" gradually expanding as the profitability of this enterprise became apparent.

Up to this point, production for virtual worlds had therefore already followed the standard capitalist chronology (Bernstein, 1983): from subsistence production for personal use, to informal barter between players, to "monetisation" (exchange for real money), to small-scale commodity production. It was thus no surprise when, during the first years of the 21st century, gold farming adopted three final features that are typical of late-phase capitalism (*ibid.*, Porter, 1980):

- Wage labor: expansion beyond informal arrangements such that an entrepreneur pays someone else to farm gold on their behalf. In time, and as per the full capitalist commodity production model, some of the hired workers did not own the means of production: the PCs and software and even accounts were owned by the entrepreneur.
- Offshoring: given that wage labour forms by far the single largest cost component of gold farming, it not-unexpectedly migrated to low-wage locations. Thanks to its combination of gaming culture and skills, broadband infrastructure, low costs, and relatively good overseas trading connections, East Asia—and China in particular—was the obvious choice.
- Automation: the cutting of time and financial costs by use of bots that can imitate the actions of real players and can be used for some gathering of in-game items and currency (Kushner, 2007). e-Commerce has also been central to gold farming. Almost all currency transactions are undertaken via web portals, with the player-buyers making their purchases using online payment systems such as PayPal.

The current picture of gold farming is one on which data is frustratingly uneven. There are few certainties at an aggregate level. Heeks (2008) provides a best estimate, based on other estimates, that something like 400,000 people are employed in gold farming, of whom perhaps 85% are based in China. Globally, the secondary real-money trade associated with gold farming may well be worth in excess of US$1 billion. But the true figures could be much more; Ryan (2009) for example cites one million gold farmers working on a global trade worth more than US$10 billion.

The foundation for all this is the gold farming archetype: a Chinese "playborer" who spends time in-game killing non-player characters for their drops, undertaking quests, gathering rare items, or arbitraging in order to build up virtual currency (Chan, 2006; Gilmore, 2009). These different roles form the basis for an in-game division of labor: some gold farmers will fight individually, others will assist fighters, some will gather valuable resources, others will produce items, some will "mule" and bank currency, and others will produce currency through trade.

Although overall numbers are imprecise, the specifics of playborers' working conditions are less so. They are almost entirely males aged around 18-25 years; existing gamers or college students seeking additional income in the early days but increasingly unemployed rural migrants seeking work in urban areas. They earn something like US$150 per month working a 10-12 hour daily shift with (often rather poor-quality) food and accommodation thrown in. Payment is typically for currency produced rather than a set wage (though some workers will be undertaking power-levelling: building up the levels of a client's game character).

The playborers typically work in one of the tens of thousands of gold farms or "gaming workshops" as they known in China, which might employ a few dozen such farmers. But there are other roles found in such enterprises:

- Management: just one or two people (typically the owner-managers) would handle administration, management, and HR management tasks.
- Research: one or two staff might be employed to seek more effective ways of gold farming or power-levelling, though the gold farmers themselves may also cover this.
- Technical: there are staff who purchase, install, and maintain the workshop's ICT infrastructure.

Some would also add a fourth role:

- Customer relations: responsible for all activities that involve contact with potential and actual customers, usually undertaken by email or online chat.

We can put all this together to build a picture of the internal value chain within a typical full-service gold-farming-and-trading firm (see Figure 2).

