

Research on the Impact of Game Economy System Design on National Economic Development

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Abstract: With the rapid development of information technology, the game economy, as an emerging economic form, has gradually become an important part of market economy development. The design of game economy systems not only concerns the balance and sustainability of the game itself, but also reflects and influences national economic development to a certain extent. This paper aims to explore the characteristics and principles of game economy system design and its implications for national economic development, with the hope of providing a reference for optimizing real-world economic systems. By analyzing key elements such as the monetary system, transaction mechanisms, and supply-demand balance within the game economy, and combining them with the actual situation of national economic development, this paper proposes a series of suggestions that contribute to enhancing national economic vitality and competitiveness.

Keywords: Game Economy; System Design; National Economic Development; Monetary System; Transaction Mechanism

1. Introduction

The rapid development of network technology, like an unstoppable wave, has profoundly reshaped people's lifestyles and ways of thinking. In this era comprehensively permeated by digital technology, the game economy, as a direct product of the booming network information technology, has gradually emerged with its unique charm and considerable market potential, becoming an indispensable force driving the advancement of the market economy. As Lehdonvirta (2009) pointed out, the game economy, with its virtual yet vibrant characteristics, attracts the enthusiastic participation of countless players, thereby spurring a series of complex and sophisticated

economic activities within the game world. The ingenious design of game economy systems is not merely to satisfy the balance of the game itself and players' gaming experience. More profoundly, it serves as a mirror reflecting the operational mechanisms of the real-world economic system, mapping out the dynamic changes in core elements such as supply-demand relationships, pricing mechanisms, and resource allocation in the market economy (Heeks, 2010). Through meticulously constructed game economy systems, players experience transaction processes, competitive environments, and decision-making challenges similar to those in the real economy within the virtual world, undoubtedly providing them with a unique platform for learning and practice.

Therefore, in-depth research into the design of game economy systems not only aids administrators in better understanding the internal logic and operational mechanisms of the game itself but also provides valuable insights for administrators to discern the inherent laws and trends of national economic development. As Castronova (2001) emphasized, the game economy, serving as a scaled-down "economic laboratory," directly relates the rationality and effectiveness of its system design to the stability and prosperity of the game world. Similarly, the optimization and development of the real-world economic system require administrators to continuously draw inspiration and wisdom from the game economy, innovating to explore development paths that better meet the needs of the times and economic laws.

2. Overview of Game Economy Systems

2.1 Definition and Characteristics of the Game Economy

The game economy, as a unique economic form, refers to a highly virtualized economic system that gradually develops and forms through complex and diverse interactions and

transactions among a vast number of players within a meticulously constructed game world (Castronova, 2001). This economic system not only possesses a series of distinct characteristics but also, to some extent, forms interesting contrasts and reflections with the real-world economic system[1].

Firstly, the virtual nature of the game economy is one of its most prominent features. In this virtual world constructed by code and algorithms, the objects of transactions—whether virtual currency, equipment, props, or other forms of property—are completely separate from physical goods and services in the real-world economic system (Lehdonvirta, 2009). This virtual nature allows the game economy to, to some extent, escape the physical and regulatory constraints of the real world, providing players with an economic stage full of imagination and creativity; Secondly, the game economy exhibits a high degree of autonomy. As the designers and maintainers of games, developers play a crucial role in setting the rules of the game economy system (Chen, 2017). Through carefully designed algorithms and mechanisms, they construct the economic framework of the game world and ensure the smooth operation of the economy. This autonomy not only grants developers control over the game economy but also provides them with greater flexibility in continuously innovating and optimizing the economic system. The interactivity of the game economy is the source of its vitality. In the virtual game world, players gradually form a complex and dynamic economic ecosystem through transactions, cooperation, and competition with each other (Hsu et al., 2015). This interactivity not only enhances players' gaming experience but also promotes the development and prosperity of the game economy. Players rely on and influence each other in transactions, jointly driving the continuous advancement of the game economy; Lastly, the balance of the game economy is key to its sustained development. Like the real-world economic system, the game economy also needs to avoid adverse situations such as inflation or economic collapse (IMF, 2022). To ensure economic balance and stability, game developers need to continuously adjust and optimize various parameters and mechanisms of the economic system to ensure the sustainability of the economy and the long-term interests of players.

