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Property-Rights Confirmation for Emerging Virtual Property: Dilemmas and Solutions

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Abstract. With the development of artificial intelligence, blockchain, and metaverse technologies, the forms of virtual property have shifted from traditional types such as game items and social accounts to novel virtual property like non-fungible tokens (NFTs), metaverse land, digital artworks, and algorithmically generated content. Although Article 127 of the Civil Code calls for protection of virtual property, it does not clarify the legal character or ownership of such property. Legal protection for virtual property currently faces core dilemmas including ambiguous rights-holders, difficulty in identifying the objects of rights, and the absence of a registration and public-notice system. This paper argues that novel virtual property should be recognized as a form of "special property right." Drawing on foreign experience and adopting a phased approach to legislation, China should construct a three-dimensional protection framework centered on registration and public notice. Such measures would enrich property-rights theory, safeguard user interests, and promote the healthy development of the digital economy.

Keywords: novel virtual property, confirmation of rights, registration and public-notice system

1. Introduction

Driven by digital technologies, new forms of virtual property have already broken through traditional property modalities, yet they have fallen into a rights-confirmation dilemma due to plural rights-holders, blurred object boundaries, and the absence of registration and public notice. In the theoretical literature there are multiple doctrines concerning the nature of online virtual property: some regard it as the object of proprietary rights, others as the object of obligations (claims), and still others as the object of intellectual property rights [1]. Professor Lixin Yang even argues that virtual property can be divided into movable and immovable property [2]. In response, this paper aims to determine the nature of emerging virtual property, analyze the difficulties in establishing rights over such property, and—by drawing on experience in foreign jurisdictions—construct a regime for the confirmation and protection of virtual property that suits China's conditions.

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2. The connotation of emerging virtual property

2.1. Definition of emerging virtual property

Virtual property refers to information resources that, in a network environment, simulate real-world things and exist in digital form — resources that are both relatively independent and possess exclusivity [3]. Traditional virtual property (such as in-game items and digital content) depends on centralized database storage systems; its existence, ownership records, and transaction rules are completely controlled by platform operators. Users obtain only limited usage rights, and the asset's value is contingent on the platform's continued operation. Emerging virtual property represented by non-fungible tokens (hereinafter "NFTs"), metaverse assets, and the like, however, is built on blockchain distributed ledgers, enabling assets to break free from single-platform control and to possess an independently verifiable on-chain existence. Therefore, emerging virtual property refers to digital assets that use blockchain technology as the underlying architecture and digital proofs of entitlement such as NFTs as their representational form, and that exhibit uniqueness, verifiability, programmability, and decentralized ownership characteristics.

2.2. Characteristics of emerging virtual property

As a product of the deepening development of the digital economy, emerging virtual property displays structural characteristics markedly different from traditional property forms. Its essence is a technology-driven composite rights form — a bundle of programmable rights jointly shaped by algorithms, data, and community consensus. Its core characteristics can be summarized as follows:

1. Dynamic objecthood. The boundaries of the object are highly fluid; it is no longer fixed to a physical carrier but exists in forms such as metadata on distributed ledgers, sets of smart-contract instructions, or digital avatars within immersive environments. The outward appearance of rights updates in real time as the underlying code iterates, following the generative logic of "code is property."

2. Artificial scarcity. The blockchain's immutable accounting mechanism and an NFT's unique identifier confer verifiable scarcity on digital objects. However, this scarcity does not arise from natural finiteness but from collective recognition based on cryptographic algorithms and community protocols, and thus has a strongly constructed (artificial) quality.

3. Cross-border interoperability. Open-standard cross-chain protocols and metaverse interoperability frameworks enable emerging virtual property to migrate freely across different platforms; the exercise of rights is no longer constrained by a single legal jurisdiction, thereby producing a new legal landscape of "decentralized governance conflicts."

4. Compound risks. The coexistence of technical fragility and legal lag produces a highly complex risk structure. On the one hand, smart-contract vulnerabilities, loss of private keys, or algorithmic governance attacks can directly result in asset destruction; on the other hand, existing frameworks of property law, obligations, and intellectual property are ill-equipped to comprehensively cover its rights attributes, creating a "dual regulatory gap between code and law."

In short, emerging virtual property has evolved into a dynamic rights system that integrates technical architecture, economic incentives, and social recognition. Its continued evolution will profoundly challenge and reshape the conceptual framework of traditional property rights and legal governance.