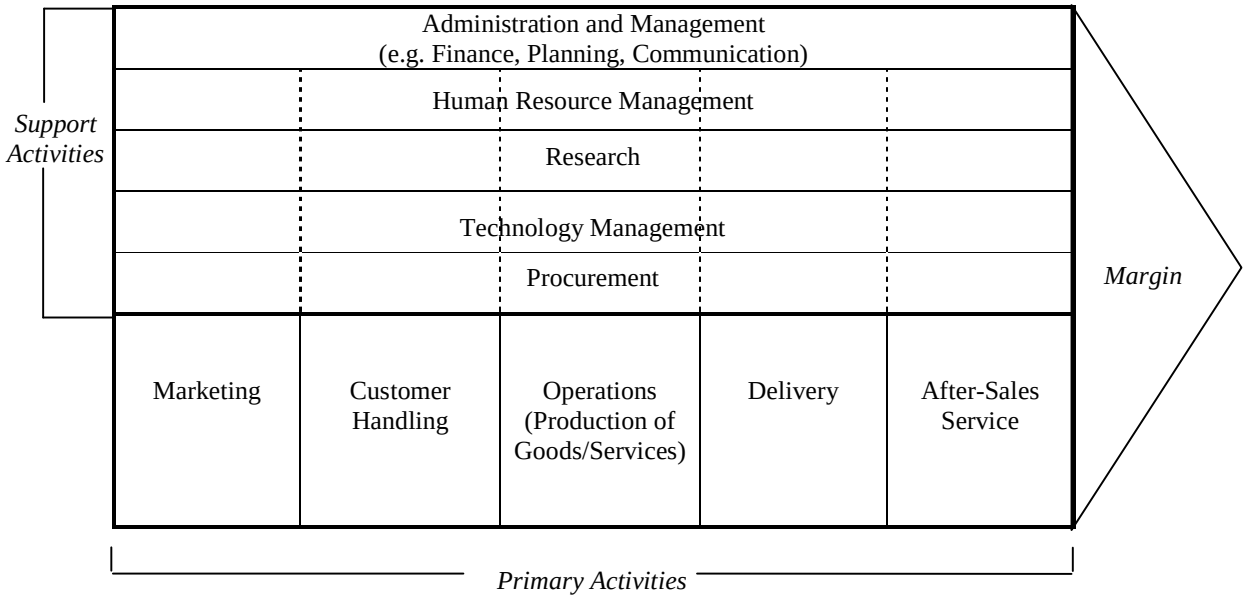

Figure 2: Gold-Farming-and-Trading Firm Internal Value Chain

Looking at the external supply chain, gold farming firms may sell direct to player-buyers via their own web portal or they will sell via a number of brokers. The brokers, usually based in China as well, also have web portals and just employ customer-relations staff who undertake all of the non-operational primary activities shown in Figure 2. The brokers are classic intermediaries, producing and consuming nothing themselves but earning a living from the difference between buy and sell prices for virtual currency and services. (One or two exchanges exist; these put producers and consumers in touch with each other but, unlike brokers, do not directly participate in the trade).

Data is also imprecise about the client market for gold farming and power-levelling. There are likely to be several million buyers worldwide. However, the uncertainties here and over other aggregate figures arise because very little data is available on what may be a major constituent of the trade: purchases by East Asian— particularly Chinese—players, including purchases on games using the "free-play, item-pay" model (no subscription fee but a need to pay real money to buy in-game items) that is popular in Asia.

Understanding Gold Farming and RMT Economics

There was a clear sense above in which the "industrial development" of gold farming and real-money trading had quite closely followed the same pattern that one finds in other sectors of the economy. Perhaps the key difference that virtuality— or, more accurately, the pervasive involvement of information and communication technologies—has brought is to help speed the cycle. For instance, while it took centuries—millennia, even—for real-world farming to move from subsistence through barter to small-scale and then large-scale capitalist production, gold farming moved through the same steps in less than two decades.

Basic Economics and In-Game Issues: Utility and Prices

Just as the models of capitalist development have been applied to analyze the history of gold farming so have basic economic ideas been applied, such as utility/disutility. This has been applied to the notion of play more broadly within MMOGs (see Box 1) but also to the specifics of gold farming's impact. At root, gold farming is utility-maximizing for both parties, gold farmer and player-buyer. Otherwise, of course, it would not take place (Castronova, 2003). Castronova (2006) further argues that there are negative externalities of gold-farming sufficient to justify the imposition of controls upon it; although Heeks (2008) questions some of the assumptions about externalities.

Box 1: Play and Work, Utility and Disutility, and Gold Farming

One of the difficulties of applying economic ideas in MMOGs is that they are both games and virtual economies, and there may be some tendency to conflate the features of these two. Certain economic peculiarities of MMOGs arise from the game aspect but are not intrinsic to the MMOGs' virtuality. For example, Castronova (2003) has written on the "puzzle of puzzles": that real-world assumptions associating constraints with disutility do not hold for MMOGs because they involve play, and players derive satisfaction (i.e. utility) from some level of challenge (i.e. constraint).

But we can readily undermine any simple notion that real-world work is a disutility while virtual-world play is a utility (Lehdonvirta 2005). Gold farming does this par excellence by showing that players will pay others to play for them. At least some aspects of "play" thus have a disutility to players and resemble work rather than non-work. Through analysis of gold farming and other examples, the whole notion of separable – as per Huizinga's "magic circle" – worlds of work and play breaks down into a messy blur in which play looks more like work and, potentially, work looks more like play (e.g. Dibbell 2006, Shaviro 2007). Likewise, the idea that principles of utility apply differently to MMOGs' play component may also crumble away (Kelly 2007).

Gold farming is argued to reduce the utility of other players (those not involved in real-money trading) by negatively impacting on prices (see below) or game-play; it may also reduce the utility of game companies by imposing costs such as those of dealing with complaints. On the other hand, the real working gold farmer behind the avatar means gold farming has positive as well as negative externalities: the financial externalities of a created, paid livelihood and the economic merit externalities of transferring surplus through RMT from rich (often industrialised country) consumers to poor developing country workers who might otherwise be unemployed. Gold farming also helps the virtual value within MMOGs be "real-ized": converted from an unseen, unmeasured phenomenon into real economic activity, thus addressing some of Castronova's (2003) concerns about potential losses to real GDP of more and more human activity being undertaken in virtual worlds.

Castronova focuses on the negative externalities to demonstrate some level of control on gold farming is desirable, but Heeks' counter-points could equally be used to argue that some level of gold farming is desirable in utilitarian terms. Overall, these authors' work shows the applicability and relevance of the economic principles of utility and disutility. It suggests some difficulties in applying those ideas that arise due to the virtuality of gold farming and trading. This virtuality means, for example, that gold farming is unrecognizable: it is impossible to distinguish with certainty a gold farmer from any other player (notwithstanding the "ten signs he's a gold farmer" nonsense that circulates on game forums). Likewise, it is very hard to observe real-money trading. Their hidden nature means it is the perceptions of farming and trade more than their experienced actuality that create disutility, and means that true supply-demand curves cannot be calculated.

Another basic economic idea that has been applied to gold farming is that of money supply and demand. This has been invoked to argue—at times, complain bitterly— that gold farming fuels in-game inflation (e.g. Bell, 2006; Castronova, 2006; Ward, 2008). The economics of this are apparently straightforward: increase in the supply of any item—assuming constant demand—causes its value to fall. As gold farmers pump additional currency into the virtual economy, it is argued, this is the equivalent of increasing real-world money supply. The value of the currency falls. It therefore requires more of the currency to purchase any item. In other words, prices rise and there is in-game inflation.