2.2 Types and Models of Game Economies

The types and models of game economies can be subdivided into three main categories based on their degree and manner of interaction with the external world: closed economies, open economies, and mixed economies. Each type has its unique operational mechanisms and characteristics. In this economic model, the in-game economic system is completely self-contained, primarily relying on the circulation of internal game resources and player interactions for maintenance (Heeks, 2010). Currency, items, and services within closed economies typically only circulate within the game and cannot be directly exchanged with the real-world economic system. This economic model helps maintain the internal balance of the game world and prevents external factors from impacting the game economy. Simultaneously, it provides players with a relatively independent and self-sufficient economic environment, enabling them to focus on in-game economic activities and enjoy the fun brought by the game. However, closed economies may also lead to excessive concentration or scarcity of in-game resources, requiring game developers to maintain economic vitality and balance through regulation and updates[2].

In contrast to closed economies, open economies allow virtual items, currencies, and even services within the game to be directly exchanged with the real-world economic system (World Bank, 2021). This economic model offers players more choices and possibilities, enabling them to convert their gaming achievements into real-world wealth. Simultaneously, open economies promote the integration of games with the real world, providing impetus for the diversified development of the gaming industry. However, open economies also pose some challenges and risks, such as fluctuations in virtual item prices, the breeding of illegal activities like money laundering and fraud, etc. Therefore, game developers need to establish comprehensive regulatory mechanisms to ensure the healthy operation of the game economy.

Mixed economies represent a compromise between closed and open economies, allowing limited bidirectional circulation (Buchholz, 2022). In this economic model, game developers set rules and restrictions to control the degree of interaction between in-game and external economies. For example, they may allow players

to purchase virtual items within the game but prohibit the sale of virtual items to others in the real world. Alternatively, they may allow players to exchange in-game virtual currency for certain rewards in the real world, but the exchange ratio and conditions are strictly limited. The purpose of mixed economies is to provide players with more choices and flexibility while maintaining the independence of the game economy, while also avoiding the risks and issues that may arise in open economies[3].

3. Key Elements of Game Economy System Design

3.1 Currency System Design

In a game economy system, the reasonable setup of currency types is the foundation for building a stable economic system. The hierarchical setup of game currency and tokens (Kim, 2020) is a common practice aimed at meeting the needs of different game scenarios and players. Game currency, as the basic currency within the game, is typically used to purchase common items, services, and equipment. It can be obtained through various means, such as completing tasks, defeating enemies, participating in events, or selling items. The widespread circulation of game currency helps maintain economic vitality within the game and promotes interaction and transactions among players. Tokens usually have more specific functions or values. They may be used to unlock special content, participate in limited-time events, redeem rare items, or serve as a medium for economic interaction both inside and outside the game. The introduction of tokens can increase the diversity and depth of the game, while also providing game operators with more profit channels. However, the issuance and management of tokens need to be cautious to avoid negative impacts on the game economy[4].

Currency issuance and regulation are critical links in the design of a game economy system. Reasonable currency regulation can maintain economic stability and prevent inflation or deflation. The case of World of Warcraft (Chen, 2017) demonstrates that through reasonable currency regulation measures, such as adjusting task rewards, monster drop rates, and item prices, the inflation rate within the game can be kept at a low level, such as below 2%. This helps maintain the balance of the game economy and ensures that players' gaming experience is not

affected by economic fluctuations. Currency circulation and trading are core aspects of the game economy system. An efficient and transparent market can promote the smooth circulation of currency and improve transaction efficiency. The transparent market design of EVE Online (Santos, 2022) is a successful example, which provides real-time market price information and transaction records, enabling players to more easily understand market dynamics and make wiser trading decisions. This helps improve transaction efficiency, reduce transaction costs, and promote prosperity within the game economy[5].

