

The Tokenization of Space and Cash Out without Debt: Focus on Security Token Offerings Using Blockchain Technology

Hoobin Lee* · Dasom Hong**

공간의 토큰화와 빚 없이 현금 뽑기: 블록체인 기술을 활용한 증권형 토큰 발행을 중심으로

이후빈* · 홍다솜**

Abstract: This paper analyzes two cases of space tokenization, Meridio and QuantmRE, to explore the potential of tokenization as a new means of space financialization. Space tokenization is based on blockchain technology and security token offering (STO). Although some financial geographers noted the possible impact of blockchain technology on space financialization, it has not been examined in depth. Therefore, this paper demonstrates space tokenization cases in detail. Meridio and QuantmRE suggest financial structures that convert space into tokens based on fractional ownership transactions. QuantmRE, specifically, allows a homeowner to secure cash without either debt or ownership relinquishment through sales of tokenized home equity. As this method takes a form of sale transaction rather than a loan, it enables financial institutions to circumvent strengthened regulation on loans after the 2008 global financial crisis. Moreover, even “house poor” households, who own houses but lack cash due to excessive loans, can cash out from their properties through QuantmRE. As such, space tokenization enables financial institutions to overcome constrained conditions after the global financial crisis, thereby reproducing space financialization. Space tokenization also has the potential to geographically expand space financialization through stimulating investment in the depressed housing market.

Key Words : Housing Finance, Financial Geography, Financialization, Blockchain Technology, Space Tokenization, House Poor Households

요약: 본 연구는 공간 금융화의 방식으로써 토큰화의 가능성을 탐구하기 위해 Meridio와 Quantm RE의 사례를 분석한다. 공간의 토큰화는 블록체인 기술과 증권형 토큰 공개(STO)에 기초한다. Meridio와 Quantm RE는 구분소유

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* (제1저자) 이후빈, 국토연구원 주택택토지연구본부 부연구위원 (Associate Research Fellow, Housing and Land Research Division, Korea Research Institute for Human Settlements), hblee@krihs.re.kr

** (교신저자) 홍다솜, 서울대학교 지리학과 석사 (MAs, Department of Seoul National University), aboutcity@snu.ac.kr

권 거래를 바탕으로 공간을 토큰으로 만드는 금융모형을 제시하는데, 특히 QuantmRE는 주택소유자가 부채 없이 주택지분 거래를 통해 현금을 확보할 수 있게 한다. 이와 같은 방식은 대출이 아닌 매매의 형태를 취함으로써 금융기관이 대출에 대한 규제를 우회하고, 더 이상 부채를 늘릴 수 없는 하우스푸어가 주택으로부터 현금을 얻을 수 있게 해준다. 따라서 공간의 토큰화는 2008년 금융위기 이후에도 여전히 공간의 금융화를 재생산하는 대안이 될 수 있다. 그리고 하우스푸어에 대한 추가적 투자는 불황 주택시장의 저소득층 주거지역을 다시 투자지역으로 부상시켜서 금융화의 지리적 확장을 실현할 수 있다.

주요어: 주택금융, 금융지리학, 금융화, 블록체인 기술, 공간의 토큰화, 하우스푸어

1. Introduction

The security token offering (STO) has attracted attention in the financial market since the cryptocurrency crash (Ante and Fiedler, 2019; Liebau, Lambert, and Roosenboom, 2020). The cryptocurrency fever, best represented by Bitcoin, aroused a furious debate on the status of cryptocurrency that uses blockchain technology as currency (Böhme *et al.*, 2015; Glaser *et al.*, 2014). The tremendous appreciation of Bitcoin and subsequent depreciation, however, showed the unstable nature of financial bubbles. In this context, the STO is actively discussed as a recent alternative to cryptocurrency in the financial market (Trading Strategy Guideline, 2019). Cryptocurrency speculation, dependent on short-term rise in value, could not avoid rapid depreciation, because it does not generate actual profits. In contrast, security tokens linked with real assets, such as real estate or intellectual property rights, provide a solid foundation for value that is secured by stable cash flows. Specifically, real estate is considered one of the main underlying assets of security tokens as it

generates stable revenues and creates liquidity through a STO (FIBREE, 2019; Laurent *et al.*, 2018). In short, the current financial market is paying attention to the process of tokenizing physical space.

Tokenization has not, however, received theoretical attention in the study of the financialization of space. Although some scholars have noted that blockchain technology will create new possibilities in the financialization of housing (Aalbers, 2019; Proskurovska and Dörry, 2018),¹⁾ they have stopped short of analyzing the differences between new possibilities and conventional financialization. New possibilities of tokenization need to be explored in both conceptual and empirical dimensions. Conceptually, it is necessary to contrast the tokenization of space with existing means of financialization. Through this contrast, we can understand potential of blockchain technology utilization. Moreover, it is necessary to empirically investigate cases of issuing and trading real estate tokens to identify how the potential is realized. Cases will illustrate the new method of financialization, which was previously impossible but can now be performed with blockchain technology.

The purpose of this paper is to examine space tokenization as a new frontier for space financialization. Financialization of housing has continued even after the 2008 global financial crisis. Securitized rental housing, specifically, has emerged as a new asset class in this process (Byrne, 2020; Fields, 2017). Some foreclosed houses were converted into rental houses. The rental income from those houses were securitized and traded in the financial market (Charles, 2020; Wijburg *et al.*, 2018). As such, space financialization is reproduced, while its form has changed from mortgage-backed securities to rental housing. Therefore, this paper aims to analyze the potential of blockchain technology in light of the reproduction of space financialization. It captures how financial institutions seek new opportunities in housing and realize them even in constrained conditions after the 2008 global financial crisis.

This article analyzes features and examples of the tokenization of housing and then argues for tokenization as a new instrument for financializing space. This argument is developed in the following sequences. In the next section, it contrasts the tokenization of space with a conventional real estate financial system and then suggests how blockchain technology brings about qualitative changes in the financialization of space. In section 3, this article examines cases of tokenization. It focuses on distinctive business models of STOs to reveal the differences between tokenization and typical means of financialization. In section 4, it interprets tokenization as a new means of financialization. The argument demonstrates the distinctiveness of tokenization centered on three issues: the

immediate task, the method of liquidation, and the source of profit. Finally, in section 5, it summarizes the findings and suggests the significance and limitations of the analysis.

2. Contrasting Space Tokenization with the Real Estate Finance System

This section reviews the literature on the real estate finance system and space tokenization, respectively. Furthermore, it contrasts space tokenization with the conventional real estate finance system to identify space tokenization's distinctive natures.

1) Real Estate Finance System

Real estate finance is a sub-discipline of finance and real estate, which refers to either financing or the flow of funds related to the acquisition, development, management, or disposal of real estate (Breuer and Nadler, 2012; Claretie and Sirmans, 1984; Han and Cho, 2008). The real estate finance environment consists of financial instruments, institutions, and markets. Financial institutions create and purchase financial instruments that transfers money and credit to develop or acquire real property, and instrument transactions occur in financial markets. Succinctly, the real estate financial system is the environment through which real estate finance occurs. In the financial system, savings are transferred from surplus income units to deficit income units directly or through

intermediaries (Clauret and Sirmans, 1984).