However, we may question this simple reasoning. In-game inflation has undoubtedly been seen in the short-term (e.g. Castronova et al, 2009) but there seem to be few long-term records. One data set for a game in which gold farming is present is *EVE Online* from October 2005 to June 2007 which shows deflation, not inflation (Lehtiniemi, 2008). Yee (2005) claims in-game deflation in *World of Warcraft* and similarly Castronova's (2001) study of *EverQuest* showed deflation over time.

Other evidence is mixed. Players themselves report both inflation and deflation (Kaminski, 2006). More objectively, comparing prices over time for a basket of different items on the *Runescape* Price Guide (http://www.zybez.net/priceguide.php) indicates a mix of inflated and deflated prices. Overall, inflation between September 2006 and November 2009 was just 5% within which was a period of deflation up to late 2007 (when gold farmers were likely to be relatively more active), and a period of subsequent inflation up to late 2009 (during a period when game redesign had made gold farming more difficult).

There is, thus, little evidence as yet to support the supply-demand claims of gold farming causing in-game inflation. Some of the explanations are entirely consistent with supply-demand economic principles: that demand is not constant but rises and falls, for example, due to changing numbers of players in the game; and that gold farmers represent only a minority of players and thus have a limited impact on currency supply (Woodcock, 2008).

Other explanations rely more on the particular characteristics of virtual economies, hinging on the fact that gold farmers do not create anything tangible. Gold farmers make money by doing the things that all other players do: mining ore, picking herbs, killing monsters for their drops, and so on. Where another player would have, say, mined the same ore vein, gold farmers are not creating new value within the virtual economy, they are merely diverting it. They,

therefore, do not affect supply. (Where another player would not have farmed the item, gold farmers may be increasing the supply—but of items, not currency—hence having a deflationary price effect.)

Over and above all this lie two further issues. First, a core premise about what makes virtual economics different is the question of scarcity, abundance, and cost of production (e.g. Lehdonvirta, 2005; Kelly, 2007; Shaviro, 2007). Parts of standard economics rest on the notion that items are scarce and have production costs. This is close to untrue for game companies; they can produce an infinite number of mithril ore veins at close to zero cost. At times, this has been used as an argument to justify the need for different economic models for virtual economies. But most virtual items are "produced" twice before they enter the economy: first by the game company, and then by the player. At least for gold farmers, the element of difference is absent. Resources are scarce, not abundant; there are not an infinite number of ore veins or bosses, and they are rivalrous: whoever gets them denies others. Indeed, gold farming overall exists only because it combines virtual-world scarcity of currency and items with real-world scarcity and unequal distribution of time and money. Gold farming arose because those in the world with more money than time (player-buyers) can trade a scarce resource (gold, or items, or high-level characters) online with those in the world with more time than money (gold-farmers). In this sense, there is nothing particularly different or unusual about the economics of gold farming.

Second, there is the game company: the virtual world's economic gods who ultimately control all inflows and outflows of currency and items, and impact demand. Game patches and redesigns may introduce new sources of in-game currency (such as daily quests in *World of Warcraft*), or new sinks (e.g. costly items like epic flying mount training in *World of Warcraft*); they may also increase or decrease the demand for certain items and for currency. These impacts are likely to far outweigh those of gold farming on prices. The company's ready ability to do this arises because they control the code that creates the world and its economy. In many ways, they resemble a national economy's central bank although they have transcendent powers compared to their real-world equivalents (and also different purposes – game companies care relatively little about the core role of a real central bank: the control of inflation and economic growth).

In applying the simple idea of supply and demand to gold farming, then, we find relatively little evidence for a reality behind the perception of inflation. We find a picture of more complexity than the initial "headline" narrative, and we find a mixture of some standard application of economic ideas including those of scarcity and central banking, combined with some particular features of the virtuality of production and in the overriding control of the game company.

What can we find from application of other economic tools? Here, I select three gold farming and RMT issues, to each of which an economic tool is applied. As noted above, they are chosen because they have not yet been much used in discussions of virtual economics.

Gold Farming Production and Scale Economies

To understand the nature of gold farming production and enterprise, one useful tool will be scale economies. Economies of scale exist "where a firm can lower the cost of each unit of output by producing more units" (Sayer, 1985, pg10), meaning that firms producing larger amounts have a competitive advantage because they can produce each item more cheaply than a

smaller producer. They can do this where there are fixed costs: input costs which do not rise proportionately for each extra unit produced. The alternative is variable costs: which rise proportionately for each extra unit produced and which do not provide the basis for scale advantage.

Basic in-game gold-farming appears to have few scale economies. Variable costs dominate as each additional production unit (i.e. individual or pair of players if they are working back-to-back shifts) requires one PC, one Internet connection, and one account. Playborers are typically paid incrementally based on output, so wage costs are fully variable. Productivity per worker is also constant: one person kills a monster or chops wood or crafts an amulet just as quickly whether or not twenty other co-workers are doing the same. The virtuality of gold farming has thus made little difference here; the rules apply as they would for a real production line worker or real wood-cutter.

Step back, though, and some economies of scale do start to emerge, mainly in relation to all the non-operations activities identified in Figure 2:

- Indivisible-cost items: some investments, although their input cost does vary with size of output, are discrete items ("lumpy investments"). For example, if it requires one manager to manage 20 gold farmers, or one technician to manage 20 PCs, this creates scale economies on the assumption that it is hard to purchase twentieths of their services. They only come in discontinuous amounts: zero, one, etc. There can also be an equivalent indivisibility in game-play. Some high-level monsters such as bosses can only be killed by groups working together; hence the items or currency they drop have a scale economy.
- Fixed-cost items: some gold-farming firms will have fixed-cost investments in a web portal, in setting up payment and security systems, and in marketing their services. These create scale economies.
- Divisions/specialization of labor: as described above, gold farmers play various different roles in-game, and staff in gold-farming firms undertake different out-game activities. On the assumption that there are efficiencies gained from specializing in particular roles, then there will be scale economies for those firms that have enough workers to allow this specialization.