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2.3. The legal attributes of virtual property

Regarding the legal nature of emerging virtual property, the Chinese academic community currently advances several theories: the property rights theory, the obligations (claims) theory, the intellectual property theory, and the new-type property rights theory.

The property rights theory holds that NFTs possess the two core attributes of property rights—specific objects and a considerable degree of exclusivity and disposability—and thus can be regarded as a new type of property rights object [4]. The property rights theory takes "control and exclusivity" as its core logic. However, it encounters significant obstacles in the aspects of "object specificity" and "publicity/public trust." Emerging virtual property exists on the basis of distributed ledgers and smart contracts; its boundaries fluctuate with code updates, making it difficult to satisfy the requirements of property rights objects as being "specific, independent, and disposable." At the same time, although private key control achieves exclusivity at the technical level, it lacks legally prescribed publicity mechanisms such as immovable property registration or movable property possession, leaving third parties unable to ascertain the status of rights.

The obligations theory argues that since users sign agreements with platform operators, the exercise of rights over virtual property necessarily depends on cooperation with online service contracts and software license agreements. The particularity of the mode of exercising rights over online virtual property renders it inseparable from classification as an obligation (claim) [5]. However, this theory is confined to the legal relationship between users and operators and neglects protection against third-party infringements, making it insufficient to meet the requirements of virtual property protection.

The intellectual property theory maintains that emerging virtual property belongs to the category of intellectual achievements. Whether for network users or for platform operators, substantial time, effort, and creative labor are invested in virtual property, thereby entitling them to intellectual property rights [6]. Yet this theory still faces disputes over the attribution of rights between "platform employment" and "user-generated content." Moreover, the limited protection term of copyright law is at odds with the commercial demand for virtual property to remain "perpetually online."

The new-type property rights theory contends that network virtual property has special characteristics and should be defined as a new category of rights, to be stipulated through special legislation. This approach accords with the continuous increase of virtual property and the ongoing expansion of its rights content [7]. While this theory captures the characteristic of virtual property as "code as rule," it fails to provide clear specifications of rights, limitations, and remedies. Consequently, judicial practice can only fall back on general clauses such as "the principle of fairness" and "public order and good morals," thereby weakening the predictability of legal application.

From the above analysis it is evident that the property rights theory, obligations theory, intellectual property theory, and new-type property rights theory all attempt to impose a single paradigm onto emerging virtual property, producing a "Procrustean bed" classification. Yet whether it be the specificity of property rights, the relativity of obligations, or the originality of intellectual property, none can fully capture the multiple attributes of virtual property across its full life cycle—generation, possession, circulation, and extinction. Specifically, users exercise factual control over on-chain assets through private keys, exhibiting the property rights features of "control–exclusivity." At the same time, platforms continuously provide node computation, data synchronization, and rule updates, thereby substantively constituting a "continuing performance" obligation. Virtual avatars and digital artworks often embody users' personality elements together with algorithmically derived

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expressions, intertwining the attributes of personality rights and intellectual property rights. Accordingly, virtual property is not the object of a single right, but an aggregation of a "bundle of rights." Property attributes, obligation attributes, data attributes, personality attributes, and even public interest limitations coexist, overlap, and conflict within the same object, forming a complex structure of mutual entanglement.

In conclusion, this paper argues that, on the premise of recognizing virtual property as an aggregation of multiple rights bundles, and guided by the dual value goals of protecting users' core interests and ensuring transactional security, virtual property should be accorded a legal status as a "quasi-property right" or "special property right," situated between property rights and obligations. Such a "quasi-property right" is not a simple breach of the principle of numerus clausus in property law, but a three-tier structure: outwardly manifested as "statutory provision + registration or technical publicity"; effective through "exclusivity + right of pursuit"; and substantively constituted by "contractual agreements + mandatory law limitations."

3. The dilemma of rights confirmation in emerging virtual property

3.1. Ambiguity of rights holders: competition among multiple subjects

First, the imbalance in the "user–platform" binary game and standard-form clauses has led to structural deficiencies in user rights. The generation and persistence of emerging virtual property are highly dependent on platform technology infrastructures. Platforms often retain ownership through standard contracts such as User Agreements and Terms of Service, granting users only a "limited right of use." Many online game operators stipulate in their agreements: "All virtual props, coins, and other virtual items are the property of our company; users only acquire a non-exclusive, non-transferable right of use." While such clauses formally comply with the principle of contractual freedom, they exempt the platform from liability and exclude users' primary rights, thereby falling within the scope of the "overlord clauses" prohibited by Article 497 of the Civil Code. Once a platform unilaterally changes its rules or ceases operation, users face the awkward situation of "having the right to use but not to own." Judicial practice also tends to classify such situations as "obligations relations," which fails to meet users' expectations of ownership in the sense of "things."

