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The digital tokenization of property rights. A comparative perspective

*Rosa M. Garcia-Teruel**, *Héctor Simón-Moreno*

UNESCO Housing Chair. Department of Private, Procedural and Financial Law, Universitat Rovira i Virgili, Spain

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ABSTRACT

Blockchain technology allows virtual disintermediation and automatization of property transactions, which might help to design future platforms, intended to facilitate cross-border transactions within the EU and worldwide. To this end, users of these blockchain-based platforms may create the so-called "digital tokens" or "colored coins" that aim to represent rights over different types of "real world" assets. By transferring a digital token, the parties aim to transfer the ownership or other property rights over the asset represented by the token without the intervention of traditional intermediaries, such as real estate conveyancers, land registrars or notaries specializing in real estate. However, this new technological tool raises several questions in the field of private law, such as the legal nature of the token, how the effective transfer of the property rights operates or how ownership rules may be applied in this decentralized environment (e.g. rights and duties of the token holder). Some of the issues at stake have only been tentatively addressed by both lawmakers and academia. In light of this research gap, this paper addresses these controversial issues from both a private law and a comparative perspective, and proposes a model to tokenize the right of usufruct over chattels and real estate, analyzing its legal viability and limitations across six jurisdictions. The paper concludes that private law rules may be adapted to the tokenization of property rights, which may contribute to the establishment of a digital market for the trading of asset-backed tokens worldwide.

1. The tokenization of property rights so far

1.1. *Blockchain technology as a tool to transfer property rights*

The worldwide social and economic consequences of the 2007 financial crisis, in particular, the housing crisis, caused the loss of trust in traditional institutions (e.g. the banking system, the governments or the market gatekeepers) and boosted a collaborative economy (Nasarre Aznar, 2020), aimed at sharing underused resources and getting rid of traditional intermediaries. An expression of this new trend and of the immediacy needs of new generations was the emerging economy formed by on-line platforms, which allowed for peer-to-peer (P2P) contact between private parties. This opened the door

Abbreviations: ABGB, *Allgemeines bürgerliches Gesetzbuch*, Austrian Civil Code; AI, Artificial Intelligence; BGB, *Bürgerliches Gesetzbuch*, German Civil Code; BW, *Burgerlijk Wetboek* (Civil Code of the Netherlands); CC, Spanish Civil Code; DAO, Descentralized Autonomous Organization; GDP, Gross Domestic Product; P2P, Peer-to-peer, SPV, Special Purpose Vehicle.

* Corresponding author.
E-mail addresses: rosamaria.garciat@urv.cat (R.M. Garcia-Teruel), hector.simon@urv.cat (H. Simón-Moreno).

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to the fostering of technologies that allow for a truly disintermediated P2P process, through which on-line transactions can be undertaken without losing the trust that physical or digital middlemen provide (Garcia Teruel, 2019), such as distributed ledger technologies (e.g. blockchain).

It was not by chance, then, that blockchain technology emerged in 2008 (Nakamoto, 2008) when the virtual currency Bitcoin was created, as this provided the security and confidence that other technologies could not offer.[1] Blockchain, which is designed as a digital, immutable, shared and synchronized database, works in a distributed and disintermediated way among various users. This means that blockchain can be consulted and modified from the device of each user (node), that it is cryptographically protected and that the approval of each transaction on this database does not depend on a central authority, but on the validation of the rest of the users.[2] These characteristics have led blockchain to be considered as a technology that provides trust (De Filippi and Wright, 2018), especially in an environment in which the parties interested in a transaction do not know each other, and in which they want to complete the transaction without a central authority controlling them.[3]

To be specific, transactions in blockchain are based on smart contracts, which are sequences of computer codes that automatically execute pre-established instructions thanks to the use of functions (executable code). Smart contracts allow for a particular cryptocurrency or asset to be transferred almost immediately between two virtual wallets. In order to do so, parties create the so-called "tokens" or "colored coins", a digital asset intended to represent a right. This phenomenon is called "digital tokenization" and allows the creation of virtual tokens of different types. For example, using the ERC-20 protocol, parties might create fungible tokens; with the ERC-721 protocol, they may design non-fungible tokens, that include some specific data and characteristics in their metadata that differentiate them from other tokens; or parties may even create tokens that cannot be transferred, because they are intended to represent titles or badges (e.g. a token representing an academic title) that can only belong to a certain person: these are the non-transferable tokens that follow the ERC-1238 protocol.