The last two items on the list help explain why individual gold farmers may likely work via brokers/exchanges rather than seeking to sell direct to player-buyers since they thereby avoid fixed costs and the need to adopt multiple roles. If all three items in the list were economically overwhelming, then one would expect medium and large-sized enterprises to emerge. But there appear to be relatively few signs of this from on-the-ground reports (e.g. Johnson, 2006; Wang, 2008), suggesting that fixed, indivisible costs do not dominate.

Again, there are few signs here that virtuality of production has had much impact. It is very real items like staff and hardware infrastructure that underpin the fixed costs. The divisions of labor imitate those found in many other forms of production. The only possible echo of virtuality we may find lies in one final factor—potential scale diseconomies.

These could arise from perceptions that the sector is too volatile to justify large-scale investment, or from growing costs of coordinating a large operation, or from the inability to cut regulation-related costs as informal sector small enterprises can. But they might also arise from dangers of "becoming noticed," e.g. for taxation and regulation purposes by local government or

for legal action by game companies. The only sense of virtuality is that it may allow firms to remain somehow hidden if they do not become too large.[1]

Enterprise Strategies and Exchange Rates

Exchange rates between real-world and virtual currencies impact neither regular players nor game companies in subscription-based games. They do, though, impact gold farmers and their customers, both affecting and being affected by enterprise strategies. Calculations from available data on leading games show that in-game currencies, on average, devalued against the US dollar by roughly 85% between June 2005 and November 2009, using a weighted average based on 2008 subscriptions (see Table 1).

Table 1: Change in Exchange Rate of In-Game Currencies to US$ Over Time

Game	***June 2005 rate***	***November 2009 rate***	***Devaluation***	***Unit (US$ per)***	***2008 subscriptions***
World of Warcraft	10	0.84	92%	100 gold	10m
Runescape	10	4.5	71%	1m gp	1.2m
Lineage II	5	0.11	98%	1m adena	1m
Final Fantasy XI	24	28.3	-18%	1m gil	500,000
EVE Online	3	0.5	83%	10m ISK	235,000
Everquest II	150	2.8	98%	10 plat	200,000
Everquest	40	24	39%	100k plat	175,000
Star Wars Galaxies	5	0.55	89%	1m credits	100,000
	March 2009 rate				
Lord of the Rings Online	113	99	12%	100 gold	
Warhammer Online	30	19	36%	1000 gold	

Source: GameUSD (2005) for the June 2005 figures, checked with historical search of IGE web site: http://web.archive.org/web/*/http://www.ige.com; averaging across several gold-farming web sites for the November 2009 figures. Subscription figures are drawn from Woodcock (2008).

Let us begin with the minority trend: appreciation rather than devaluation. There are claims that anti-gold-farming campaigns by game companies do temporarily revalue currencies (Dibbell, 2007). There is some evidence to support this idea but particularly the notion that effects are only temporary. Square Enix put a very strong effort into curbing gold farming within *Final Fantasy XI* during the latter half of the 2000s (e.g. Davis, 2009a), a period during which currency appreciated (though using an earlier start point changes this picture). Taking before and after valuations (October 2007 and June 2008) relating to the point where Jagex undertook a major redesign of *Runescape* to try to reduce gold farming, there was no currency devaluation (but devaluation did occur subsequently). During 2009, hundreds of gold farmers and then a major real-money trader were banned from *EVE Online* by CCP Games causing a significant impact (Davis, 2009c; de Zwart, 2009). Over that same period, *EVE Online* currency

[1] The overt signs of real-money trading – especially advertising – therefore tread a difficult line between attracting the attention of customers, and not attracting the attention of those seeking to control gold farming.

ISK appreciated by 72% against the US dollar, rather than devaluing (but the longer-term picture for ISK has been devaluation).

So we have a little evidence for temporary effects resulting from game company actions taken against gold farming. But the overall and fairly relentless picture is one of devaluation. Even more-recently-designed games are affected. *Lord of the Rings Online* (launched in 2007) and *Warhammer Online* (launched in 2008) show an unweighted average 24% devaluation of their virtual currencies over just an eight-month period in 2009 (a similar average to that of all games over the same period).

Currency exchange rates, of course, represent a foundational connection between the real and the virtual. So what can be learned from the ongoing devaluation?

First, that devaluation has real causes. The main offered explanation for the devaluation is competition, with new entrants undercutting existing firms in order to try to win business (Heeks, 2008). Interviewed gold-farming entrepreneurs are quite clear that new firms have moved into the sector particularly since the mid-2000s and that both entry and survival are based on a simple competitive approach: "those companies have to reduce prices" (Carless, 2007; see also Debatty, 2008).