Second, the intertwining of investors' and creators' interests complicates ownership chains and unbalances risk allocation. In NFT transactions, purchasers usually obtain a "unique certificate" pointing to a digital artwork, but not the copyright itself. The ownership chain between platform, minter, and investor presents a "triangular structure": the platform provides smart contracts and a marketplace, the minter uploads works and triggers NFT generation, and the investor pays consideration to acquire the token. However, if the minter is not the original copyright holder, or if "copycat" issues or "multi-chain issuance" arise, investors' claims to "uniqueness" collapse due to defects in ownership. The situation becomes even more complicated if a platform shuts down its servers due to poor management: although the on-chain token still exists, the metadata or image file it points to may no longer be accessible. Whether investors can then demand return of the object, compensation in lieu, or continued performance from the platform is not explicitly provided for in current law, leading to an imbalance in risk allocation among rights holders.

Third, the lack of provisions on the disposition of residual value after platform bankruptcy creates significant uncertainty in ownership. When a platform enters bankruptcy liquidation, whether virtual property constitutes "debtor's property" becomes the central issue. Under the property rights theory, users enjoy "absolute rights," and virtual property should be excluded from the bankruptcy estate; under the obligations theory, users only have a claim against the platform to "continue providing

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services," and virtual property should be monetized and distributed collectively, leaving users as ordinary creditors. In judicial practice, courts often reject user claims for recovery on the grounds that "service contracts can no longer be performed," thereby exacerbating uncertainty in rights attribution.

Overall, the normative documents currently governing online virtual property suffer from insufficient legal authority and rule density, limiting their role in judicial practice [8].

3.2. Categorization of rights objects: difficulties in identifying the object of virtual property

1. Intangibility complicates the recognition of "things." Traditional property rights are modeled on tangible objects, emphasizing physical boundaries of disposability and control. Virtual property, however, exists through code and data, lacking perceptible form; its "existence" relies on server computation and client-side rendering. Take metaverse land as an example: what users purchase is not a physical plot, but a set of coordinates and texture data on a metaverse platform. Once the platform ceases operation, the "land" loses interactivity, and its "specificity" as a property rights object is called into question due to the absence of continuous representation.

2. Reproducibility weakens the "uniqueness" of virtual property. New forms of virtual property such as game skins and digital albums may be "uniquified" via NFTs or serial numbers, yet the underlying files can still be infinitely replicated. Blockchain technology ensures uniqueness of records on-chain but cannot prevent circulation of off-chain copies. For instance, a "limited-edition NFT album" released by a digital music platform might be copied by users via screen recording or packet capture, then uploaded to cloud storage for free public download. In such cases, does the NFT holder's "exclusive control" extend to off-chain copies? If not, the "absolute exclusivity" of virtual property is greatly weakened; if yes, the problem of technical infeasibility and prohibitively high enforcement costs arises.

3. Dependence gives rise to "object commingling." The existence of virtual property often depends on specific software environments, account systems, or even hardware devices, displaying inseparability between "rights" and "medium." For example, with the voicebank of the virtual idol "Hatsune Miku," users purchase encrypted sound files and usage licenses, but the files can only be invoked within designated editors and must be bound to an account. Once a user account is banned for violations, the voicebank files cannot be activated. In such circumstances, the virtual property and account permissions are highly commingled, making it difficult to abstract and specify the former as an independent object.

3.3. Absence of registration and publicity mechanisms: a dual constraint on transaction security and efficiency

Traditional immovable property takes registration as a requirement for validity, while movable property relies on possession as a form of publicity; both provide an "externally recognizable" rights appearance. Emerging virtual property, however, lacks a unified registration authority. Rights transfers are only manifested through on-chain transaction hashes or platform-internal records, resulting in severe deficiencies in "publicity" and "public trust." Compared to domain name registration—though domain names share virtuality and global uniqueness—the ICANN system enables global searches via the WHOIS database and is complemented by the UDRP dispute resolution mechanism, forming a relatively stable publicity–remedy loop. NFT trading platforms, by contrast, operate independently; while on-chain data are searchable, authoritative interpretation and

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uniform dispute resolution standards are lacking, making it difficult for buyers to assess defects in title.