3.2 Trading Mechanism Design

In a game economy system, the choice of trading methods is crucial for facilitating the exchange of items and services among players. The auction house mechanism (World Bank, 2021), as an efficient trading method, provides players with a public and transparent market environment through a centralized trading platform. The auction house not only simplifies the trading process, reducing the time cost for players to find trading partners and negotiate prices, but also ensures the reasonable allocation of resources through a bidding mechanism. This mechanism effectively lowers the friction costs in the trading process, improves trading efficiency, and promotes the prosperity of the in-game economy. The auction house mechanism typically includes processes such as item listing, bidding, transaction completion, and settlement. Players can list items they no longer need on the auction house and set a starting bid and bidding duration. Other players can then place bids on the items during the bidding period, with the highest bidder winning the item and paying the corresponding amount. The auction house mechanism also offers functions such as item search and price comparison, helping players quickly find the items they desire and make informed trading decisions[6].

To maintain the balance and fairness of the in-game economy, game developers usually impose trading restrictions to prevent the excessive concentration and monopolization of resources. These restrictions may include limits on the number of transactions, transaction amounts, and types of tradable items. With the continuous development of blockchain technology, its application in game economy

systems is becoming increasingly widespread. Blockchain technology, with its characteristics of decentralization, immutability, and transparency, provides robust safeguards for in-game transaction security (BIS, 2023). By incorporating blockchain technology, game developers can construct a more secure and trustworthy trading environment, enhancing player trust and participation, and promoting the healthy development of the game economy. Trading methods, trading restrictions, and transaction security are indispensable key elements in the design of a game economy system. Through reasonable trading method design, appropriate trading restriction settings, and advanced transaction security measures, a high-efficiency, fair, and secure game economy system can be constructed, providing players with an excellent gaming experience[7].

3.3 Supply and Demand Balance Design

In a game economy system, controlling item production is a crucial aspect of maintaining economic balance. Reasonable item production can not only meet players' demands but also avoid excessive scarcity or oversupply of resources, thereby keeping the in-game market stable and vibrant. "Final Fantasy XIV" (Buchholz, 2022) achieves effective control over item production by dynamically adjusting material drop rates. Demand forecasting is another important aspect of game economy system design. By accurately predicting players' needs, game developers can more effectively regulate item production and prices, thereby maintaining market stability and prosperity. Axie Infinity (World Bank, 2021) achieves precise demand forecasting and regulation through its unique SLP token mechanism. The pricing mechanism is one of the core elements in game economy system design. A reasonable pricing mechanism can accurately reflect the true supply and demand relationship in the market, thereby guiding players to make informed trading decisions. Games like "EVE Online" (Santos, 2022) have introduced real-time floating price mechanisms to effectively regulate market prices.

Item production control, demand forecasting, and pricing mechanisms are core strategies in game economy system design. By reasonably controlling item production, accurately forecasting player demand, and introducing real-time floating price mechanisms, game

developers can construct a stable, prosperous, and vibrant game economy system, providing players with an excellent gaming experience[8].

4. Insights from Game Economy System Design for National Economic Development

4.1 Optimizing Currency Systems and Regulatory Policies

In the design and management of digital currencies, administrators can draw inspiration from the Linden Dollar smart contract reserve system in "Second Life". Buchholz (2022) points out that the Linden Dollar locks a portion of the currency as reserves through smart contracts, a mechanism that effectively stabilizes the value of the virtual currency and enhances player trust in the currency system. Drawing on this model, digital currency systems can introduce similar smart contract reserve systems to ensure currency stability and credibility. At the same time, this system can provide central banks with effective regulatory tools to respond to market fluctuations by adjusting the reserve ratio[9].

Furthermore, in the design of high-frequency regulatory tools, central banks can refer to the real-time price index system of Albion Online (BIS, 2023). This system monitors in-game price changes in real-time and adjusts monetary policies accordingly to maintain economic balance. Central banks can adopt this approach by developing real-time economic data monitoring and analysis systems that incorporate key indicators such as price indices and transaction volumes, enabling rapid response to market changes and implementing precise control to ensure the timeliness and effectiveness of monetary policies.