Second, that devaluation has real effects. It has been cited as the reason behind the collapse of the high-wage (e.g. US-based), cottage-industry model of the early 21st century (Concernedeq, 2006). And it has also changed the way gold farming is undertaken in East Asia, with three main effects:

- Revenue adjustment: changing the profile or distribution of income. In the first half of the 2000s, "super-profits" were being made from gold farming. Zhe (2006) suggests profits at that time were 265% of operating costs, and Dibbell (2008) reports the dominant real-money trading firm of the time, IGE, making US$ tens of millions per month, with multi-million-dollar payments to its senior staff. As a result of competition and devaluation, that super-profitability disappeared in mid-decade to be replaced by more normal or even tiny profit levels (Terdiman, 2007; Salyer, 2007).
- Increased productivity: finding ways to make more in-game currency per hour. In the first half of the 2000s, for example, a typical in-game earning rate for *World of Warcraft* was 200-300 gold per 12-hour shift (e.g. He, 2005; Zhe, 2006). By the latter half of the 2000s, it was possible to make 100 gold per hour relatively easily, with several hundred per hour being feasible for the highest-level players (e.g. Voodex, 2008). There may also be greater use of bots to raise productivity levels (e.g. Allen, 2008).
- Cost-cutting: in the first half of the 2000s, a few brokers were dominant; notably IGE which is claimed to have had a 60% market share (Salyer, 2007). Since then a number of gold farming firms have disintermediated the supply chain, selling directly to customers in order to reduce the costs of dealing via a broker, and taking advantage of the relatively low costs of setting up a "cookie-cutter" e-commerce portal. They have looked to reduce overhead costs; for example, relocating outside major city centres as broadband infrastructure has diffused (Gilmore, 2009). There are also reports of relocation outside China to lower-cost locations such as Vietnam (Davis, 2008b).

All of this, then, seems to reflect the ready application of economic rules showing that virtual currencies behave like real ones. Prices have gone down as supply has increased. Where supply is constrained by game company actions, there is some evidence of prices holding firm or even appreciating. And temporary supply constraints also have an effect: real-to-virtual currency rates on a wide range of MMORPGs spike in late January/early February when the Chinese New Year holiday reduces supply (Davis, 2008a; WoWMine, 2008). Reaction to devaluation has been what one would expect to see in any real-world company or country facing the same situation: squeezing profits, increasing productivity, and cutting costs.

Real-Money Trading and Information Failure

Having looked at in-game issues and production scale/strategies, we move lastly to look at the process and structure of real-money trading. In some ways it is a minor miracle that gold farming can exist as a sub-sector given that RMT is such a textbook case of information failure. Information economics shows that trading generically relies heavily on information during each of its three steps (Norton, 1992; Casson, 1997):

- Information acquired prior to trading (on general items/services available, on the existence of traders, on their reputation and trustworthiness, on typical prices).
- Information communicated during trading (on specific items or services offered and money sought, on quality of items/services offered, as part of negotiation).
- Information acquired after trading (on whether or not the terms of the agreed trade contract have been fulfilled).

Availability, quality, cost, other characteristics of information, and the ability to communicate that information, are thus critical foundations for all trade and all enterprise (Porter and Millar, 1985; Stiglitz, 1988).

Given that everyone playing MMOGs and all gold farmers have web access, and given the huge quantities of data available on gold farming[2], then information failure might, at first sight, seem odd. The key problem is at least three-fold: the virtuality of trade (buyers and sellers never meet physically), the anonymity of online activity, and data quality (the snowstorm of data available that could be good, bad or indifferent). Data available online may be good for providing buyers with certain information—the virtual existence of sellers, typical prices, specific items, and services offered. But the following information failures still occur:

- Information absence: both buyers and sellers may be completely unable to find out who, in reality, they are trading with.
- Information uncertainty: buyers and sellers will be uncertain about each other's trustworthiness; buyers particularly will be uncertain what—if anything—will really be delivered if they pay; buyers report being uncertain about whether or not partially-completed deals will ever be fully-completed; both sides will be uncertain about whether or not their trade is under surveillance from game companies.
- Information asymmetry: absences and uncertainties affect both sides of real-money trading but there is a typical asymmetry since key items of information about the trustworthiness and quality of items/service are known to the sellers but not the buyers.

[2] As a cheap example, Google produces 5.7m results for a search on 'wow gold'.

- Communication problems: sellers typically offer online chat and email contacts but buyers report problems with communication relating to issues like language, time difference, non-response, and being fobbed off with excuses (e.g. mmobux, 2008).

Information economics demonstrates that characteristics such as these failures in turn shape both the process and structure of commerce (Williamson, 1975; Stiglitz, 1988). The informational characteristics just described indicate the build-up to trading may be relatively quick and easy. However, trading overall has the characteristic that it is risky, far more so than typical real-world trading.

That risk can be instantiated as both opportunism and adverse selection. Opportunism would refer to actions such as overcharging for goods or agreeing to a contract knowing it cannot properly be fulfilled. One can seek evidence for this from those who post online about the experience of buying gold-farmed items/services. They are generally negative (e.g. Jamie, 2007; Allen, 2008; PowerLevelingReviews, 2008). Of course one must allow for the profile of those who post being different from the average buyer profile and the possibility that posts are made by those with vested interests for and against gold farming or particular suppliers. However, the level of detail provided in some posts suggests they represent real experiences and that a proportion of purchasers are disappointed. Examples of reported problems include:

- Late delivery: rather than the instant service and large stock promised, purchasers find currency being delivered piecemeal over a long period of time; other actions promised quickly do not occur for days or even weeks.
- Partial delivery: full amounts of currency are not delivered; characters are returned having been only partially-levelled.
- Currency loss: currency is impounded by the game company.
- Account suspensions and banning: particularly for power-levelling.
- Disputes: as purchasers try to get their money back.

Underfulfilment and opportunism thus do seem to be present.