In this sense, not all tokens pursue the same legal-economic purpose. Broadly speaking,[4] the following types of tokens may be identified: currency tokens, designed to work as a means of exchange and payment; security tokens, intended to represent shares in companies or in certain projects; utility tokens, which entitle the holder to benefit from a utility offered by the issuer; and asset-backed tokens, intended to represent rights – whether of a proprietary or an obligatory nature– over "real-world" assets. Most of them are created through an Initial Coin Offering (hereinafter, ICO) (Blemus and Guégan, 2019), although tokens can also be issued without an ICO, such as bitcoins (currency tokens), which are created by volunteer "miners", or when a natural person decides to tokenize an asset and to transfer it to another person (asset-backed tokens).

As a result, ownership can be the object of smart contracts and transferred securely through blockchain. The tokenization of assets may lead to a number of benefits, such as potentially cheaper and frictionless transactions, increased transparency regarding transactional data and information about the issuer, providing investors with direct access to primary and secondary markets or increasing asset liquidity.[5] Specifically, in the real estate field, this technology could be used to design future platforms that facilitate cross-border transactions involving real estate assets within the EU (Garcia Teruel, 2020) or worldwide (the size of the professionally managed global real estate investment market accounted for $9.6 trillion in 2019[6]), and, at the same time, to face the challenges posed by the digitalization of the collaborative economy and the new economic reality that emerges after the COVID19 crisis.[7]

1.2. *State of the art and methodology*

It is worth noting that some legal measures have been passed at national level to provide legal certainty to the use of smart contracts and specific tokens (Scheinert, 2016).[8]

[1] It is worth taking into account that up until that time there was no technology capable of preventing the replication of information on the network, so the value of a virtual currency could not be trusted when it could be copied like any other digital file.

[2] These are the main features of public and permissionless blockchain networks, such as Bitcoin. However, there are other types of distributed ledger technologies that are private, permissioned or that have another type of consensus mechanism.

[3] In fact, this technology emerged from the cyberpunk movement, Nasarre Aznar, S. (2020) Op. cit. 607.

[4] See Coin Crunch, *Guide to Crypto Token Types*, 16.7.2018, available at https://hackernoon.com/guide-to-crypto-token-types-6ce04edaba72 (accessed 15 May 2020). Furthermore, according to the European Securities and Markets Authority (2017), *ESMA alerts investors to the high risks of initial coin offerings (ICOs)*, ESMA50-157-829, available at https://www.esma.europa.eu/sites/default/files/library/esma50-157-829_ico_statement_investors.pdf (accessed 15 May 2020), features of *tokens* vary from one ICO to another.

[5] OECD (2020), *The Tokenisation of Assets and Potential Implications for Financial Markets*, OECD Blockchain Policy Series, 16 ff. Available at: www.oecd.org/finance/The-Tokenisation-of-Assets-and-Potential-Implications-for-Financial-Markets.htm (accessed 5 November 2020).

[6] Source: MSCI (2020), *Market Size Report on Global Real Estate* (available at https://www.msci.com/real-estate/market-size-report, accessed 5 November 2020).

[7] As pointed out by Deloitte (2020) *Property Index Overview of European Residential Markets*, 9th edition, 6, available at https://www2.deloitte.com/content/dam/Deloitte/at/Documents/presse/deloitte-property-index-2020.pdf (accessed 10 December 2020): "Immediately after the implementation of protecting measures in the participating countries, residential markets in most of them effectively froze. The majority of pending transactions, which were in early phases of the process, were put on hold. Almost no new deals were initiated, as personal property inspections were almost impossible to perform. Some countries reported a year-on-year decline in transactions by up to 80%". As for the future of the real estate market in Europe, it points out precisely that "implementation of technologies such as electronic validation of contract certificates via block chain may become part of the sales process together with virtual reality tours in development projects currently in construction".