In a similar vein, the concept of the real estate finance system (REFS) was suggested, which refers to a system where different entities play various roles and make decisions about real estate finance through interaction and transactions (Han and Cho, 2008). The financial surplus sector (investors), the financial deficit sector (debtors), the real estate financial market, intermediaries, and the government are the entities of REFS. In the real estate financial market, real estate-related actors participate in transactions of financial instruments. The financial deficit sector raises funds for acquisition, development, and disposal of real estate through instruments, and the financial supply sector directly or indirectly invests in instruments. The intermediaries, including both private and public

sectors, develop and mediate financial instruments, as well as manage associated risks. Lastly, the government develops and oversees the market. The decisions of individual entities and the REFS have a mutually beneficial effect, and the REFS also interacts with external institutional and environmental factors like regulations or policies (Han and Cho, 2008).

Financial markets, instruments, and intermediaries provide the foundation for real estate finance, and diverse entities operate by forming the flow of funds. Specifically, the role of intermediaries has been emphasized. Although intermediaries vary in purpose and form, they commonly perform several functions, such as providing liquidity or credit risk evaluation, to facilitate the flow of funds in the financial system. Moreover, these intermediaries receive

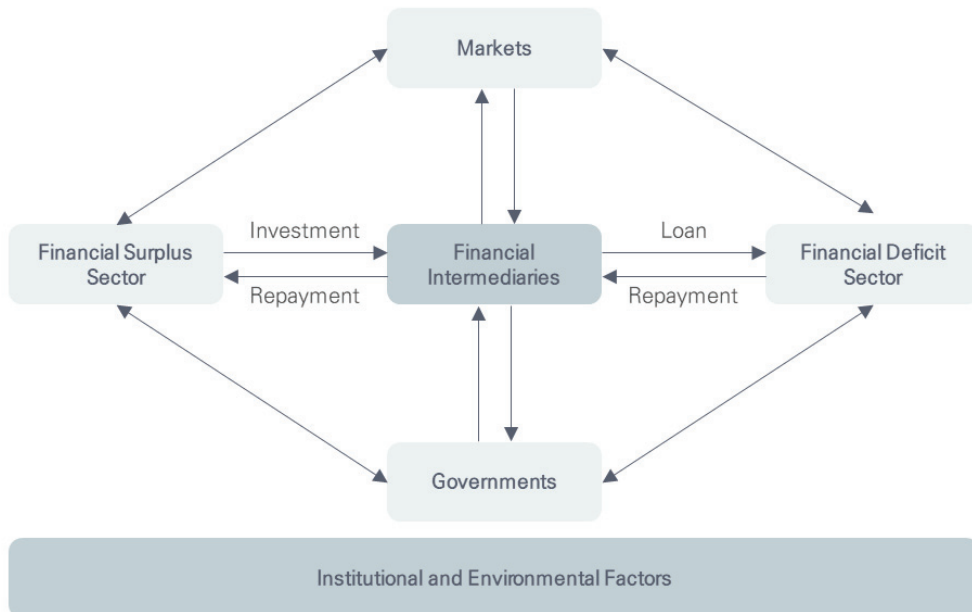


Figure 1. Real Estate Finance System

* Source: Han and Cho, 2008

commission due to their distinctive position within financial markets (Clauret and Sirmans, 1984). On the other hand, modern real estate financing tends to be disintermediated due to the emergence of innovative financial schemes and instruments (Breuer and Nadler, 2012). For example, internet-based real estate crowdfunding platforms perform intermediary functions similar to those performed by conventional financial intermediaries (Montgomery, Squires, and Syed, 2018). This signifies that technological innovation disrupts the traditional real estate finance landscape.

2) Components of Space Tokenization

The process of tokenizing space consists of three components: blockchain technology, smart contracts, and security tokens. It is necessary to understand the three technological innovations constructing the tokenization process to comprehend its characteristics as a method of financialization. First, blockchain refers to a distributed digital ledger technology consisting of blocks that contain transaction records (Davidson, De Filippi, and Potts, 2018; Miraz and Ali, 2018). A blockchain database uses a peer-to-peer network, so transaction information is recorded with each participant in what is called a “node” rather than a centralized server. A block that records all transaction information is generated every unit of time (typically 10 minutes) and is transmitted to participants within a blockchain network. The participants examine the block on individual computers and only approved blocks are recorded in connection to the previous block. A series of con-

nected blocks in chronological order form a blockchain. All distributed ledgers held by individual participants has the same content throughout this process. As such, it is almost impossible to manipulate data on the blockchain because all participants own distributed ledgers and create the ledgers by connecting the blocks together in chronological order.²⁾

In a conventional financial system, an trusted third party, such as a stock exchange, records information and receives fees for facilitating the information (Pagnia and Gärtner, 1999). The third party has no stake with the transacting parties. In this system, the credibility and security of the authorized third party are paramount. If a stock exchange is hacked or transaction records are manipulated, the system would be damaged to such a severe extent that the entire stock exchange’s transactions would be suspended. Thus, such systems incur considerable social costs to avoid a single point of failure (Agrawal *et al.*, 2018). In contrast, participants in a blockchain network independently verify, record, and store transaction information, thereby ensuring both credibility and security while reducing transaction costs.

Second, smart contracts refer to the automated self-enforced agreements without human intervention by utilizing blockchain technology (Szabo, 1997). When predetermined contract conditions are achieved, a contract for an asset listed on a blockchain platform is automatically executed by a specific software code recorded on the blockchain.³⁾ Smart contracts could be regarded as a form of algorithmic contract in that human intervention is not required after the contract is signed.⁴⁾ Smart con-

tracts, however, differ from algorithmic contracts because they are not suspended once the contracts are executed (Wright and De Filippi, 2015, 15–17). Therefore, smart contracts eliminate default risk through automated self-enforced. Given that default risk is one of the most significant risks in a traditional contract, smart contracts would minimize costs. In doing so, parties to a contract do not need to make legal efforts to build trust, such as the notarization system for conventional written contracts, nor do they incur litigation or execution costs in cases of non-compliance (Harz and Boman, 2019; Werbach, 2019).

Lastly, a STO refers to an issuance of security tokens, which represent ownership information for investment products, such as stocks, bonds, funds, or real estate (Ante and Fiedler, 2019; Liebau, Lambert, and Roosenboom, 2020). Security tokens are traded, stored, and recorded through blockchain technology. STOs emerged as an alternative to initial coin offerings (ICOs) as short-term speculation of cryptocurrency produced considerable victims and surging criticism (Trading Strategy Guideline, 2019). An ICO is a type of fundraising that sells cryptocurrency in the issuer market. Most cryptocurrencies issued by ICOs were utility tokens provided by issuing entities as an incentive to energize their blockchain networks.⁵ Utility tokens have been criticized because there is no relationship between tokens and underlying assets, and it is challenging to generate profits except for speculative value increases. On the other hand, security tokens are stable with low risk because they are based on real assets and business models that generate profits.⁶

The three technologies constitute the processes

for tokenizing space. Owners and investors enter into smart contracts to convert space into financial assets. Security tokens based on such contracts are then issued. The security tokens represent the rights of properties, including claims for profits and decision-making over the real assets. Investors can trade the security tokens on blockchain networks, which validate and store transaction information. Consequently, space is converted into digital tokens traded on blockchain networks.