Adverse selection would mean actions such as unwittingly selecting either a trade partner or trade items of poor quality. The quality of virtual trade items can readily be determined on their delivery but the risks of poor trade partner selection do appear to be present. They are present for sellers (e.g. defraud by players: see Aiken, 2007; Floozle, 2008). And they are present for buyers. For example, out of more than 400 real-money traders reviewed by mmobux[3], only five got a rating of more than 7 out of 10, sufficient for them to be deemed "extremely reliable" (Carebear, 2009). The vast majority of traders got very low ratings indicating a poor quality of trade.

On the basis of these information failure-shaped characteristics, one would predict the following outcomes:

[3] This site provides what appears to be the most comprehensive review of gold-farming firms: http://www.mmobux.com/shops.

- Suppression of trade: the level of trading is likely to be below that which would occur if the various informational challenges were mitigated or removed. One possible indicator is the gap between the US$10 average annual spend per player on gold farming and the US$46 spent when Sony set up Station Exchange for *Everquest II*: a system that legitimised real-money trading on two servers and thus addressed most of the information failures indicated here (see Heeks, 2008 for calculations). That suggests a possible 78% suppression of trade due to information failures (though issues of legitimacy and effort would also have an effect).
- Localization of trading: as traders seek to deal only with those they physically know. RMT did begin on this basis. It still seems to be the starting point for individual developing countries as MMOGs take off. However, the online nature of the games, including their globalization, has encouraged trade to move beyond the local, impelled by buyers and sellers not knowing enough other players to match their respective demand and supply.
- Presence of intermediaries: intermediaries address information absences and uncertainties by holding information about both buyers and sellers; for example, reputational/trustworthiness and quality information. They can reduce the information-gathering costs of all stages of trading. They can make trade less risky, or at least make it perceived to be less risky, because of their informational resources and reputation. It is not easy to judge the extent to which intermediaries exist in RMT – separating intermediaries from end-producer gold farms on the basis of just their web sites is hard; judging volume of trade is even harder. Some do undoubtedly exist (Gilmore, 2009) but there are countervailing tendencies. Pressures for disintermediation thanks to the virtual nature of trade, and pressures from game companies are a partial explanation. The shifting and anonymous nature of buyers is another. And the brokers have their own reputational problems (e.g. PJ, 2007).
- Reputational portals: given the importance and scarcity of information on reputation and trust, it should have a high value, and this should encourage information brokers to emerge who would gather and disseminate such information. In practice, there appear to be relatively few such brokers, most likely because they also struggle to establish their own trustworthiness and that of the information they provide. The one exception appears to be: http://www.mmobux.com.[4] Exchanges of which, again, there appear to be very few (e.g. http://www.playerauctions.com/, http://www.markeedragon.com), typically provide this information as an integral part of their service (though the last appears to have so few suppliers that its exchange function is unclear).
- Reputational tactics by sellers: given information uncertainties and the importance of trust, sellers would be expected to try to provide a lot of information about their reputation and trustworthiness. Overt tactics include the presence of customer testimonials (e.g. http://www.guy4game.com/about/customer-testimonial/); graphics of reputed global firms such as MasterCard, Visa, PayPal (e.g. http://www.gmlvl.com/); links to reputation rating sites such as BizRate (e.g. http://www.igegolds.com/); guarantees of fast, safe service and refunds if unsatisfied (e.g. http://www.mmoempire.com/); and demonstrations of altruism/corporate responsibility through donation programmes to charities (e.g. http://wow.vcsale.com/). Other tactics include advertising methods for easier communication such as live chat; detailed explanations of the process (e.g. http://www.wowgold-wow.com/FAQ.asp); and imitation of the names of well-known traders (e.g.

[4] Problems with other reputation-and-review sites include the following: they make their money from links to real-money traders and all reviews are positive (e.g. http://buywowgold.co.uk/; http://www.warcraftgoldreviews.com/gold_seller_reviews.php); they are very limited in coverage (e.g. http://powerlevelingreviews.wordpress.com/); some combination of the above (e.g. http://wowgoldbuyer.com/; http://wowgoldhunter.com/); all reviews are negative (e.g. http://www.powerlevelingsucks.com).

http://www.igewow.com/). The main problem is that, by and large, all these tactics are perceptual rather than real. They may have a marginal impact on some customers but they have no more actual value than a would-be real trader telling you "I am not a fraudster." One should also mention the potential for "anti-tactics:" providing false negative information about competitors. This means that even where companies are rated—for example, IGE has more than 25,000 ratings on BizRate—it is difficult to trust either the positive or the negative ratings.

- Repeat business: those purchasers who buy repeatedly are likely to stick with one supplier if they are satisfied with its service. Given the lack of data on purchasers, it is not clear if this happens in practice.

From all this, we see that the ideas of information failures are applicable to gold farming and real-money trading. They show a whole set of information failures which lead to opportunism and adverse selection. Those characteristics, in turn, shape this activity in a powerful manner. For example, they probably significantly suppress the level of trade, and they trigger a whole raft of reputational tactics. However, because of virtuality, the outcome is not exactly that which one would predict from real-world experiences. In particular, trade is more globalised and perhaps less intermediated than an offline equivalent with similar information characteristics.

Analysis and Conclusions

Since the foundational work of Castronova and others, we have known that is possible to address virtual worlds from the perspective of economics, and to study various phenomena from a micro- or macro-economic perspective. In this paper, we have extended that study in two initial ways. First, we applied a set of economic ideas that have not yet been much used: scale economies, exchange rates, and information failures. Second, we applied these ideas not to the virtual economies alone but to gold farming and real-money trading, which can be argued to represent the intersection of the real and the virtual.