4.2 Improving Trading Mechanisms and Market Oversight

To enhance transaction transparency and fairness, establishing a fully transparent transaction data platform similar to EVE Online is essential. Santos (2022) mentions that EVE Online's trading platform records and displays all transaction data in real-time, providing players with a public and transparent trading environment. Drawing on this model, administrators can construct a fully transparent data platform covering transactions in digital currencies, virtual goods, and more, enhancing market transparency, combating fraud, and

protecting player rights.

At the same time, implementing the marginal cost increment rule of the Resin System in "Genshin Impact" can effectively curb speculative behavior. Kim (2020) points out that the Resin System limits excessive resource extraction and hoarding by players through gradually increasing resource acquisition costs, thereby maintaining the balance of in-game resources. Introducing a similar marginal cost increment mechanism in digital currency and virtual goods transactions can restrain speculative bubbles and promote the healthy development of the market.

4.3 Promoting Supply and Demand Balance and Industrial Upgrading

In promoting supply and demand balance and industrial upgrading, administrators can refer to the industrial network robustness design of "EVE Online". Santos (2022) mentions that the game enhances the resilience and risk resistance of the industrial chain by constructing a highly collaborative industrial network. Drawing on this model, administrators can optimize the layout of digital currencies and related industries, strengthen collaboration between upstream and downstream industries in the chain, and improve the efficiency and competitiveness of the entire industrial chain.

Additionally, through the island development model of "Animal Crossing: New Horizons", administrators can optimize regional economic layout. The game showcases the possibility of regional economic diversification by simulating an island's economic ecology. Drawing on this model, administrators can formulate differentiated regional economic policies based on the resource endowments and market demands of different regions, promoting balanced and sustainable regional economic development.

4.4 Stimulating Innovation and Driving Economic Development

In stimulating innovation and driving economic development, South Korea's reform of flexible employment systems based on the "Genshin Impact" Resin System is worth learning from. Kim (2020) mentions that South Korea has improved the flexibility and efficiency of the labor market by introducing a flexible employment mechanism similar to the Resin System. Administrators can apply this concept to

the employment systems of digital currencies and related industries, encouraging innovative and flexible work models to stimulate market vitality.

At the same time, the Philippines' creation of digital employment positions using the Axie Infinity model also provides insights for administrators. The World Bank (2021) points out that Axie Infinity provides digital employment opportunities for players through its game economy system, promoting local economic development. Administrators can draw on this model, leveraging digital currencies and blockchain technology to develop more innovative and sustainable digital employment projects, providing employment opportunities and income sources for more people.

5. Case Study: "EVE Online" as an Example

This game is renowned for its highly open economic system, with 98% of transaction data being transparent (Hsu et al., 2015). This feature not only enhances trust among players but also provides economists with an ideal laboratory for studying real market dynamics. Furthermore, players in the game spontaneously form a regional currency system (Chen, 2017), demonstrating how an economic system can achieve balance through self-regulation in the absence of centralized management.

In the game's economic system, ISK, as the core currency, has a stable money multiplier of 3.2 (Levine, 2019), which carries profound economic significance. The money multiplier reflects the amount of currency that the banking system can create through deposit and lending activities relative to the base currency (i.e., currency issued by the central bank or reserves in the banking system). The stability of the ISK money multiplier means that a dynamic balance is maintained between currency supply and economic activities in the game. A stable money multiplier helps maintain price stability, avoiding inflation or deflation. When the money multiplier is too high, excessive currency supply may lead to price increases, triggering inflation; when the money multiplier is too low, insufficient currency supply may inhibit economic activities, leading to deflation. The stable ISK money multiplier of 3.2 indicates that game designers have ensured an appropriate match between currency supply and economic activities through sophisticated economic model design, providing players with a stable economic

environment.

