

# THE ECONOMIES OF VIRTUAL WORLDS: LESSONS FOR THE REAL WORLD

Online computer games offer more than just entertainment, explains **Callum Jones**

In 2001, Edward Castronova published an economic report of the computer-simulated three-dimensional world of Norrath, created in 1999 for the online computer game *Everquest*. He found that, in terms of actual wealth, an average Norrathian participating in the economy of Norrath was as wealthy as a Russian and far better off than an average person in China.

This is a surprising observation which motivates an investigation of the economies that flourish within three-dimensional and interactive virtual worlds. To this end, this article looks at the synthetic environments that encourage economic activity. Further, the article investigates the exciting potential for virtual worlds to be used as tools for research.

## Virtual worlds: an overview

At the outset, some clarity is needed on what constitutes a 'virtual world.' A formal definition is provided by Mark Bell of Indiana University: '[a virtual world is] a synchronous, persistent network of people, represented as avatars, [which is] facilitated by networked computers.'<sup>1</sup>

This definition says that the simulated world should be persistent, meaning that it should exist regardless of whether participants are present in the world or not. Second, the world should be based on consistent physical rules binding all members of the world, as gravity acts on everything on Earth. Third, the world should be synchronous and interactive, which requires that the behaviour

of one world participant influence the experience of another if the latter participant is within the sphere of influence of the former.<sup>2</sup>

Bell's definition mentions that users are represented as *avatars* within the virtual world.<sup>3</sup> An avatar represents a real-life person's presence in the virtual world. It allows him or her to interact with the world, and with other users. To draw a parallel, on Earth our bodies are equivalent to a virtual avatar.

To provide an example of what a participant to a virtual world might see, Figure 1 gives a typical view of a participant of the three-dimensional virtual world *Azeroth* of the online computer game *World of Warcraft*, developed and maintained by Blizzard Entertainment. The closest user in the foreground is the avatar of the participant. The user can interact with other citizens of *Azeroth* within the user's line-of-sight.

The primary reason for the existence of virtual worlds is entertainment; if users find it fun to enter and participate in a virtual world, then that world will attract inhabitants. Further, virtual worlds facilitate social interaction. If a virtual world can provide this in a fun and accessible

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form, that world will attract people to populate its environment.

**Figure 1:** World of Warcraft



Virtual worlds have increasingly become a subject of academic attention. In the field of medicine, Lofgren and Fefferman explored the spread of an unintentionally initiated virtual disease called Corrupted Blood across the four million inhabitants of the virtual world Azeroth in 2005.<sup>4</sup> The outbreak in Azeroth allowed Lofgren and Fefferman to examine the human behavioural responses to the uncontrolled spread of a highly contagious disease. This was a desirable (and topical) research interest in a field that generally relies on pre-programmed computer simulations.

Events in virtual worlds have also been studied by counter-terrorism experts. The Center for Terrorism and Intelligence Studies in the United States has expressed interest in monitoring the world of Azeroth and studying bioterrorist attacks, such as intentionally spread diseases, amongst its inhabitants.<sup>5</sup> Again, the attraction of virtual worlds is the ability to model actual human behaviour as opposed to relying on pre-programmed artificial intelligence.

Virtual worlds are potentially a fertile source of economic research, as it is for epidemiologists and domestic security officials. Indeed, the economic aspects of virtual worlds have already enticed academic economists. The next section introduces the work of a prominent researcher of virtual world economies, Edward Castronova of Indiana University, which focused attention on the research potential of virtual worlds.

## The economy of Norrath

In 2001, Castronova published an economic report on the three-dimensional virtual world of Norrath, the synthetic environment of the online computer game *Everquest*, founded in 1999.<sup>6</sup> At the time of his analysis, Norrath was the largest English-speaking virtual world by subscription, with around 400,000 regular inhabitants.

Castronova conducted a survey of more than 3,600 users and compiled data from real-life online auctions of Norrathian goods and transferable *Everquest* accounts.<sup>7</sup> These accounts permitted users to access the avatar associated with each account. These data were used to compile a range of macroeconomic statistics—statistics that are familiar to the general public for real world economies. The constructed data helped put virtual economies into an understandable form, and gave the synthetic environment of Norrath real-world context.

First, Castronova calculated an exchange rate between the unit of currency (platinum pieces or PP) used for transactions within Norrath and the USD.<sup>8</sup> He found the price of a PP was US\$0.0133 in May 2001 implying one PP was priced higher than one Japanese Yen.