Some scholars, such as Yanchao Yang, have studied the design of property rights and copyright systems for NFT digital collectibles [9]. At this point, copyright registration might appear to be a registration–publicity solution for confirming rights in virtual property. Yet the two differ fundamentally in institutional function: copyright registration aims to confirm the attribution of "original expressions," with a protection term lasting for the author's lifetime plus fifty years; virtual property, however, emphasizes "transaction circulation" and "real-world value," with rights duration often determined by platform rules or contractual stipulations. For digital artworks, copyright registration may resolve "who is the author," but it cannot answer "who is the current holder" or "can the right be asserted against third parties."

4. Comparative study on the confirmation of new forms of virtual property

4.1. Comparative models of virtual property confirmation

The first is the principle of contractual fairness review in the United States. The U.S. legal system consists of both statutory law and case law, and the regulation of virtual property relies on the combined effect of the two [10]. At the legislative level, states such as Connecticut (2005) and Rhode Island (2007) were the first to pass Digital Estate Acts, recognizing inheritance rights over digital assets such as emails and social media accounts, and requiring service providers to transfer account contents to lawful heirs. Such legislation directly invalidates attempts by platforms to strip users of inheritance rights through user agreements, thereby establishing the legal status of virtual property as inheritable assets.

In judicial practice, Bragg v. Linden Research Inc. was a landmark case. In this case, a player was permanently banned for exploiting a game loophole, and the platform unilaterally confiscated his purchased virtual land. The platform invoked a "mandatory arbitration clause" in the user agreement to evade liability. The Pennsylvania court creatively held that the clause was unconscionable and therefore invalid, stressing that operators cannot exclude users' core rights to virtual property through standard form contracts. The "contractual fairness review" principle established in this ruling provides important jurisprudential reference for regulating unfair terms in online service contracts in China.

The second is Germany's user-centered principle. Germany defines virtual property as an object of property rights, with legislative innovations focused on electronic inheritance. The German Bar Association explicitly defines electronic inheritance as "all contractual relationships of the deceased related to the internet," including online accounts, digital content, and derivative rights. This broad definition legally affirms the inheritability of virtual property.

In judicial practice, the Facebook Inheritance Case highlighted the priority of user rights. In this case, a minor user died unexpectedly, and Facebook refused to grant her parents access to the account data on the basis of a user agreement prohibiting third-party access. The German court, invoking fundamental principles of inheritance law, directly invalidated the "prohibition of inheritance" clause in the user agreement and ordered the platform to transfer the account data to the heirs. This case established the rule that "inheritance rights to virtual property cannot be restricted by standard form contracts," offering crucial jurisprudential support for resolving account inheritance disputes in China.

The third is South Korea's dual-track protection system and value assessment mechanism. As a highly developed internet nation, South Korea pioneered a dual-track protection system for virtual

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property. On the civil law side, Article 49 of the Act on Promotion and Protection of Information and Communications Network explicitly prohibits any entity from unlawfully damaging, misappropriating, or disclosing another's virtual information [7], thereby granting virtual data the attribute of property rights. On the criminal law side, South Korea established the offense of "computer use fraud" to combat theft of virtual property and included virtual property within the scope of "goods" for taxation purposes (e.g., under the Value-Added Tax Act), thereby recognizing its equivalent economic value and legal status to traditional property.

Of particular note is Korea's innovative value assessment mechanism. Its "Virtual Environment Management System," jointly operated by service providers and professional institutions, employs sampling and statistical methods to quantify the value of virtual property. The process involves selecting user samples and virtual items from specific games, calculating the average time cost for players to acquire such items, and then converting this into economic value based on market transaction data [11]. This scientific evaluation model effectively addresses the absence of damage compensation standards for virtual property and offers a technical model for China to establish a national-level value recognition system.

4.2. Comparative law insights

The above practices from the three countries provide the following lessons for the protection of virtual property in China:

First, clarify the quasi-property rights nature of virtual property and build a classified confirmation system. South Korea's legislative practice of treating virtual property as "goods" shows that a property-rights orientation is most conducive to protecting user rights. It is recommended that the Judicial Interpretations of the Property Rights Book of China's Civil Code include provisions affirming the special property-rights nature of virtual property similar to quasi-property rights. To address ownership disputes, Germany's "data carrier right–property value right" dichotomy can be adopted: platforms retain ownership of data carriers, while users enjoy rights to the value of virtual property. For example, in NFT art transactions, the creator retains copyright while the purchaser acquires the proprietary rights attached to the blockchain token, thus realizing a structured division of rights.