3) Space Tokenization and the Real Estate Finance System

The tokenization of space has attracted attention because of its potential to disrupt the conventional landscape of the real estate finance system. Compared with the existing real estate finance system, the tokenization of space has the following characteristics. First, internet-based blockchain platforms replace conventional financial intermediaries (Cai, 2018; Chiu, 2016). This is often regarded as disintermediation, but some scholars explain it as re-intermediation by blockchain platforms (Langley and Leyshon, 2020). Nevertheless, the platforms are different from conventional financial intermediaries in terms of cost reduction, because these platforms utilize different technologies. The decentralization, security, and transparency of blockchain technology bring about reduced transaction costs (Yue and Shyu, 2019).

Second, the tokenization of space can enhance asset liquidity. The financialization of real estate allowed the conversion of indivisible real estate

into small units shared or traded among multiple investors (Tapp, 2019). Existing real estate finance, however, has a limitation on dividing the real estate. As Coakley (1994) identified, real estate could only become a quasi-financial asset rather than a pure financial asset. Tokenization, conversely, can theoretically divide property rights into unlimited units of cryptocurrencies and fractional ownership created by tokenization allows small investors to participate in real estate investment (Kim, 2020). Additionally, investors around the world can invest anywhere by purchasing tokens with simple procedures since there are no international regulations yet on token transactions (De Filippi *et al.*, 2018). International accessibility to tokens enables capital from around the world to be invested in any specific property.

Lastly, tokenization can lead to new investment opportunities in the financial market. A security token can create new opportunities because it is a new asset class with weak links to traditional investment assets. The extensibility of blockchain technology like smart contracts can also be used to design financial products with various structures that are different from those that currently exist (Cai, 2018; Chiu, 2016). Specifically, smart contracts create new contractual relationships and eliminate defaults

through the automatic execution of contracts, which allow for a dramatic reduction in transaction costs (Ding and Zhu, 2020; Wright and De Filippi, 2015). The features of space tokenization are similar to elements in the conventional real estate finance system. For instance, real estate investment trusts (REITs) also enable investors to invest in real estate without owning it, and most REITs are traded like stocks (Park, 2013; Na *et al.*, 2013). Notwithstanding, the reduced transaction costs, divisibility, and extensibility are intensified with tokenization technologies (See Lee, 2019a: 21–22). Furthermore, intensified elements bring qualitative changes, which reveal specific cases and business models. Hence, the next section analyzes the business models for space tokenization platforms to discover qualitative changes induced by tokenization.

3. Discovering the Cases of Tokenizing Space

This section analyzes the new means of financializing space that use tokens. First, the cases of turning real estate into tokens and selling

Table 1. Comparison between Space Tokenization and Real Estate Finance System

	Real Estate Finance System	Space Tokenization
Intermediary	Financial institutions	Internet-based blockchain platforms that reduce transaction costs by utilizing technologies
Asset liquidity	Limitation on dividing real estate	Dividing property rights into unlimited units of cryptocurrencies and fractional ownership
Investment opportunities	Conventional financial products	Providing new investment opportunities and financial products like security tokens

them on the financial market are identified. To examine tokenization from the perspective of space financialization, the analysis excluded the cases of applying blockchain technologies to real estate transactions irrelevant to the financial market, such as blockchain registration. It selected the cases which attempt to connect real estate to the financial market through blockchain technology. Then, it identified new ways of real estate finance based on the originality of the business model, which are different in quality from the existing ones (see Table 1). At present, the use of tokens in real estate finance is still in its infancy, so few cases have raised a large scale of funds from investors. Most cases are in the stage of establishing a business model and promoting it in the financial market. Therefore,

the focus of the case study was not the popularity in the financial market but the novelty of the business model.

Consequently, Meridio and QuantmRE were analyzed because they reveal the extensibility of blockchain technology. Specifically, this section concentrates on QuantmRE, which utilizes both security tokens and smart contracts. The previous section revealed that the tokenization of real estate is not significantly different from conventional means of financialization unless combined with the advantages of blockchain technology, such as smart contracts. The business model in each case is unique compared to existing means of financialization due to its advantage of blockchain technology. Meridio suggested transactions and investment in fractional

Table 2. Examples of STOs related to Real Estate

Tokenization Platform (State)	Business Model	Features
Meridio (U.S.A.)	Support for real estate transactions and investment by utilizing smart contracts	<ul style="list-style-type: none"> - Reducing transaction costs and increasing transparency by using smart contracts - Providing real-time data on real estate development and intermediation
QuantmRE (U.S.A.)	Issuing security tokens based on transactions of fractional ownership	<ul style="list-style-type: none"> - Providing cash without debt to homeowners through fractional ownership transactions - Providing revenues based on the difference in the value of current and future equities to investors
ATLANT (Russia)	Intermediating real estate equity tokens and peer-to-peer rental transactions	<ul style="list-style-type: none"> - Issuing security tokens linked to individual real estate - Supporting transactions between property owners and tenants through smart contracts
Bloquid (Russia)	Issuance of security tokens with reverse mortgages as collateral	<ul style="list-style-type: none"> - Providing token revenues linked to housing prices, which are collateral for reverse mortgages - Providing interest from reverse mortgages as token profits when housing prices rise
BitRent (U.K.)	Support for financing and decision-making of real estate development	<ul style="list-style-type: none"> - Collecting and disclosing construction-related information using blockchain technology - Providing decentralized monitoring services to investors regarding the construction process of real estate development projects

ownership by utilizing smart contracts, QuantmRE's business model has converted the conventional financial instrument of home equity to a non-debt form by combining smart contracts and security tokens.

1) Meridio: Transaction and Investment of Fractional Ownership

Meridio proposed a new method to increase real estate liquidity by utilizing smart contracts for transactions of fractional ownership (Meridio, 2018). As a house is a capital-intensive product, it is difficult to find a single buyer when selling it. A homeowner who sells the house due to an immediate need for cash may still want some shares of the house in anticipation that its price will rise in the future. Meridio suggests solutions to these types of scenarios. With Meridio's Pangea platform, homeowners can sell home equity⁷⁾ as much as they want to investors around the world (see Figure 3). Token holders can sell small-scale tokens to other investors at any time, so the liq-

uidity of the tokens is much higher than the underlying asset of the house. Intrinsically, it is possible to increase the liquidity of real estate by dividing the entire ownership into security tokens.