[8] As a matter of fact, there was no legal system in Europe with a regulation on virtual currencies in 2016, see Scheinert, C. (2016) *Virtual currencies Challenges following their introduction*. European Parliamentary Research Service, 7.

This has been the case in Monaco,[9] Germany,[10] France,[11] Russia,[12] Luxembourg,[13] Italy,[14] Malta[15] and the USA.[16] In Asia, some countries have banned cryptocurrencies as a means of payment, such as China or Vietnam, while in others they are not recognized as such (e.g. in the Philippines or Malaysia).[17] Other countries, such as Portugal, have not taken action on this issue and have merely opted to warn investors about the complexities and risks related to tokens (Azevedo Basílio, 2019). In addition, we must take account of the European reality, where some public authorities have made inroads into the implementation of blockchain, providing some facilities to help incorporate blockchain transactions into the registration process, such as the Swedish Land Registry. However, it is still far from a true blockchain property land registry.[18]

As a result, few legal systems have addressed the property law issues related to asset-backed tokens. Examples are the *Gesetz über Token und VT-Dienstleister* 54/2019 of Liechtenstein,[19] which addresses its legal nature and regulates the "*Physischen Validator*", an entity that verifies the condition of the "tokenized" asset, ensuring that the token maintains its value; and Belarus Law No. 8 for the development of the digital economy of 21 December 2017,[20] that allows expressly asset-backed tokens to represent objects of civil law.

From an EU perspective, there is a draft regulation intended to add legal certainty to crypto-assets, while at the same time supporting innovation and protecting consumers: the Proposal for a Regulation of the European Parliament and of the Council on Markets in Crypto-assets (MiCA) 24 September 2020.[21] However, this proposal does not cover the legal nature, effects and admissibility of using asset-backed tokens to transfer property rights and, in fact, tokens that are issued in blocks of less than 150 tokens are excluded from the Regulation, so it does not cover small issues, which will normally be the case in the tokenization of real-world assets.

Furthermore, several ICO projects offer investors the possibility of becoming the owners of an asset with little investment (this is the case of Atlant,[22] Smartlands[23] and Crowdlitoken[24] among others). However, when analyzing the specific conditions and the smart contract codes used, the ownership of the tokenized asset is usually held by one company, while it is managed by another one that takes the relevant decisions on its use and disposition. Token holders only have the right to receive returns, so they do not acquire ownership rights over the property/chattel itself, but rather a share in the company (Garcia Teruel, 2020).[25] The same may be said concerning

[9] *Loi* 1.491, of 23 June 2020, relating to token offers, which established a legal framework for the issue of utility tokens. Available at https://journaldemonaco.gouv.mc/Journaux/2020/Journal-8492/Loi-n-1.491-du-23-juin-2020-relative-aux-offres-de-jetons (accessed 15 November 2020).

[10] Law n. 50, of 12 December 2019, on the Implementation of the Amendment Directive to the Fourth EU Money Laundering Directive, which regulated cryptoassets as a new category of financial instruments. Available at https://www.bgbl.de/xaver/bgbl/start.xav?startbk=Bundesanzeiger_BGBl&start=//*[@attr_id=%27bgbl119s2602.pdf%27 (accessed 15 November 2020).

[11] *Loi* 486, of 22 May 2019, on business growth and transformation, which allowed ICO provided that they are registered in the *Autorité des marchés financiers* and that they do not offer security tokens. Available at https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000038496102/ (accessed 15 November 2020).

[12] Law of 18 March 2019, No. 34-FZ on Amendments to Parts One, Two, and Article 1124 of Part Three of the Civil Code of the Russian Federation, which regulates digital rights and smart contracts. Source: https://www.debevoise.com/-/media/files/insights/publications/2019/03/20190314_russian_state_duma_adopts_bill_on_digital_rights_in_third_reading_eng.pdf (accessed 15 May 2020).

[13] Law 7363, of 5 March 2019, on blockchain, that provides for the possibility of creating securities by using distributed register technologies (blockchain). Available at https://chd.lu/wps/PA_RoleDesAffaires/FTSByteServingServletImpl?path=414EAB76C8DA9D1744DE373A886517C4C36E57E84ABEB2315BE6E7D80DA619AB899BD2F11E092DA4CFBCAE93663D5D62$4CE2013F27BFA882BBB133456BF004DB (accessed 15 May 2020).