Second, establish a system for reviewing standard form clauses and a blacklist mechanism. The reasoning in the U.S. Bragg case reveals that judicial intervention is an effective check on platform dominance. It is recommended that the Supreme People's Court issue judicial interpretations invalidating three types of standard form clauses: (1) clauses excluding user ownership, such as "accounts belong to the platform"; (2) excessive disclaimer clauses, such as "no compensation for hardware failures"; and (3) clauses restricting property circulation, such as "prohibition of account trading." At the same time, following the German Civil Code, a "blacklist of standard clauses" should be established to expressly prohibit hidden infringement clauses such as mandatory arbitration and unilateral interpretation clauses.

Third, create an electronic inheritance and registration disclosure system. Germany's experience with electronic inheritance demonstrates that the transfer of virtual property requires going beyond contractual restrictions. It is recommended to revise Article 1122 of the Inheritance Law by adding a provision that "network virtual property as a special type of property shall be subject to statutory inheritance" and imposing a statutory obligation on platforms to cooperate in transferring ownership. To ensure transaction security, China could draw on South Korea's "Virtual Environment Management System" and establish a national-level virtual property registration platform: fundamental ownership information would be filed with notary agencies, while daily transaction

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registrations would be managed autonomously by compliant trading platforms, forming a tiered registration model of "public authority supervision + market-based operation."

5. Pathways for confirming and protecting new forms of virtual property in China

5.1. Legislative model: a pragmatic, stepwise approach

At present, the protection of virtual property in China faces a dual dilemma: insufficient legislative supply and fragmented judicial rulings. Although Article 127 of the Civil Code explicitly stipulates for the first time that virtual property is protected by law, it does not define its legal attributes or rules of protection, leading courts to rely mainly on standard-form contracts or the analogy of traditional property rules in adjudication. In response, scholars have proposed two legislative pathways:

Path One is to amend the Civil Code and its supporting judicial interpretations. The Supreme People's Court could issue a judicial interpretation to refine the application of Article 127. The focus would be on clarifying three core rules: (1) defining virtual property as "special movable property" and recognizing users' ownership rights; (2) establishing an integrated adjudication framework of "title determination—tort liability—remedial procedures"; and (3) stipulating differentiated title-confirmation standards for new categories such as in-game assets, digital collectibles, and metaverse property. This pathway has the advantage of low legislative cost and rapid responsiveness, and can be integrated into the existing property law framework. The law should explicitly define the core rights attached to virtual property—including possession, use, profit, disposition, and the right to exclude interference—while preserving contractual autonomy for users and platforms to stipulate limitations, service duration, or termination conditions through standard terms or specific agreements, thereby achieving a model of "statutory framework supplemented by party autonomy."

Path Two is to enact a standalone Virtual Property Protection Law. Such legislation would comprehensively regulate the definition, ownership, registration and publicity, transfer rules, tort liability, and regulatory mechanisms of virtual property. A specialized law could systematically address emerging issues such as NFT fractional ownership, metaverse land transactions, and rights attribution of AI-generated assets, thereby providing stability and predictability for the digital economy. However, this pathway must reconcile potential conflicts with existing laws such as the Civil Code and the Data Security Law, and would involve a relatively lengthy legislative process.

Taking into account legislative costs, systemic compatibility, and the rapid iteration of technology, this paper advocates a "two-step" gradual legislative pathway. In the first stage, within the next three years, the Supreme People's Court should issue a judicial interpretation to refine Article 127 of the Civil Code, focusing on clarifying the legal attributes, rules of transfer, and tort liabilities of virtual property. It is especially important to define ownership subjects and their division of powers, and to promote the concretization and standardization of the rights objects. In the second stage, after sufficient judicial practice has been accumulated and the maturity of technology and market scale have been scientifically assessed, the National People's Congress should initiate the enactment of a standalone Virtual Property Protection Law. This should regulate the entire lifecycle of virtual property—from creation, title confirmation, transfer, and inheritance to extinction—under a systematic legal framework with clearly defined subjects, specified objects, and distinct rights and obligations. Such an approach can quickly fill the current judicial gap while leaving institutional interfaces for future legislation, thereby avoiding the risks of a rigid "one-law-for-all" approach.