The sale of fractional ownership, which trades only a part of an asset, is not entirely new. Even without using blockchain technology, both the creation and transaction of fractional ownership are possible through existing methods. There are various forms of common ownership, such as joint ownership, partnership ownership, or collective ownership. The vitalization of fractional ownership transactions through smart contracts nevertheless brings a change to the real estate market. The use of a distributed digital ledger and smart contracts allow fractional ownership transactions at lower costs despite the complex relationships of rights created by common ownership. Smart contracts relieve the anxiety of unpredictable behavior by co-owners, such as the non-fulfillment of contract terms. Since restrictions on exercising property rights with shared ownership is a crucial issue, establishing

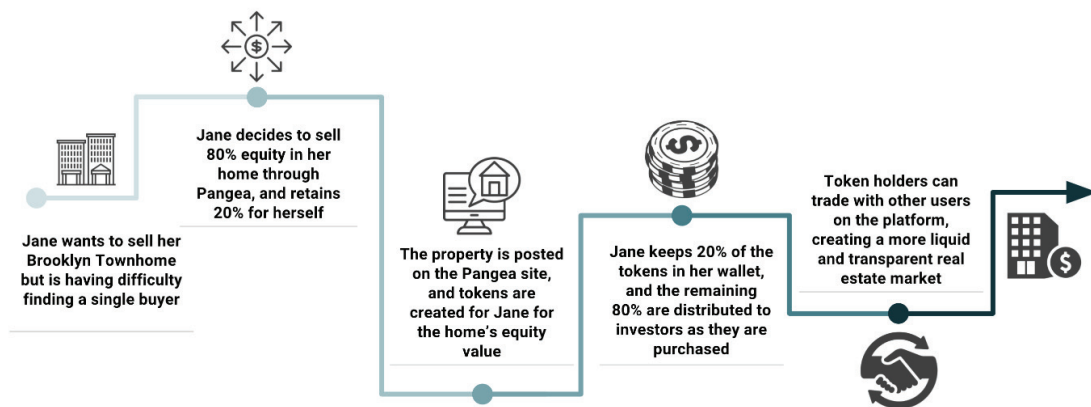


Figure 2. Fractional Ownership Transactions in Meridio

*Source: Meridio⁸⁾

a transparent relationship of rights can dramatically curtail transaction costs. A decrease in transaction costs promotes the trading of fractional ownership in the real estate market.

2) QuantmRE: Cash out from Houses without Debt

QuantmRE suggests a new means of financialization that allows homeowners to secure cash without increasing debt while still living in their house. At the heart of this business model is the transaction of fractional ownership, which satisfies both continuing to reside and securing cash. In the case of Meridio, the transactions of fractional ownership aim to create liquidity from houses, so homeowners can secure cash but cannot continue to live in the homes. QuantmRE, on the other hand, devised a way that homeowners can sell home equity to secure cash while continuing to live in their houses. In addition, the homeowners need not pay interest every month for the cash that they received. Assume a homeowner who has to secure cash by utilizing his or her only asset, a house. The homeowner typically borrows a mortgage loan from a bank and pay interest every month. Conversely, a homeowner can sell home equity through fractional ownership transactions. Homeowners receive as much cash as the home equity they sold, but they do not need to pay interest because the sale of fractional ownership is not a loan. Even after the sale of fractional ownership, the homeowner still retains some level of ownership and maintains their status as homeowner so that they can continue to

live in the house and choose when to sell the property.⁹⁾

There is a time lag between the transfer of rights and payments among homeowners and QuantmRE. The homeowner receives cash equivalent to the present value of fractional ownership from QuantmRE in exchange for transferring the fractional ownership to QuantmRE. QuantmRE then raises funds from investors around the world by issuing security tokens based on the fractional ownership transferred from the homeowner. While the homeowner receives cash immediately from QuantmRE, the platform only receives cash corresponding to the fractional ownership when the homeowner sells the property and receives payment. Thus, QuantmRE gains cash equivalent to the fractional ownership value at the moment of sale of the property, not the present value. Homeowners can postpone home sales for up to 30 years after the transfer of fractional ownerships. Meanwhile, QuantmRE remains a “silent partner” and homeowners maintain exclusive control over their houses, with some restrictions on change of ownership.

The transaction of fractional ownership is similar to conventional securitization in terms of splitting the ownership of the asset but differs in terms of maintaining control over the asset.¹⁰⁾ Securitization divides property rights into a myriad of securities circulating in the financial market. In this process, not only the right to claim revenues but also the right to control an asset is divided, which may lead to problems with actual control of the asset. The only thing, however, that splits in the transaction of fractional ownership

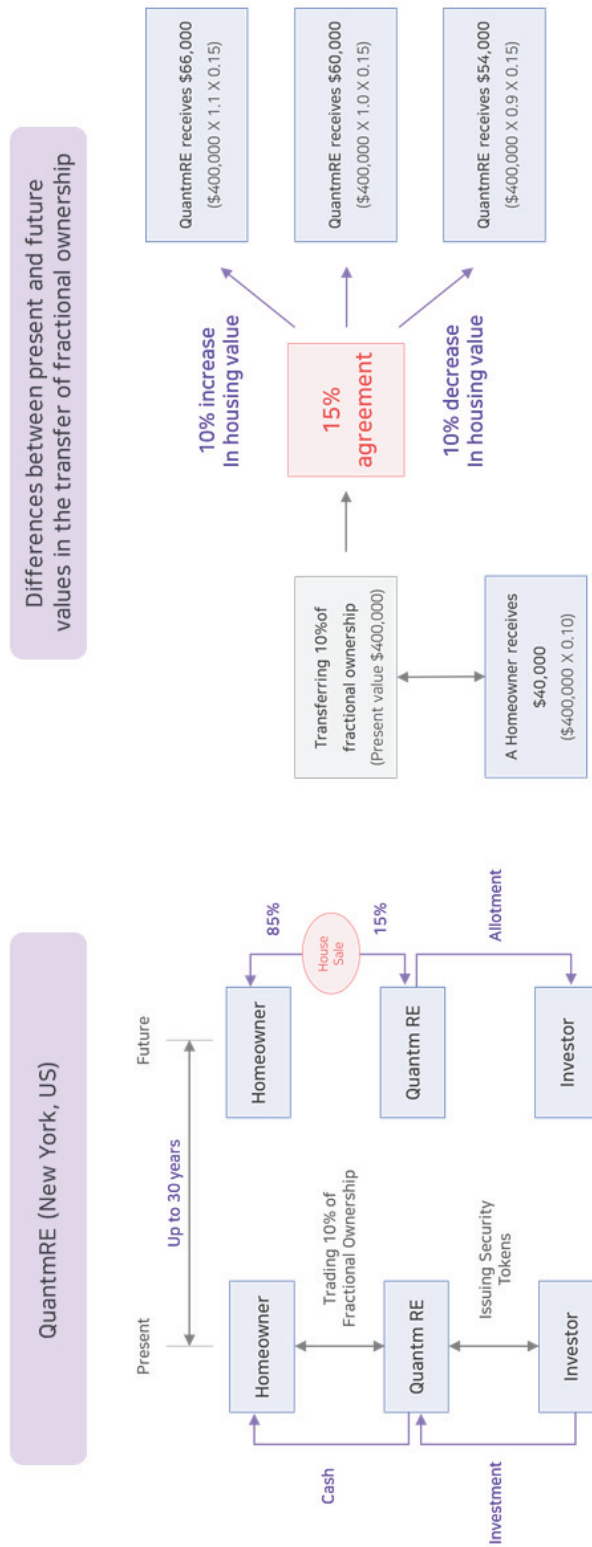


Figure 3. Asymmetry at the Time of Cash Receipt and Compensation for the Difference in the Value of Fractional Ownership

with QuantmRE is the right to claim future revenues. Homeowners living in the house still have control over the property. In this case, what investors obtain is not control of the property but claims of future profits generated by the property. The sale of fractional ownership allows homeowners to split the ownership and sell it as much as they want, while still controlling the house and a portion of ownership. It is an attractive opportunity for homeowners because they can maintain status as owners and maintain control even after securing cash through the sale of fractional ownership.