We have seen economic effects of real-world elements. The offshoring of gold farming to China and other Asian nations, and the location of gold farming within China, reflect tangible factors: the availability of labour, the cost of labor, and the availability and cost of technological infrastructure. The nature of scale economies is significantly determined by tangible factors of production including divisions of labor. Game-world currencies have devalued against real-world currencies due to new businesses entering the sector and their competition driving down prices.

We have also seen some economic effects of virtual-world elements. The virtuality of production impacts the effects of money supply. The virtual and hidden nature of gold farming perhaps acts as a disincentive to getting too large, as IGE did in the early 2000s. The virtuality and hidden nature of trading causes a series of information failures that have both suppressed and shaped that trade. The shaping of that trade has occurred in ways that—again due to virtuality—one would not quite predict from the experiences of other types of trading: for example causing brokers and other intermediaries to be less powerful but more globalized than one might anticipate.

But what has this analysis told us about the viewpoints summarised in Figure 1?

On the question of applicability of standard economics, there is no support for the extreme view that we need different economic models let alone different economic principles. At most, we might perceive some minor issues as having arisen—due to the hidden nature of production and trade, the different powers and purposes of the MMOGs' "central bankers", and the ability to bypass the local and the intermediating. But really, this has been more about developing a proper understanding of virtual economies and RMT and their fit to current economics, rather than about a necessity to change that economics. The overriding message is how relevant and applicable standard economics is, rather than vice versa.

Castronova et al (2009, pg. 702) offer a somewhat throw-away but intriguing comment: "the implicit real-world benchmark in this study has been a developed post-industrial economy. Perhaps virtual economies are very precise analogs for other kinds of real-world economies, such as frontier, developing or black market economies". There is certainly something in this. Looking in-game, we can see a number of features reminiscent of a developing country economy:

- A subsistence economy in which many goods and services never enter the trading system and the formal economy, being consumed by those who produce them (resulting in GDP estimators for virtual worlds likely significantly undervaluing their economies since they are based on visible trade; just as one sees with GDP estimation for developing countries (Castronova et al, 2009)).
- An assumption that human time/labor has a relatively low value and is in relatively abundant supply.
- A system of governance described as a dictatorship (Castronova, 2003) and strong centralized control over the economy in the form of the game company; the pinnacle of which was Jagex in the post-2007-redesigned *Runescape*, epitomizing the kind of developing country command-and-control economy that was common before neo-liberalism took hold.
- A large amount of informal and unregulated activity that seeks to pass under the radar of central control; principally in the form of gold farming.
- Significant price movements in short periods of time and a value of price controls (as exemplified by Jagex) that are not generally seen in industrialized economies but which are common in developing countries.
- And, only semi-tongue-in-cheek, one may note the strong reliance within most virtual economies on primary commodities, with some small-scale production and sale of simple manufactured goods, and few services; a pattern found in most developing economies.

Looking at the interface between virtual and real represented by currency exchange, features call to mind the black market trade that occurs in those developing countries with non-convertible currencies:

- It is much harder to sell the currency than to buy it: most RMT portals will only sell not buy.
- The buy-sell spread is large: US$2 to US$4.5 per 1000 *World of Warcraft* gold when you sell; c.US$10 when you buy in early 2010 (e.g. http://www.mmofly.com; http://www.iwtsgold.com).
- There is a lack of good quality information about trading, and a strong presence of information failures.

- Trade itself is much like the hasty real-world, black-market, back-alley swap with its attendant concerns from both sides—but especially the buyer—about being scammed, or about being caught.

Finally, looking out-game, there are the real gold farms themselves which the fundamentals of economics have pushed to developing country locations.

So perhaps the models we look to in explaining virtual economics should draw less from standard economics and more from development economics.

The second dimension of Figure 1 summarized views about the relation between real and virtual. One stated reason behind selecting gold farming for analysis was that it draws together the real and the virtual. We have certainly seen examples of a hybrid, intersectional perspective. Gold farming shows ways in which the real is injected into the virtual. Not, perhaps, in relation to in-game inflation but in relation to in-game utility, to the real-ization of virtual value. Even to the real-ization of agency: any player will recognize at some level the illusion of agency (Krzywinska, 2008): your raids, your quests, your instances have no effect. You might kill the cultists to save the damsel-in-distress but turn your back for a moment and they have all returned. Gold farming makes that agency real; turning the cultists' drops into gold and gold into dollars with an effect on real lives.

Above all, gold farming has arisen because it brings real-world scarcities and inequalities of time and money to bear on virtual scarcities of currency and resources. Just as nature abhors a vacuum and rushes to fill it, so capitalism is inexorably sucked in to any situation of scarcity. Thus the real-world patterns of capitalism have been mapped into the virtual world: monetisation of virtual currencies, divisions of labor, and the wage laboring, offshoring and automation of virtual activities.

These are the economic parallels of more sociological evidence about the real infecting the virtual: the way in which play becomes work in MMOGs that are designed to offer "players a capitalist fairytale in which anyone who works hard and strives enough can rise through society's ranks and acquire great wealth." (Rettberg, 2008, pg. 20). So, far from representing some new and weightless economy, the grinding required to level is very "old economy"; the equivalent of assembly line work (see also Wang, 2006). And the way in which gold farming has led to real-world racism being remapped into cyberspace, with Chinese gold farmers subject to the same tropes of pestilence and the same attempts at extermination that met the Chinese laundry workers who served the 19th century California gold rush (Yee, 2006; see also Bell, 2006 and Langer, 2008).