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5.2. Core institutional design: a three-dimensional architecture centered on registration and publicity

5.2.1. Ownership attribution: user-centric title confirmation principle

Platform practices of defining virtual property as "owned by the company, with users enjoying only usage rights" through standard-form terms should be corrected. The law should establish the principle of "user-centrism," stipulating that virtual property obtained by users through lawful labor, payment of consideration, or gift, in principle, belongs to the user, who enjoys the full bundle of rights to possess, use, profit from, and dispose of it. Particularly, although virtual currencies are not recognized as legal tender in China and lack legal tender status, they are acquired through expenditure of electricity, computing power, or fiat money, and possess exchange value as virtual goods. Their property attributes should thus be affirmed, and users should enjoy ownership rights including holding, transfer, and trading on compliant platforms. Platforms may only impose reasonable restrictions on the exercise of rights where such restrictions are prominently disclosed and expressly consented to by users. Restrictions lacking such disclosure or manifestly unfair shall, in accordance with Articles 497 and 506 of the Civil Code, be null and void. In addition, drawing from the logic of Germany's "Facebook inheritance case," the law should establish that virtual property is subject to statutory inheritance rules upon the user's death, and platforms bear a legal obligation to cooperate in ownership transfer. When a platform terminates its services, it must assume the responsibility of value compensation or data migration to prevent users' assets from becoming nullified.

5.2.2. Layered title confirmation: a multi-level model combining general and special rules

Virtual property is diverse in type and complex in its sources of rights, and a single model of ownership attribution cannot suffice. The law should establish a layered title-confirmation mechanism of "general statutory ownership + special contractual arrangements."

General statutory ownership means recognizing virtual property as a form of special property and directly granting users ownership rights by law. Such rights cannot be waived or restricted by contract. At the same time, the law should specify exceptions where public interests—such as national security, the protection of minors, or public order—justify temporary restrictions on user rights, but only under the principle of proportionality and with remedies available to users.

Special contractual arrangements apply to composite assets that overlap with copyright or trademark rights, such as NFT artworks, metaverse virtual buildings, or on-chain domain names. In these cases, parties may agree on ownership and exercise of rights through contract. For NFT artworks, the creator may retain copyright under the Copyright Law, while the buyer acquires ownership of the NFT as virtual property; both sides may further stipulate, via smart contracts, royalty-sharing arrangements, exhibition restrictions, or adaptation licenses in subsequent transfers. For virtual currencies, ownership by users should be the statutory principle, but transfers, trading venues, and uses must strictly comply with mandatory financial regulatory provisions on ICO risk prevention and anti-money laundering, and parties may not contract to engage in illegal financial activities. For metaverse virtual buildings or land, users may, on the basis of ownership, agree with platforms or third parties on development, leasing, or advertising uses. The law should provide model contract clauses to guide fair negotiation and impose invalidity or voidability consequences for manifestly unfair agreements.

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5.2.3. Registration and publicity: a dual-layer mechanism for title confirmation

The immateriality, replicability, and cross-platform transferability of virtual property render traditional possession-based or immovable property registration models inapplicable. Legislation should therefore establish a nationwide or industry-wide registration and publicity system for virtual property, built on blockchain technology and structured as a "dual-layer architecture of on-chain evidence plus state endorsement."

(1) System Architecture and Division of Functions. The system would be supervised by the Ministry of Justice and operated by the National Internet Finance Association of China, with a national alliance chain and industry sub-chains. The national alliance chain would handle cross-platform identity verification, data interoperability, and judicial enforcement, while industry sub-chains—covering games, NFTs, the metaverse, and other scenarios—would provide integrated services of registration, inquiry, publicity, and enforcement. Nodes would be maintained jointly by judicial organs, industry associations, leading platforms, notary offices, and arbitration bodies, ensuring data immutability and regulatory oversight.

(2) Registration Effect. The system would adopt a mixed model of "registration for opposability" and "registration for right-creation." For routine secondary-market transactions (such as sales, gifts, or inheritance), registration for opposability applies, meaning unregistered rights cannot be asserted against bona fide third parties. For initial or first-division acts (such as the initial minting of an NFT or the first subdivision of virtual land), registration for right-creation applies, making registration a constitutive requirement for the validity of the right, thereby preventing "duplicate issuance" or "double-chain" scenarios. Rights information confirmed through registration would be directly recognized by courts as equivalent to "official documents" and presumed authentic and lawful, subject to rebuttal through contrary evidence in opposition proceedings. For unregistered or defectively registered transactions, courts should determine ownership based on a holistic review of on-chain data, platform logs, and payment records, so that "technical form" does not override "substantive justice." The registration system should also interconnect with notarial, arbitral, and bankruptcy management systems, enabling the rapid identification and valuation of virtual property in inheritance, bankruptcy, and enforcement proceedings.