Smart contracts allow QuantmRE to wait as a silent partner for up to 30 years. If blockchain technology completely controls all real estate transaction processes, such as documentation, registration, or payment, QuantmRE's right to claim revenue can be entirely maintained as agreed in smart contracts. Although a homeowner can sell a house without a discussion with QuantmRE, a certain percentage of proceeds will be deposited into QuantmRE's electronic wallet under a smart contract. Additionally, if actions that affect housing value are prohibited in smart contracts, QuantmRE does not need to monitor whether prohibited activities occur in a house transaction governed by blockchain technologies. As the protection of claims is assured, QuantmRE, a financial investor, is not required to be involved in housing management. A smart contract clearly distinguishes between use-value and exchange value so that the only thing in which financial capital is interested is the right to claim revenue for exchange value.

The revenue structure of QuantmRE depends

on the difference between the value of home equity in the present and the future. First, QuantmRE and a homeowner make a contract that sets the present and future values of the classified ownership differently. QuantmRE ensures profits by estimating a future value of fractional ownership higher than the present value. For example, QuantmRE and a homeowner enter into a contract stating that the homeowner transfers a 10% fractional ownership to QuantmRE. The contract also includes a provision that QuantmRE has a right to claim 15% of the sale price in the future when the homeowner sells the property. The difference between 10% of present value and 15% of future value is the source of revenue that QuantmRE will generate. Furthermore, the revenue is linked to changes in property value. If housing prices rise in the future, QuantmRE can profit from the increase in the housing price and the 5% difference stated in the contract. Of course, QuantmRE suffers losses when housing prices fall by more than the difference between 10% and 15%. As such, the difference between fractional ownership value in the present and the future compensates at the time of transaction for the asymmetry of receiving cash between homeowners and QuantmRE.

4. Putting Tokenization in the Financialization of Space

The case of QuantmRE shows potentials of space tokenization as a new means of financialization of space. Hence, to reveal these

potentials, we discuss the case of QuantmRE in three aspects: the immediate challenge, the methods for creating liquidity, and the source of profits. By analyzing these aspects, this section demonstrates the uniqueness of tokenizing space rather than just using new blockchain technology. By analyzing these aspects, we can understand how and why financial institutions solve problems with blockchain technology rather than being overpowered by this new technology. In order to prove the originality of tokenization, it is necessary to contrast it with existing methods. Therefore, we mobilize multiple existing methods to position the case of QuantmRE within financialization of space. This section demonstrates the uniqueness of tokenizing space rather than just using new blockchain technology.

1) Immediate Challenge: Home Equity Extraction from “House Poor” Households

Extracting value trapped in space is one of the long-standing themes of research fields regarding the financialization of space (Choi, 2011; Green, 2019; Harvey, 1974; Kim, 2015; Purcell, Loftus, and March, 2020; Weber, 2002). The value extraction from space assumes that exchange value is easily disentangled from the use-value. Space, specifically real estate, produces profits and reproduces labor power in capitalism. As an asset, however, real estate may have an exchange value priced in the market apart from such use-value. The exchange value is appraised on the basis of the cash flows generated by the use of the real estate. If the exchange value

exists on a different level than the use-value, it is possible to make real estate living capital by releasing the exchange value (Christophers, 2010). For instance, like a reverse-mortgage, a house has value-in-use as a residence and can generate exchange value through home equity extraction. In other words, a homeowner can secure capital while still living in the house. As residents occupy the use-value, financial capital ceaselessly attempts to release dead capital trapped in houses.

The mortgage loan is a traditional method of extracting home equity (Canner, Luckett, and Durkin, 1989; Lee, 2019b). A homeowner provides a bank with a house as collateral and receives cash in the form of debt. The bank receives interest from the homeowner in return for the loan. The loan is expired when the homeowner repays the loan principal and interest on a fixed date. If the owner fails to repay the principal, the bank sells the collateral and recovers the principal on its own. Here, the house serves to complement the credit of the owner. The parties to the loan are the homeowner and the bank, so the bank focuses on the homeowner’s ability to repay the mortgage debt. The bank determines the loan amount and interest rate by evaluating the homeowner’s income level and credit score (Avery *et al.*, 1996). Consequently, the importance of collateral is measured by the recoverability of the principal, which is loan-to-value (LTV).

The rise in U.S. housing prices in the early 2000s showed that a house could be more than collateral for underwriting debt (Mian and Sufi, 2009, 2011). A rise in housing prices lowers LTVs for the same amount of loan capital, thereby increasing the recoverability of principal. Of course,

a rise in housing prices does not immediately lead to an increase in the amount of loan capital, as the amount of a loan fundamentally relies on a debtor's income level and credit score. Nonetheless, as housing prices continued to rise, banks began to ease restrictions on debtors' income levels and credit scores (Bhattacharya and Kim, 2011).¹¹ Liquidity-constrained households reacted most to easing loan conditions (Mian and Sufi, 2009). High leverage households, which needed cash but had no more capacity to borrow, immersed themselves in extracted home equity based on rising housing prices. They secured cash by increasing their loan amount to as much as the rise in housing prices through home equity lines of credit and refinancing mortgage loans. During this time, homeowners used their houses as ATMs to withdraw cash whenever they need it (Chen, Michaux, and Roussanov, 2020).

Tokenization inherently differs from the existing method of financializing houses because it is not debt. QuantmRE suggests the method to secure cash immediately without increasing debt occurs through the transfer of fractional ownership. The cost incurred to homeowners is the difference between currently received cash and proceeds that should be shared in the future. It is not the interest that places burdens on debtors' lives with monthly payments. It is a transaction for an asset rather than a debt to be repaid. Therefore, the terms of transactions are determined not by the debtors' income level or credit score, but by the value of houses. As such, the shift from debt to transfer means the home equity extraction is wholly disconnected from the homeowner. In the early 2000s, home

equity-based loans took advantage of the rise in home prices to maintain the extraction of home equity. It could not, however, ignore homeowners' income levels because it retained the form of debt that must be paid back with the income of homeowners. In the transfer of fractional ownership, on the other hand, the value of houses decides both costs of securing cash and the terms of contracts.

Who then needs to extract home equity in a form other than debt? That are house-poor households that the 2008 global financial crisis left behind. Since the crisis, excessive lending based on rising housing prices has created a class that has become poor due to homeownership. The term "house poor" refers to households with difficulties in living because these costs, especially mortgage interest, are too high relative to their income (Choi, 2016; Liberto, 2019). In the early 2000s, rising housing prices and eased mortgage issuance conditions drove many people to buy homes with debt.¹² Upon the expectation of realizing capital gains in the short-term, homeowners did not consider mortgage interest to be homeownership's cost. Rather than realizing capital gains, excessive loans caused losses for homeowners when housing prices fell and the global financial crisis occurred in the late-2000s. Furthermore, mortgage interest has become more burdensome as income has declined following the recession. The asset that most homeowners can use to secure cash for maintaining a livelihood is a house, but it was impossible to increase debt any further because of the broader financial crisis and excessive loans. Even if it was possible to increase debt, additional interest payments in the

absence of living expenses would lead to default. Such a challenge has driven home equity extraction to develop beyond mortgage loans to fractional ownership transactions.