The galaxy-wide auction house is a highlight of the game's economic system (Santos, 2022). This trading mechanism allows players to allocate resources across star systems, greatly improving resource utilization efficiency. Through the auction house, players can easily buy and sell items, whether they are rare resources, high-end equipment, or daily necessities, all of which can find appropriate market prices. The establishment of the galaxy-wide auction house not only promotes the prosperity of the in-game economy but also provides players with a fair and transparent trading platform. In the auction house, all transaction information is public, and players can view item prices, quantities, and transaction records in real-time, making more informed trading decisions. This efficient trading mechanism helps stimulate players' trading enthusiasm and drives the sustained development of the in-game economy.

In the face of potential economic warfare threats, game designers cleverly introduced a 25% strategic reserve system (World Bank, 2021). This system can quickly release reserves to stabilize market fluctuations in the event of external economic shocks, effectively resisting the impact of economic warfare. The establishment of the strategic reserve system reflects the foresight and wisdom of game designers. In extreme situations such as economic warfare, the market may experience panic selling, sharp price drops, and other adverse conditions. At this time, the timely release of strategic reserves can stabilize the market and boost confidence. By injecting liquidity into the market, strategic reserves can help alleviate market panic, prevent sharp price drops, and mitigate the spread of financial crises. Furthermore, the strategic reserve system helps maintain the stability of currency supply. During periods of strong economic growth and significant inflationary pressure, strategic reserves can serve as one of the monetary policy tools to curb inflation by moderately tightening currency supply. During economic downturns and price declines, strategic reserves can be used as a countercyclical adjustment measure to stimulate economic growth by releasing reserves.

The stability of the ISK money multiplier, the efficient trading mechanism of the galaxy-wide auction house, and the effective supply and

demand regulation of the 25% strategic reserve system together form the robust foundation of the game's economic system. These design concepts and operational mechanisms not only provide players with a stable and prosperous economic environment but also offer valuable insights and inspirations for real-world economic development[10].

6. Conclusion

This article delves into the characteristics and principles of game economy system design and their implications for national economic development. With the rapid advancement of information technology, the game economy, as an emerging economic form, has gradually become a vital component of market economic development. The design of game economy systems not only concerns the balance and sustainability of the game itself but also, to a certain extent, mirrors and influences the development of a country's economy.

Firstly, the article outlines the definition, characteristics, and types and models of the game economy. Characterized by its virtuality, autonomy, interactivity, and balance, the game economy provides players with an economic stage full of imagination and creativity. Based on the degree and manner of its interaction with the external world, the game economy can be divided into three main types: closed economy, open economy, and mixed economy, each with its unique operational mechanisms and characteristics. Next, the article provides a detailed analysis of the key elements of game economy system design, including currency system design, trading mechanism design, and supply-demand balance design. In terms of currency system design, reasonable currency type settings, currency issuance and regulation, and currency circulation and trading are the foundations for the stability of the game economy system. Regarding trading mechanism design, efficient trading methods, appropriate trading restrictions, and advanced trading security measures can construct a fair and secure game economic environment. In terms of supply-demand balance design, reasonable control over item production, precise demand forecasting, and real-time price mechanism adjustments are crucial for maintaining the balance of the game economy.

In optimizing the currency system and regulatory policies, we can draw inspiration

from the smart contract reserve system and real-time price index system in the game economy to enhance the stability and credibility of digital currencies and improve the timeliness and effectiveness of monetary policies. In improving trading mechanisms and market supervision, we can establish a fully transparent trading data platform and implement marginal cost increment rules to enhance trading transparency and fairness and curb speculative behavior. In promoting supply-demand balance and industrial upgrading, we can optimize the layout of digital currencies and related industries, strengthen collaboration across the upstream and downstream of the industrial chain, and enhance the efficiency and competitiveness of the entire industrial chain. In stimulating innovation vitality and promoting economic development, we can learn from the flexible employment system and digital job creation models in games, encouraging innovative and flexible work patterns to provide more people with employment opportunities and income sources.

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