[14] *Legge* of 11 February 2019, which regulates the distributed ledger technologies and smart contracts. Available at: https://www.gazzettaufficiale.it/eli/gu/2019/02/12/36/sg/pdf (accessed 15 May 2020).

[15] Virtual Financial Assets Act, of 1 November 2018, which defines blockchain and smart contracts and, among other provisions, regulates the need for an ICO to have a technical information article (whitepaper) that includes certain required content, for the purpose of protecting investors. Available at http://www.justiceservices.gov.mt (accessed 15 May 2020).

[16] Token Taxonomy Act of 2019, that excludes digital tokens from the definition of a security and clarifies their taxation. Available at https://www.congress.gov/bill/116th-congress/house-bill/2144?s=1&r=4 (accessed 15 August 2020).

[17] OECD (2019) *Cryptoassets in Asia. Consumer attitudes, behaviours and experiencies*, 12 ff. Available at https://www.oecd.org/countries/vietnam/2019-cryptoassets-in-asia.pdf (accessed 15 November 2020).

[18] According to the Blockchain Property Registry Adoption levels described by Graglia, M. and Mellon, C. (2018) *Blockchain and property in 2018: at the end of the beginning*, 17. Available at: https://d1y8sb8igg2f8e.cloudfront.net/documents/Graglia_Mellon_blockchain.pdf (accessed 15 May 2020), Sweden is just at the 2nd level (of the levels Blockchain uses to record the progress of a transaction), below Dubai (at the 3rd level, Central database replaced with a permissioned blockchain) and the so-called 'Pangea' (6th level, Rights for a given parcel are fragmented and managed via blockchain). There are no examples of countries in the 7th (Rights are transacted without intermediaries) and 8th levels (Different blockchain registries merge). Another example is the UK, where the HM Land Registry is "looking to the future through its Digital Street research project and has successfully used a blockchain prototype", but it has not been implemented so far, see *HM Land Registry is making it easier to remortgage* (8 April 2019), available at https://www.gov.uk/government/news/hm-land-registry-is-making-it-easier-to-remortgage (accessed 25 October 2020).

[19] Available at https://impuls-liechtenstein.li/blockchain-gesetz/ (accessed 15 May 2020). This law came into force in January 2020.

[20] An English version is available here: http://law.by/document/?guid=3871&p0=Pd1700008e (accessed 15 May 2020).

[21] COM(2020) 593 final. Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020PC0593 (accessed 25 October 2020).

[22] http://atlant.io.

[23] https://smartlands.io.

[24] See the prospectus of Crowdlitoken at https://crowdlitoken.com/wp-content/uploads/2020/04/CRT-Prospectus_EN_digital_mit_Nachtrag_Mrz2020.pdf (accessed 9 November 2020).

[25] See an analysis of these case studies in Garcia Teruel (2020a, 2020b) 'Introducción al fenómeno de la tokenización: estudio de

some real estate transactions that have already taken place in Europe, such as the tokenization of Villa AnnA (Germany),[26] or in the USA (St. Regis Aspen Resort in Colorado).[27]

For their part, scholars have started discussing, apart from the technological aspects, the application of blockchain to market needs (Leloup, 2017) as well as smart contracts and their legal nature (Raskin, 2017); there is also some work dealing with the tokenization of property rights from a domestic law perspective (Yapicioglu and Leshinsky, 2020); and even some projects that aim to replace, complement or modify existing Land Registries with this technology (Vos et al., 2017) (Verheye, 2017). In addition, scholars have pointed out some challenges related to the risks of "tokenization" and "blockchainization" of private law (Savelyev, 2018): for example, "tokenization" may absorb existing regulation on the transfer of property rights and replace it with new coded rules applicable to tokens; there are concerns about the legal nature of such tokens and the birth of a new law of information property that can also provide governance for distributed ledgers, thus leading to a hybrid solution of "bitproperty" (Ishmaev, 2017); or the way to extrapolate contractual and property rights to smart contracts, which may lead, according to some authors, to the beginning of the end of classic contract law (Savelyev, 2017). Furthermore, some scholars have tentatively addressed the relevant challenges when tokenizing property (van Erp, 2019) and others advocate the right of citizens to choose which technology to apply for managing their property rights by developing a new type of property registries (Konashevych, 2020).