Second, Castronova constructed a measure of Norrath's gross national product (GNP) by examining participants' virtual productivity. He calculated the value-added of time spent by an avatar in Norrath.<sup>9</sup> Combining this with survey data on users' time spent in Norrath, Castronova calculated that US\$15,000 in avatar improvements were being created per hour. Extrapolating, this implies a GNP of US\$135 million at 2001 prices, or a GNP per capita of US\$2,266. Extraordinarily, the calculated GNP per capita of an inhabitant of Norrath rivaled Russia's per capita GNP at 2001 levels.

The nominal hourly wage of a Norrathian was calculated to be PP319 or US\$3.72. This figure was formed by taking the value of an avatar's equipment and PP holdings as determined by the survey, and relating them to the respective player's hours spent in Norrath. Extrapolating, if the user were to work 80 hours a week in Norrath, Castronova calculated he or she would have earned enough US dollars to fall above the US 2001 poverty line.<sup>10</sup>

In addition, Castronova painstakingly developed price indices for Norrath from 2000 to 2001 for different products, and for products before and after an update to the *Everquest* game was implemented by developers.<sup>11</sup> The price indices showed Norrath was suffering steep deflation, with the general price level falling by 29 percent across the time period.

Microeconomically, Norrathians trade in two broad markets: a bazaar-type user-to-user market with flexible prices and quantities, and a market between users and computer-controlled merchants, whose settings can be altered by the game developers. This latter market, a common feature of virtual world games, is characterised by developer-defined prices and unlimited quantities, and is used by the administrators of Norrath to control the supply of real money in the economy.

### Virtual world economic design

Castronova's economic report on Norrath should stimulate researchers to take virtual worlds as a serious subject of study.<sup>12</sup> As he shows, striking results surface if the researcher is prepared to discard natural assumptions made about 'fake' virtual environments; 'if it's important to people, it's important to study it'.<sup>13</sup> In view of this, to maximise the potential for virtual worlds to examine economic questions, this section discusses the two crucial design goals of scarcity and trade that give rise to in-world economic behaviour.

The logical starting point is to enquire about how people behave when controlling their avatar, that is, when in the virtual world, do people translate their economic behaviour into a synthetic environment? Castronova finds that they do.<sup>14</sup> In his custom-designed virtual world Arden, Castronova discovers a price elasticity of demand for 'potions' of -0.43, which says that if the price of potions rises by 1 percent, the demand for potions falls by 0.43 percent. This is consistent with real-world behaviour with studies pointing to a price elasticity of demand of around minus one-half.<sup>15</sup>

The next question to ask is whether virtual worlds *should* encourage participants to act, in an economic sense, as they would in real life. Appealing to the purpose of an economy can illuminate an answer.

An economy organises and allocates scarce

resources between unlimited but competing desires. The scarcity of resources is a necessary condition for an economy; without scarcity, there would be no need for an economy to arise to organise and guide those scarce resources to their most productive ends.

Castronova argues that scarcity is an essential component for a fun and successful virtual world.<sup>16</sup> He argues the decision-making process accompanying the need to direct limited resources is enjoyable and attracts users back to the world. To take a Darwinian angle, human beings appear hardwired to take pleasure in considering the opportunity costs between goods and services and making optimal decisions because it provokes a sense of achievement. Accepting this, to be successful, a virtual world should encourage the development of economic activity by mimicking the real-world feature of scarcity. Inhabitants of the virtual world will find such an environment familiar and should be encouraged to act naturally, as they would in real-world economies.

Second, we may draw on the lessons of Adam Smith's *Wealth of Nations* to define an important design goal. A virtual world should encourage specialisation in the creation or acquisition of goods to stimulate trade between inhabitants of the virtual world, and set up an environment where gains from trade are readily available. Specialisation and trade allows a society to increase its net product but implies dependencies across members of the world. It is these dependencies that give rise to markets and trade; features of a successful economy.

There are many other specific design goals that virtual world developers could and should strive to achieve to create a world in which users feel part of a fully functioning economic system. The two broad points described above give a general feel for the basic features to be implemented in any successful economic system.

### Virtual tools for analysis

If a virtual world is designed with an environment that acts as a catalyst for economic activity and is enjoyable enough to attract users, that virtual world could open up opportunities for the collection of data to answer research questions and for conducting interesting experiments under ideal or standardised conditions. A polymath's

portfolio of research questions emerging from virtual worlds were provided earlier and included medical research, national security research, and investigations of microeconomic economic phenomenon.