2) Liquidation Method: Beyond the Social Regulations on Loans

Liquidity refers to the degree to which an asset can be rapidly converted into ready cash at a moment of need without property value loss (Crockett, 2008). The sooner an asset is sold in the market, the higher its liquidity. Market conditions such as asset supply and demand are essential to selling quickly, but the manner of liquidation also has a significant impact on liquidity. Specifically, the type of rights over assets is crucial (Kim, 2014, 2018). With a secured loan, the ownership of collateral belongs to a debtor, and the creditor can exercise the security right only when the debtor fails to pay off the debt. Here, the creditor gains not the ownership of but the contractual claim to the asset in exchange for providing cash. The creditor can legally exercise ownership, however, by transforming the contract to a sale transaction rather than a loan. The creditor effectively becomes a buyer who obtains the ownership of the asset and can sell it whenever they want without any specific conditions. The difference between creditors and owners is evident in the bankruptcy of a debt (Markell, 1991). Creditors cannot exercise security rights due to regulations from the debtor protection system.¹³⁾ In contrast, owners can sell their assets immediately to minimize potential losses. Hence, creditors can convert secured loans into sales con-

tracts to minimize losses, which increase liquidity. This has been referred to as the propertization of contractual claims and some argue that it constitutes to the nature of modern finance (Kim, 2018).

A repurchase agreement (repo) is a typical financial instrument that takes the form of a sales contract while its economic substance is that of a secured loan (Garbade, 2006). In a repo, a seller sells securities in cash to a buyer while promising to repurchase the same securities at a higher price in the future. The seller and the buyer enter into the current sale and future repurchase agreements simultaneously. Although the transfers of ownership take place between the seller and the buyer, there is no final change in the owner since the ownership of securities reverts to the original owner. The only thing remaining in the repo is the difference between the sale price and the repurchase price.¹⁴⁾ Given that the sales price and the repurchase price are determined simultaneously, the difference between them is pre-arranged fixed interest rather than a capital gain derived from fluctuations in asset price. Furthermore, the buyer's rights to securities are ownership but remain limited to a certain extent. The buyer may receive revenue from the purchased securities, but this revenue must be returned to the seller. Also, the buyer may sell the purchased securities only if an equivalent amount of securities replaces them. Such limited ownership demonstrates that the purchased securities are, in substance, collateral.

On the other hand, the growth of the repo market reveals another advantage of the propertization of contractual claims. It had a

significant advantage by not taking the form of a loan or acquiring exclusive ownership. As discussed with its impacts on liquidity, the pro-*per*terization of contractual claims takes advantage of ownership as an exclusive right to assets. More importantly, the use of repos has allowed financial institutions to circumvent regulations on loans and generate greater interest (Hagerty IV, 1984). The Federal Reserve Bank places various restrictions on secured loans against securities, including credit limits, interest rate ceilings, and reserve requirements. In 1969, however, the Federal Reserve Bank defined a repo as a securities sale rather than a secured loan, thereby exempting it from regulations on interest rates and reserve requirements (Acharya and Oncu, 2011). The interest rate cap was previously limited in the relationship between creditor and debtor. Since the definition, it has been possible to set a repo rate without restrictions in the relationship between a buyer and seller who transfer ownership of a security. Since creditors can receive greater interest from a repo than a secured loan, repo transactions have grown dramatically.

The tokenization of space also takes the form of sales contracts, thereby bypassing regulation on mortgage loans. After the 2008 global financial crisis, the Ability-to-Repay Rule and the Qualified Mortgage were introduced with mortgage reform (CFPB, 2014). Under the Ability-to-Repay Rule, lenders determine the maximum amount of a loan by considering a borrower's income, assets, debts, employment, and credit history. A Qualified Mortgage, following the loan amount, limits the points and

fees lenders can charge. The two regulations make it difficult for financial institutions to lend money to "house poor" households and receive unregulated interest. As "house poor" households have low income, the amount of a loan they can borrow is low. Financial institutions cannot set high fees even if it provides loans to low-credit, "house poor" households. In summary, the "house poor" mortgage has become a financial product that is no longer profitable (Defusco, Johnson, and Mondragon, 2020). In QuantmRE, however, an agreement between two parties decides the amount and value difference of fractional ownership. Assuming that agreement is a mortgage loan, parties can then set the loan amount and fee absent of regulation. In this manner, as mortgage loans take the form of sales contracts in tokenization of space, financial capital can faithfully perform its fundamental role of interest-bearing capital.

The tokenization of space nevertheless differs from repos in that financial capital is exposed to market price fluctuations. A repo guarantees fixed-interest just as secured loans do through daily mark-to-market (Osenton, 1986; Walters, 1983). Collateral value remains constant regardless of changes in market prices with a seller's collateral replenishment and a buyer's return of collateral.¹⁵⁾ Accordingly, the seller providing the collateral takes the risks and profits from price fluctuations, not the buyer, who obtains ownership. An investor with buyer status determines the value rather than the ownership of the collateral, and the buyer can secure the collateral that maintains certain value. Such a complicated form of contract allows an investor to acquire a constant amount of interest securely. On

the other hand, the profit model of QuantmRE relies on changes in housing prices. Even if 10% of the present value of home equity is traded with 15% of its future value, an unexpected plunge in housing prices during a contract prevents investors from receiving expected interest and forces them to bear significant losses. This suggests that interest may not be the source of profit for tokenization.

3) Source of Profits: Future Space rather than Current People

Two different aspects of mortgage loans have come to the fore since the 2008 subprime crisis. One is household debt repaid with household income (Cynamon and Fazzari, 2008; Lapavitsas, 2013) and the other is real estate finance based on the value of space (Aalbers, 2012; Christophers, 2011). Real estate can generate cash flows separate from the owner, so it is possible to raise funds based on property valuation regardless of an owner's credit score (Breuer and Nadler, 2012, 10). Unlike commercial real estate, however, residential housing has no cash flows of its own. Consequently, mortgage loans that provide residential housing as collateral is accustomed to being regarded as household debt (Brown *et al.*, 2013). Subprime mortgages grew around low-income households in the early and mid-2000s when housing prices in the U.S. rose sharply (Gramlich, 2007). The factors and methods that enabled such an unprecedented expansion of financial capital have drawn considerable attention (Mian and Sufi, 2009; Calem, Gillen, and Wachter, 2004; Palmer, 2015).

One of the primary questions was whether financial institutions exploited low-income households at high-interest rates or made profits from rising housing prices regardless of low-income households.