However, less attention has been paid to asset-backed tokens and the property law issues that arise from their transferability and the rights of these token holders in a comparative context. This might be relevant since at some point, the holder of the asset-backed token may try to exercise the ownership rights the token is supposed to entail (e.g. s/he wants to effectively possess the good it represents). This is the moment where property law rules come into play to shed light on whether the token holder has really acquired a property right, whether the systems for the transfer of ownership are compatible with this decentralized environment or whether the blockchain protocols may be an effective alternative to replace the traditional requirements of a land transfer (e.g. deed and land registration).

In light of the lack of academic research (which focuses mainly on the contract law aspects of digital tokens) (Tasca and Piselli, 2019), successful experiences on the tokenization of property rights and national and EU rules dealing specifically with the legal nature of asset-backed tokens (as legislation on blockchain and tokenization usually covers tax law issues or the admissibility of ICO), this paper aims to contextualize property law rules in the blockchain context from a comparative private law perspective (Spanish, German, French, Italian and Dutch Law, with some references to other legal systems). In particular, this paper addresses the legal nature of asset-backed tokens; detects the legal systems where it is easier to transfer ownership and other property rights; and highlights the problems encountered when acquiring property through asset-backed tokens for investment purposes (e.g. rights and duties of the token holders). Finally, this paper proposes a case study on the tokenization of a usufruct and studies its legal viability.

2. The legal nature of asset-backed tokens

Scholars[28] and some reports[29] pointed out that digital tokens may be considered "digital assets". The same approach is taken by the *Gesetz über Token und VT-Dienstleister* of Liechtenstein, which regulates tokens as assets (*Vermögen*, art. 4). In fact, it has been stated that "all -*European*- legal systems of the member states regard not only corporeal thing as the objects of real rights but also incorporeal assets, such as patrimonial rights" (von Bar and Drobnig, 2004).

However, some legal systems take a narrow approach concerning the object of property which is limited to "corporeal things", as is the case under both German and Swiss law (e.g. §§90 *Bürgerliches Gesetzbuch*[30] -BGB- or §641 Swiss Civil Code[31]). This means that tokens could not be regarded as the object of property in these legal systems,[32] e.g. in Germany they have been defined as "*eine faktische Vermögensposition*" (Lehman and Krysa, 2019).[33] Notwithstanding such a narrow

casos', in Garcia Teruel, R.M. (Coord.) *La tokenización de bienes en blockchain: cuestiones civiles y tributarias*. Cizur Menor: Thomson Reuters Aranzadi.

[26] See Digital Asset live, *Equisafe: Full Sale of Title Deed Through Blockchain*, 12 July 2019 (https://digitalasset.live/2019/07/12/equisafe-full-sale-of-title-deed-through-blockchain/ (accessed 9 November 2020).

[27] Source: https://tokenist.com/aspencoin-transitions-to-securitize-after-raising-18-million-in-security-token-offering/ (accessed 9 November 2020).

[28] For the purposes of summarizing what makes a token applicable for property relationships, Konashevych defines a token as "an object of ownership and a carrier for information on property rights", see Konashevych (2020), Op. cit. 17.

[29] The Cambridge Centre for Alternative Finance points out that "even this third group has found ways to accommodate immaterial objects (such as company shares held in electronic form) into their property laws, and there is no reason to think that cryptoassets cannot be accommodated", see Blandin et al. (2019) *Global cryptoasset regulatory landscape study*, Cambridge Centre for Alternative Finance, University of Cambridge, 22. Available at: https://www.jbs.cam.ac.uk/wp-content/uploads/2020/08/2019-04-ccaf-global-cryptoasset-regulatory-landscape-study.pdf/ (accessed 9 November 2020).