5.3. Supporting institutional framework: a tripartite rights-protection mechanism

To ensure the effective implementation of rules on title confirmation, layered ownership, and registration and publicity, the following complementary mechanisms must be developed simultaneously. First, regulation of standard-form terms to clarify ownership subjects and resolve ambiguities in rights attribution. The State Administration for Market Regulation, together with the Cyberspace Administration of China, should issue Guidelines for Reviewing Standard-Form Clauses in Online Service Contracts. Provisions that deprive users of core rights—such as "account ownership belongs to the platform," "prohibition of transfer or inheritance," or "no refunds under any circumstances"—should be included in a mandatory invalidity list, thereby anchoring in legislation the user's status as the core rights-holder of virtual property. At the same time, platforms should be required to fulfill conspicuous disclosure obligations through no fewer than four methods, such as pop-up windows, boldface text, separate checkboxes, or explanatory short videos. Clauses not duly disclosed may not only be revoked at the user's request, but may also be subject to public interest litigation initiated by consumer associations, and may be directly invalidated ex officio by courts in individual cases. Second, establishing a value-assessment system to concretize virtual property and resolve uncertainty in asset valuation. The Ministry of Justice, together with the

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Ministry of Industry and Information Technology, could establish an Expert Pool for Virtual Property Valuation, initially selecting specialists in blockchain technology, gaming economics, accounting standards, and intellectual property law to jointly issue Guidelines for Virtual Property Valuation. These guidelines should adopt a dual-track model combining "weighted average of historical on-chain transactions" with "expert adjustment factors." Valuation must be independently conducted by at least three experts on a back-to-back basis, with the final average reported. Such reports should be recognized as official documentary evidence under the Civil Procedure Law, rebuttable only by contrary evidence. By transforming abstract digital entitlements into specific monetary values, this mechanism provides an objective basis for compensation, inheritance division, and bankruptcy liquidation, thereby making virtual assets "specific" in terms of economic value. Third, strengthening publicity and credibility through digital inheritance and bankruptcy retrieval mechanisms to ensure security in rights transfer. In judicial interpretations of the inheritance provisions of the Civil Code, a "digital estate administrator" rule should be added, allowing natural persons to pre-designate administrators via notarization or certified timestamps issued by the National Time Service Center. Administrators, upon presenting effective legal documents, would have the right to request platforms to provide accounts, keys, and transaction records, with platforms required to transfer data within three working days, failing which they would bear liability for refusal to fulfill information-assistance obligations. In addition, the Supreme People's Court should clarify in its judicial interpretation of the Enterprise Bankruptcy Law that registered virtual property is excluded from the bankruptcy estate, and users may exercise a right of retrieval. For unregistered assets, if chain-based evidence can be provided, users may also declare a retrieval claim to the administrator within thirty days, and administrators may not charge additional fees. These two mechanisms, complementary in nature, jointly enhance the attractiveness and credibility of registration and publicity systems, ensuring that rights-holders' intentions expressed during their lifetime are honored, while preventing "digital death" resulting from their demise or platform bankruptcy. In doing so, a closed-loop system of "clarified rights—transaction security—efficient remedies" is formed.

6. Conclusion

New forms of virtual property carry significant economic and social value but face a series of challenges, foremost among them the ambiguity of title confirmation. The solution lies in recognizing their status as quasi-property rights or special property rights, constructing a blockchain-based registration and publicity system to achieve object specificity, and establishing layered ownership rules to balance user ownership with creator rights. At the same time, the review of standard-form terms should be strengthened to curb platform dominance, while pursuing four parallel objectives: incentivizing technological innovation, safeguarding user rights, maintaining market order, and preventing financial risks. Looking ahead, it is essential to continuously address the challenge of technological front-loading and to deepen research into frontier issues such as AI-generated works, decentralized autonomous organization governance, and cross-border regulatory coordination. Only through this shift from passive remedies to proactive governance can the legal protection of virtual property empower the rule-of-law development of the digital economy.

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