The subprime mortgage loan has a unique structure that is dependent upon rising housing prices rather than household income (Bhardwaj and Sengupta, 2012; Gorton, 2008). If housing prices rise, a subprime borrower can provide equity capital established by the price increase as collateral to refinance the subprime loan as a prime mortgage loan.¹⁶⁾ Financial institutions included resetting interest rates in subprime mortgage loans to enforce this refinancing. A relatively low "teaser" rate is provided for two to three years, after which it is converted to a high-interest rate to reflect the low-income borrower's default risk. A borrower applies for an early redemption to alleviate the burden of the interest rate.¹⁷⁾ At that time, financial institutions either approve or reject the borrower's request for early redemption, depending on whether the property price has increased. The early redemption commission of subprime mortgage loans was exceptionally high. A borrower could cash out on home equity without offering it as collateral but had to yield part of the cash out to financial institutions as an early redemption commission. The redemption commission is extra cash flow, or excessive profit, that directly benefits financial institutions from increasing housing prices, unlike its original interest income. As such, the core of subprime mortgage loans was not high-interest rates but a hike in housing prices.¹⁸⁾ Resetting interest rates reveals how banks could provide mortgage loans to

risky borrowers in line with rising housing prices, and how early repayment commission could generate profits directly from rising housing prices. In this regard, the subprime mortgage loan was a financial institutions' speculation method on housing prices.

The tokenization of space beyond a form of debt secures a source of profit at the market price of space independent of household income. Speculation on housing prices plays a crucial role in the subprime mortgage loans (Mian and Sufi, 2018). Loan conditions such as loan amount and interest rate nevertheless inevitably rely on a homeowner's income level and credit score because they fundamentally drive loans and debtors consequently cannot avoid paying interest. In contrast, QuantmRE uses the transfer of fractional ownership rather than a loan, so there is no cost that a homeowner needs to incur until the sale of the property. Additionally, the terms of transactions do not change depending on a homeowner's income level or credit score. It is only the housing price in the market at the moment of sale that determines the terms of the fractional ownership transaction. Moreover, QuantmRE is more transparent when profiting from housing prices when compared to subprime mortgage loans. Subprime mortgage banks, as creditors, claim part of the increase in housing prices in the form of early redemption commissions whereas QuantmRE receives a portion of the house sale price as an owner with equity in the home.

The tokenization of the subprime mortgage loan demonstrates that the source of profit for financial institutions is not a current borrower but

the future value of space. Low-income households, especially "house poor" households who are short of cash due to excessive loans, are not capable of repaying debts. So, what is the foundation for financial institutions to supply low-income households with credit? It is a house where value can be appraised regardless of the household's income level, even when a low-income borrower owns it. If the exchange value of space can be disentangled from the use-value and exists on a different level, financial capital can approach low-income households to capture the exchange value of space. Then, how can the exchange value of space be much higher than its use-value? The use-value of space depends on how it is currently used. On the contrary, the exchange value of space in the market is determined by considering the expected return for future use as well as the actual return for current use. For instance, houses inhabited by low-income households at present can be used to generate higher returns in the future. Urban redevelopment clearly shows how rapidly the same space's market price can rise with the conversion of use (Smith, 1987). As space exists permanently and future owners will use it, the current price of space reflects expected revenue generated by future owners. Even in the case of a house occupied by a low-income household at present, the house's exchange value can be determined irrelevant to the income level of the low-income household. Of course, it is uncertain when the conversion in use will occur and which use can generate how much revenue. Financial institutions, however, would bet on the rising exchange value of low-income residential houses rather than rising income levels of income

households.

Both subprime mortgage loans and tokenization of space rely on the rise in housing prices but differ in the time scale that they are expected to rise. Housing prices were rapidly rising when subprime mortgages expanded, so there was a strong belief that housing prices would continue to rise. Nevertheless, financial institutions effectively reduced the 30-year subprime mortgage commitment period to two to three years through resetting interest rates due to the anxiety that housing prices may someday fall.¹⁹⁾ The tokenization of space, on the contrary, began since the subprime mortgage crisis during a time when the market's belief in continuously rising housing prices has significantly weakened. If there was anxiety that home prices could fall in the early 2000s, then there is a more recent expectation that housing prices will someday rise. Hence, QuantmRE guar-

antees homeowner for up to 30 years residence or until the sale of the house because realizing expectations of rising housing prices in the current bear market takes a considerable amount of time.

5. Conclusion

This paper aimed to understand what STOs using blockchain technology signify for the financialization of space. It contrasted the tokenization of space with the conventional system of real estate finance and then explored notable examples of tokenization. Moreover, it analyzed cases from the perspective of space financialization. Space tokenization is clearly distinguished from the conventional real estate

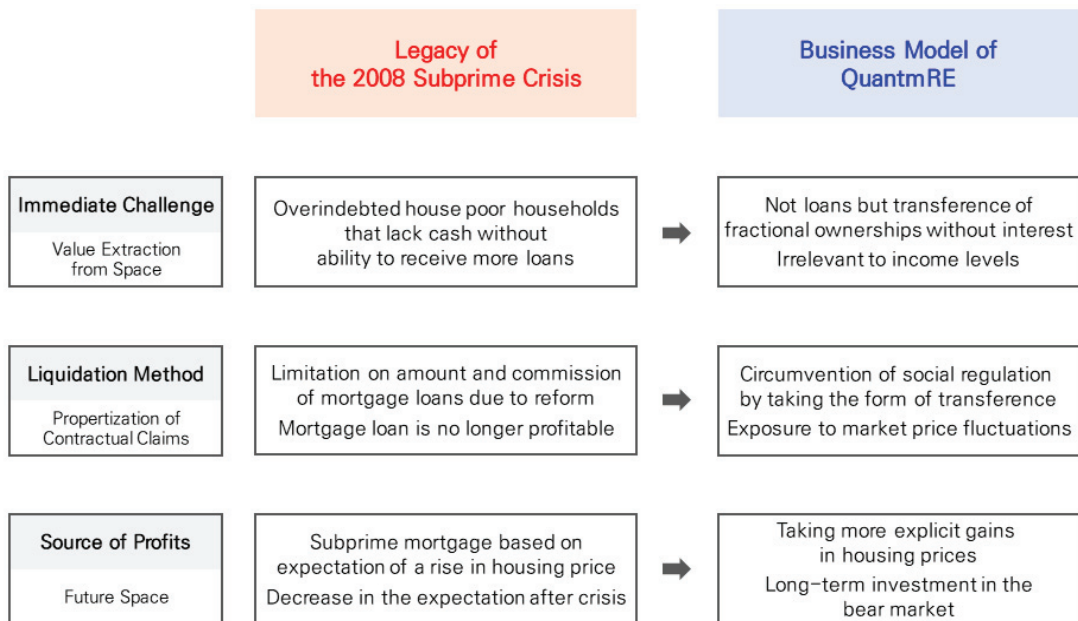


Figure 4. Anatomy of Tokenization as a New Means of Financialization

financial system in terms of cost reduction, divisibility, and extensibility. Specifically, the extensibility of tokenization, such as smart contracts, can provide qualitatively different means of financialization. Meridio and QuantmRE suggested a new method of space financialization based on fractional ownership transactions. QuantmRE, especially, has evolved the extraction of home equity into a different form (not debt) by combining smart contracts with security tokens. The distinctiveness of the QuantmRE case in terms of space financialization is that it takes the form of a sale transaction rather than a loan to finance “house poor” households who can no longer afford existing excessive loans. QuantmRE also can circumvent regulations on loans by taking the form of a sale transaction. Furthermore, space tokenization showed that by relinquishing the form of debt, a space rather than a person is the source of profit.