[30] *Bürgerliches Gesetzbuch*, German Civil Code. Published in the *Reich Gazette* on 24 August 1896. Available at: https://www.gesetze-im-internet.de/englisch_bgb/.

[31] Available at: https://www.admin.ch/opc/en/classified-compilation/19070042/index.html.

[32] In Swiss law, it has been argued that tokens are not corporeal objects, meaning that they cannot be owned, see Der Bundesrat (2018), *Bericht des Bundesrates – Rechtliche Grundlagen für Distributed Ledger-Technologie und Blockchain in der Schweiz*, 49. Available at: https://www.newsd.admin.ch/newsd/message/attachments/55150.pdf (accessed 9 November 2020).

[33] 'Blockchain, Smart Contracts und Token aus der Sicht des (Internationale) Privatrechts', *Bonner RechtsJournal*, Iss. 2, 90-96. For their part, scholars point out the need to recognize the property-like rights attached to tokens (*eigentumsähnliches Recht*) as far as possible, see Koch, P. (2018) 'Die "Tokenisierung" von Recht-

approach, the application of §453 BGB (which states that the provisions on the purchase of things apply with the necessary modifications to the purchase of rights and other objects) has been proposed to allow for the purchase of cryptocurrencies under German law,[34] and likewise, it is suggested that §713 Swiss Civil Code should be applied to the ownership of tokens (it regards as chattels the forces of nature that may be the subject of legal rights and which do not form part of any immovable property) (Cingöz, 2019).

By contrast, other EU legal systems have either incorporated a broader definition of the concept of a "thing" to include "patrimonial or valuable rights" (e.g. arts. 334.10 CC; §§292, 298 and 299 *Allgemeines bürgerliches Gesetzbuch*, ABGB[35]) or a broader definition of the concept of an "asset" (art. 3.1 *Burgerlijk Wetboek* -BW-),[36] which makes the regulation of tokens as an object of ownership easier. For example, in Spain the judgment of the Supreme Court 20/06/2019[37] denied the recognition of bitcoin as legal tender (money), but considered it an "incorporeal asset"; in Italy, tokens have been regarded as "digital assets" under the provisions of art. 810 Italian Civil Code[38] ("*Sono beni le cose che possono formare oggetto di diritti*");[39] and art. 65 French *Loi* n. 486 regulated tokens as "incorporeal assets" (*bien incorporel*).[40]

In the Anglo-American law field, a distinction is made between choses in possession (physical objects) and choses in action (incorporeal in nature, such as rights) (Smith, 2009). Currency tokens have tentatively been admitted as a chose in action under English law (Noel, 2016); in fact, English courts have recognized cryptoassets as "property" (i.e. even though "the fact that a cryptoasset might not be a thing in action under the narrower definition of that term does not in itself mean that it cannot be treated as property") so that they could be the subject of a proprietary injunction.[41] However, in other Anglo-American law countries, such as New Zealand, cryptocurrencies were deemed to be "digital assets", a form of property capable of being held on trust.[42]

Even though asset-backed tokens could be regulated as "digital assets" as is the case in Liechtenstein, the following must be taken into consideration:

a) First, that asset-backed tokens represent claims, whether of a proprietary or an obligatory nature, against third parties. This legal effect may be achieved by the parties on the basis of the principle of freedom of contract,[43] regulated in several EU countries (Luchetti and Petrucci, 2006) (e.g. Spain -art. 1255 CC- and France-art. 1172 French Civil Code[44]), but it should be established by law -for the sake of legal certainty- following the examples of the *Gesetz über Token und VT-Dienstleister* of Liechtenstein (art. 2.1.c) or the Belarusian legislation, which admits that the owner of a digital token has a right to a certain object of civil law.
b) Second, that the fact a given property right is being represented by an asset-backed token does not change its legal nature (Savelyev, 2018) (Nasarre Aznar, 2020). It follows that the parties must comply with the rules and requirements of the legal order in which the asset is located (the universal *lex rei sitae*[45]) to be able to transfer the ownership or create limited property rights (e.g. a usufruct), which may require these legal acts to be concluded in writing or with the observation of other formalities.

The rules on acquisition and transfer of property rights are analyzed in the following section, before entering into more detail on the application of ownership rules to asset-backed tokens.