Virtual worlds also provide the opportunity to examine macroeconomic theories in an experimental setting. As an example, suppose one wishes to test the validity of the quantity theory of money, which proposes that the price level is directly proportional to the money supply. This could potentially be done by examining events in virtual worlds.<sup>17</sup>

At a ‘big picture’ level, we may want to initiate a study of what constitutes a successful social system. For instance, assume a researcher is interested in testing the merits of an unregulated entrepreneurial society respecting private property but without parliamentary oversight or dictatorial direction. This could conceivably be done in a virtual world with a correspondingly appropriate social and economic design. To borrow a metaphor of Friedrich Hayek, we could develop an appropriate environment to cultivate growth, as a gardener tends to his plants.<sup>18</sup>

*Second Life* launched in 2003 and grew rapidly. Currently, *Second Life* has 15 million registered accounts. According to official *Second Life* statistics, approximately 1 million residents logged into the *Second Life* world in the 30 days to 30 March 2009.<sup>19</sup> The developers of *Second Life* allow participants to convert USD into the virtual currency of *Second Life*, Linden Dollars (LD), on the Linden Dollar Exchange (LindEX). As such, it has been described as being comparable to a real, open economy with a heavy exposure to tourism.<sup>20</sup>

In spite of its guiding philosophy, Linden Labs retains the role of the central bank within *Second Life* with the authority to introduce in-world currency into the virtual environment. As will be seen, this opens up the potential for Linden Labs to be heavily interventionist to the detriment of *Second Life* inhabitants. Otherwise, there is no formal government structure present within *Second Life*.

*Second Life* has grown to the extent that real world businesses sought exposure within its synthetic environment, including Toyota and IBM. Higher educational institutes also see advantages in setting up a presence in *Second Life*. Even political figures are involved in *Second Life*; President Barack Obama advertised in the virtual community during his presidential campaign (see Figure 2). Interestingly, then, we see a vibrant community develop within an environment without direction or control.

**Figure 2:** Barack Obama’s *Second Life*



Despite its initial successes, in a parallel to real-world economies, *Second Life* has experienced

*Second Life* developed by Linden Labs, was designed with the idea of being a free market, non-interventionist society.

Expanding on this with an example, a recent three-dimensional social world, *Second Life* developed by Linden Labs, was designed with the idea of being a free market, non-interventionist society in which members of the society may pay real money to acquire private virtual land through which they could exercise their entrepreneurial capabilities. An article from *The Economist* explains the approach of a *Second Life* founder, Phillip Rosedale:

Mr Rosedale prefers to rule *Second Life* with Adam Smith’s ‘invisible hand’ only. To him that means treating every resident the same, whether it happens to be Toyota or ‘an 80-year-old woman from India.’ Both will pay the same price for their [virtual land]; what they do with it is up to them.

in-world economic problems. The economy had suffered through a financial crisis in mid-2007 when the developers announced a ban on flourishing in-world gambling, immediately outlawing five percent of *Second Life*'s economic activity. At the announcement of the ban, an important virtual bank in *Second Life* with exposure to the gambling industry, Ginko Financial, experienced a run on its reserves and could not honour LD\$55 million worth of withdrawal requests. Ginko Financial collapsed, causing losses for *Second Life* inhabitants with exposure to the bank. Studying the dynamics of the crisis could provide real-life policymakers with ideas on how to prevent and manage real-world financial crises.

A second fascinating economic aspect of *Second Life* involves past monetary developments within *Second Life*. A 2007 article by Matthew Beller of the Ludwig von Mises Institute analyses the significant growth of LD within *Second Life*.<sup>21</sup> He finds this growth does not wholly reflect an increase in real wealth. Rather, Beller finds Linden Labs is creating LD to finance a perpetual deficit between LD provided to users in the form of a weekly stipend and the company's USD revenues, generated through subscription fees. In effect, Linden Labs is 'printing' unbacked LD and injecting it into *Second Life*, similar to the current economic policy of the Zimbabwean government. Basic monetary economics tells us we should expect to see a significant rise in the price level within *Second Life*, a concurrent depreciation of the LD and an outflow of real wealth from *Second Life*.

These two brief examples from the *Second Life* economy provide perfect illustrations of the potential for synthetic environments to illuminate research queries and to search for answers to thought experiments that may have played out in an existing virtual community. Reiterating an earlier point, this is an exciting proposition as these worlds involve human actors, emotions and responses in a close-to-real environment.

## Conclusion

This article gives a broad overview of the existence of virtual worlds and the economies that grow within their synthetic environments. Building on the unexpected observation that inhabitants within these worlds may be as wealthy as people on Earth, the article introduced the potential of virtual worlds to provide a fertile source of research

material. Excitingly, these worlds could be used to conduct experiments under ideal conditions and to answer interesting thought experiments dreamt about by prominent economists and sociologists.

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## Endnotes

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