Financial institutions may use STOs and cutting-edge financial technology to overcome the most severe situation caused by the global financial crisis in 2008. Low-income households can no longer receive loans, social regulation on debt has been strengthened, and housing prices have not increased significantly. Under these circumstances, subprime mortgages, the former high-tech financial product that had provided loans to low-income households based on rising housing prices, did not work. New financialization of space had to secure a source of profit from space and not the borrowers under stagnating housing prices. Fractional ownership transactions can allow financial institutions to lend cash to “house poor” households at the value of space regardless of

household income. Additionally, QuantmRE chooses a long-term investment by waiting up to 30 years with current low market prices for space. The long-term investment horizon is necessary to realize expectations of rising housing prices in a current bear market. Smart contracts support QuantmRE to remain a silent partner for a long time by eliminating default risk.

This paper can contribute to the development of financial and economic geography in that it interprets space tokenization as a strategy of financial institutions to overcome constrained conditions after the global financial crisis. Since the global financial crisis, research on space financialization has significantly increased with a focus on the sub-prime mortgage loans and securitization of rental housing (Aalbers, 2008, 2012; Fields, 2017; Wijburg *et al.*, 2018). Wijburg *et al.* (2018), in particular, explained securitization of rental housing as reproduction of space financialization. In this context, this research explores the potential of blockchain technology as a new instrument of space financialization. Furthermore, this paper reveals that financial institutions take advantage of blockchain technology to evade regulations on loans and incorporate house poor households as customers. As such, tokenization can be a strategy to reproduce space financialization in a crisis. Moreover, subsumption of house poor households can stimulate investment in the depressed housing market, thereby expanding space financialization geographically.

The limitation of this paper is that only a few cases of space tokenization are examined, and cases are still under experiment. The two

examples do not represent the entire process of converting spaces into financial products through blockchain technology. In addition, this paper could not analyze the practical operation of tokenization in the financial market and subsequent geographical expansion of space financialization. Nevertheless, this paper is significant in that it examines the location and conceptual potential of space tokenization in the space financialization process by analyzing how those cases are different from existing financial instruments. Although QuantmRE held its STO in September 2019, it is still in the process of raising funds (QuantmRE). This may signify that the financial market has not accepted QuantmRE's long-term investment thesis. The original business model, however, shows financial capital's intention and direction to change the landscape of the financial market with new blockchain technology. If the experiment succeeds, financial capital will have a new means of financializing space based on long-term expectations of a rise in housing prices.

Notes

- 1) Proskurovska and Dörry (2018) focused on disruptive innovations derived from fractional ownership but only presented it as an extension of direct real estate investment that differs from conventional indirect real estate investment.
- 2) For manipulating the 74th block among 90 blocks, the blocks from the 74th to 90th on a majority of the network's computers must be simultaneously modified within unit time.
- 3) For example, parties to a contract have agreed to sell a house when its price increases 1.5 times. Later, ownership is transferred to the buyer when the house

price has risen by that multiple. At the same time, electronic currency is paid from the buyer to the seller.

- 4) An algorithmic contract is a form of contract which is executed by a computer rather than a human when pre-specified terms of a contract are fulfilled.
- 5) Swiss Financial Market Supervisory Authority (FINMA) categorizes cryptocurrency as payment, utility, and asset tokens (FINMA, 2018). Payment tokens are used as a means of payment or remittance. Utility tokens provide digital access to an application or service. Lastly, asset tokens represent the rights to assets like equities and bonds.
- 6) Security tokens are similar to asset-backed tokens in that they have underlying assets but are differentiated by the nature of underlying assets. While asset-backed tokens are usually based on financial assets such as equity and bonds, security tokens are linked to real assets like real estate and intellectual property rights.
- 7) Home equity is a portion of ownership and property value.
- 8) Meridio., (2018, January 8), "[Web page] *Stop Selling your Upside: How Blockchain Can Unlock Value in Real Estate Through Fractional Ownership*" ±, Retrieved from <https://medium.com/meridio/stop-selling-your-upside-how-blockchain-can-unlock-value-in-real-estate-through-fractional-b492400b47a> (August 29, 2020)
- 9) QuantmRE suggests that a homeowner who has received cash can reside in the house for up to 30 years. As the homeowner is a fractional owner and resident, there are some restrictions on changes in ownership during their residence.
- 10) For example, a Real Estate Investment Trust (REIT), which issues equities, entirely owns a property's fractional ownership. A seller sells the property to the REIT. The REIT then issues equities based upon the value of property it entirely owns.
- 11) The banks could ease the loan conditions because they judged that they could recover the principle by rising housing prices, even if a default occurred.
- 12) Owning a house entails high costs, such as mortgage interests, property taxes, and maintenance costs.

Therefore, the term “house poor” ± embodies the process of creating poverty due to homeownership as well as a mismatch between assets and income.

- 13) The United States prevents debtors from bankruptcy through the avoidance power and the automatic stay, which limits creditors from accelerating debt collection efforts (Squire, 2013). The automatic stay simultaneously halts actions by all creditors, and the avoidance power invalidates actions taken regarding a debtor’s property before bankruptcy. Such a social system suspends certain rights of creditors for the rehabilitation of debtors.
- 14) The difference is called a repo rate and is regarded as an interest rate in the financial market. Accordingly, the repurchase price is the selling price plus the repo rate. In short, the selling price of the asset is similar to the amount of the loan, and the difference between the selling price and the repurchase price is similar to interest.
- 15) When the price of the collateral falls in the market, the seller must provide additional collateral. Conversely, when the mortgage price rises, the buyer returns part of the mortgage.
- 16) Financial institution could limit the supply of subprime mortgages to more risky borrowers in the short-term, and then provide prime mortgages to less risky borrowers due to rising housing prices.
- 17) Early redemption refers to a borrower’s full payment of principal and interest before the end of the contractual period through borrowing or selling.
- 18) Most subprime borrowers make early redemption before resetting interest rates. Thus, actual interest rates applied were relatively low teaser rates, rather than high-interest rates set in line with default risk.
- 19) Banks have supplied subprime mortgages in anticipation of rising housing prices, but actual housing prices may fall contrary to expectations. The possibility of a fall in housing prices may increase over time. The 30-year mortgage commitment period was considered too far banks to wait. Thus, banks re-established interest rates to decide whether to terminate a mortgage depending on the change in housing prices (Bhardwaj and Sengupta, 2012).

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Correspondence: Dasom Hong, ABOUT CITY, 984-6, Hancheon-ro, Gangbuk-gu, Seoul, 01059, Korea, E-mail: aboutcity@snu.ac.kr

교신: 홍다솜, 01059, ABOUT CITY, 서울특별시 강북구 한천로
984-6, 이메일: aboutcity@snu.ac.kr

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