3. The rules on acquisition and transfer of property rights

The systems for constitution and transfer of property rights may vary from one country to another. Broadly speaking, in many of the world's legal systems, the transfer of property fits into the three categories analyzed below (Vliet, 2017): the causal consensual system, the causal tradition system and the abstract tradition system.

3.1. *Jurisdictions following a "consensual system"*

In a number of countries, the mere consent of the parties is enough to transfer property (e.g. art. 1196 French Civil Code, art. 1376 Italian Civil Code and s. 18(1) English *Sale of Goods Act* of 1979,[46] which does not apply to real estate). As a result, the

spositionen als digitale Verbriefung', *Zeitschrift für Bankrecht und Bankwirtschaft*, Vol. 30, Iss. 6, 367.

[34] See Der Bretieb, *Kryptowährungen: Eine neue Herausforderung im Zivilrecht*, 23/7/2019. Available at https://www.der-betrieb.de/interview/kryptowaehrungen-eine-neue-herausforderung-im-zivilrecht/ (accessed 9 November 2020).

[35] *Allgemeines bürgerliches Gesetzbuch*, Austrian Civil Code. Available at: https://www.jusline.at/gesetz/abgb.

[36] *Burgerlijk Wetboek* (Civil Code of the Netherlands). Available at: http://www.dutchcivillaw.com/civilcodebook033.htm. Art. 3:1 BW establishes that "'Property' (or 'assets') comprises of all things and all other property rights"

[37] ECLI:ES:TS:2019:2109. It may be accessed at: http://www.poderjudicial.es/search/indexAN.jsp.

[38] *Codice civile*, RD 16 March 1942, n. 262.

[39] Rampone, F., *Token, between crypto-assets and other digital elements*, 10/04/2020 (https://www.blockchain4innovation.it/esperti/token-tra-cripto-asset-e-altri-elementi-digitali/, accessed 9 November 2020).

[40] Some challenges from a civil law perspective are pointed out by De Vauplane (2019) Le droit civil à l'épreuve de la blockchain', *Revue des juristes de Sciences Po*, Vol. 16, 6 ff.

[41] English High Court in AA v. Persons Unknown and Others, Re Bitcoin [2019] EWHC 3556 (Comm).

[42] Ruscoe v Cryptopia Ltd (in Liquidation) [2020] NZHC 728. New Zealand High Court.

[43] In the same sense, it has been stated that "Freedom of contract […] should also allow parties to agree to automate transfer of assets based on a previously established scheme", see Szczerbowski (2020) *Place of Smart Contracts in Civil Law. A Few Comments on Form and Interpretation*, 335. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3095933 (accessed 15 May 2020).

[44] *Le Code civil des Français*, 21th March 1804.

[45] This rule is adopted by the private international law of EU countries, see Smits (2002) *The Making of European Private Law: Toward a Ius Commune Europaeum as a Mixed Legal System*. Antwerp: Intersentia, 245.

[46] *Chapter* 54. Available at: https://www.legislation.gov.uk.

conclusion of the sale contract between a seller and a buyer produces both obligatory and proprietary effects. It has been argued that in the decentralized context of blockchain, the consensual transfer may lead to legal uncertainty if a piece of land is transferred without registration and without any intermediary taking part in the legal transaction (van Erp, 2019). However, blockchain is a type of public and decentralized ledger, and legal certainty could be achieved through other means (see below).

In this vein, (De Caria, 2019)[47] considers that smart contracts and the underlying agreement that gives meaning to such self-executing codes, are a valid form, capable of transferring ownership or other property rights on the basis of the principle of technological neutrality of the European Commission.[48] This principle prevents the State (Van der Haar, 2007), that is, the Law, from discriminating between technologies. In fact, scholars (Pinto Gomes, 2018) find no obstacles to the application of traditional principles governing contract law to smart contracts (e.g. the principle of private autonomy and contractual freedom, or the *pacta sunt servanda*) or the application of the rules governing the sale of future things to the ICO.[49] Therefore, the 'consent' of the parties would suffice to transfer ownership or other property rights, unless a certain formality is required (see Section 3.4).