If gold farming has helped inject the real into the virtual, it has also injected the virtual into the real. Most obviously through real-money trading. There is nothing very real about RMT; it may be largely out-game not in-game but it is still heavily virtualised. Like e-commerce for other digital goods, RMT involves nothing tangible other than the hardware through which to access it: marketing, customer relations chat, payment, and trade completion—all of these are digital. Hence, in part, the information failure outcomes seen.

So, there are tangible, physical entities involved: the people who produce and consume, the hardware they use, and the buildings in which they work. Beyond this, though, there is little that is unequivocally "real" in a physical sense. We can see that gold farming exists within a

virtual world, and can thus be thought of as virtual production. The trading element too is largely virtual because of the digitisation of e-commerce portals, communications, and payment systems. Finally, consumption of the goods or services purchased also takes place in the virtual realm.

At most, then, we are left not just with an intersection of the real and the virtual but with a very fuzzy sense of what is real and what is virtual. Rather than take a static view on this, we can see gold farming as part of a steady chronological erosion of the real vs. virtual dichotomy. As Shaviro (2007) notes, the notion of real/virtual has moved right along Figure 1's x-axis from separation to inseparability, in a similar way to dissolution of the work/play binary, and gold farming has been part of both dynamics.

Writers have already recognized this in relation to currency (e.g. Lehdonvirta, 2005; Shaviro, 2007; Castronova et al, 2009). The reality of national currencies has always been perceptual; it has always been something of a confidence trick and one that has grown as precious metals were replaced by ever-less material tokens: first coins, then paper notes, then digitized representations. The shrinking gap between currency types is reflected in the devaluation of MMOG currencies mirroring devaluation of national currencies in terms of both causes and effects, in the growing use in some developing countries of mobile airtime as a substitute for national currency (Pickens & Richardson, 2007), and in the Chinese government's attempts in 2009 to exert control over the ever-widening use of QQ coins and similar virtual currencies to purchase real goods and services (Davis, 2009b).

We can, of course, go one step further to reflect the importance of perception, which arose in the analysis above at a number of points. From that perspective, there is no real and no virtual; there is just the single stream of perception inside our heads. Disputations on what is real and what is virtual will therefore only lead the researcher to turn in ever-decreasing circles before finally disappearing up their own orifice. Following this logic, there is no "real economics" to counterpose against a "virtual economics;" there is just "economics." There are no "real economies" to counterpose against "virtual economies;" there are just "economies."

Released from the tyranny of the dichotomy, we are then free to analyse gold farming, RMT and other MMOG phenomena from perspectives other than those of "virtual economics." Straight economics will do fine, as illustrated in this paper. Broader sociological perspectives will help (e.g. Lehdonvirta, 2009). But we can also seek to explain the largely-expected-but-occasionally-unexpected outcomes portrayed in this paper using a deeper and systemic view of structure, agency and technology.

Orlikowski (1992) offers the expected, conservative, reproductive picture (which can be represented as Figure 3) of technology, structure, and agency as mutually-reinforcing. From this perspective, new creations such as MMOG economies and currencies reflect existing social structures and behaviors and, hence, obey standard economic principles in the ways observed above.

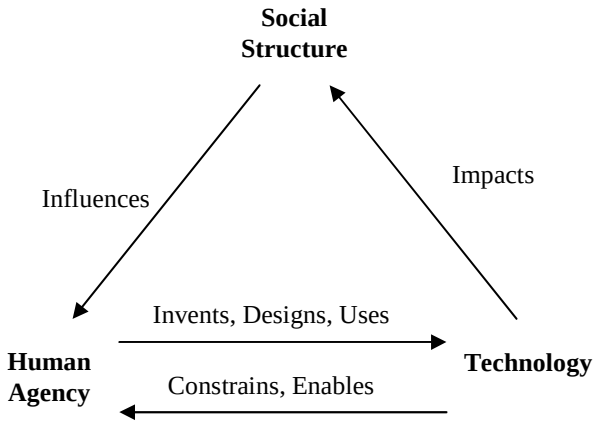

Figure 3: Systemic Reinforcing Relation Between Technology, Agency and Structure

Steinkuehler (2006) offers the potential for the unexpected (which can be represented as Figure 4) which we can derive from her idea of the "mangle of play:" a messy mix that means one cannot predict outcomes a priori. We can thus portray the creation of MMOGs and their economies as the intermixing of structure, technology, and agency that can sometimes produce a slightly unexpected result, of which we have seen some minor examples in relation to in-game prices and information failures.

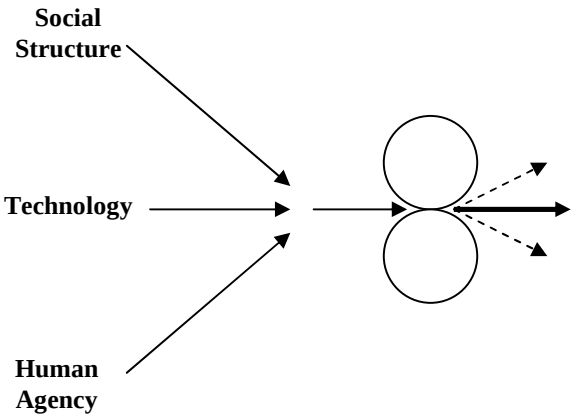

Figure 4: "Mangle of Play" Relation Between Technology, Agency and Structure

The overall picture painted by the results in the paper shows the need for some combination of the two views but the last, at least, argues the need for continuing research as the field evolves and keeps throwing up the odd unanticipated outcome.

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