Some legal systems following a consensual system (e.g. French and Italian ones) also belong to the so-called causal systems, which means that along with the consent of the contracting parties and the object of the contract, the transfer of the property is linked to the purpose of the contract. This is relevant as the legal validity of the contract is not analyzed by a third party in blockchain (see Section 3.4).

3.2. *Jurisdictions following the "title and modus" system*

In other countries, the transfer of property requires as a general rule a title (e.g. a sale contract) and the delivery of the possession of the asset to the other party (*traditio*). This is the case in Spain (art. 609.2 CC), as well as the Netherlands (art. 3:84 BW), which follow the Roman law tradition of title and modus. Neither the physical delivery of the thing nor the so-called "instrumental delivery" – i.e. transfer in the form of a notary deed – (art. 3:89 BW and art. 1462 CC) may be executed by the blockchain. However, title and modus systems foresee other methods for the transfer of assets that could be carried out through blockchain, such as the symbolic tradition (e.g. by delivery of the keys of the place where movables are stored, of the car or of a house), which could be adapted to the functioning of blockchain technology: the delivery of a symbol or sign that represents the transferred asset could be a possible model for the fulfillment of the title and modus in digital tokenization both for chattels and real estate. In fact, this sign or symbol could be either the digital token or the password or code that would be needed to access the dwelling or the car, provided that this code actually makes it possible for the acquirer to take possession of the asset. In a similar sense, the Dutch Banking Association argues that "having access to the private key constitutes control over a token";[50] and under Swiss law, it has been stated that when the transfer of a token bestows effective control over an asset, its ownership has been transferred too.[51] Title and modus systems also require the validity of the underlying contract for the transfer of ownership to take place (causal systems).

3.3. *Jurisdictions following the "abstract system"*

Other countries, such as Germany (§929 BGB), Austria (§428 ABGB) or South Africa[52] follow the abstract system, which means that the transfer of ownership will operate through an agreement, regardless of the validity of the underlying legal transaction (e.g. a sale contract). The application of §873 BGB, which regulates real agreements under German law, specifically in relation to real estate transactions, has been proposed as a piece of legislation that could be applied by way of analogy to the transfer of tokens, despite the fact that this legal order does not admit incorporeal things as the object of ownership.

In these legal systems, both the contract (e.g. the sale) and the agreement to transfer the property should be concluded when transferring a token: an option could be the inclusion of both agreements in the metadata of the smart contract or alternatively the use of Ricardian contracts (Van Rijmenam, 2019), a method that records the terms of the agreement as a legal document and also as executable code. This type of contract, which uses natural language, can be submitted as evidence in court, the parties may easily prove its existence and effects. In order to assure full synchronization between the ownership and the assignment of the token in the blockchain, the agreement could be subject to the condition precedent of a successful transaction, transferring the title of the token, following §§929 and 158 BGB when chattels are tokenized (*cfr.* 979 BGB for real estate) (Maume et al., 2020). The symbolic tradition could be also an option in the tokenization of chattels, this requires the physical delivery of the thing (§1205 BGB, §426 ABGB; in this regard, Maume et al. (2020) also proposed

[47] Smart contracts have been considered as self-sufficient legally binding agreements that could meet national contract law requirements De Caria, R. (2019) 'The Legal Meaning of Smart Contracts', *European Review of Private Law*, Iss. 6, 746 ff. This author argues that "existing contract law framework is more than adequate to accommodate even this revolutionary form of deal-making, without the need to create new legal categories that, contrary to a common belief among regulators and policy-makers, are not truly warranted in this case", 748.

[48] Used for the first time by the European Commission, 'A new framework for electronic communications services' [COM (1999)539], available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM:l24216 (accessed 15 May 2020).

[49] In particular, arts. 793 and 1472 Italian Civil Code, see Scotti, G. (2020) 'Blockchain, criptovalute e ico: analisi tecnica e giuridica della più recente innovazione fintech', *Cammino diritto, Rivista di informazione giuridica*, Iss. 2.

[50] Dutch Banking Association (2020) *Crypto-assets in Dutch perspective Opportunities for a Dutch crypto-asset ecosystem*, 8-9. Available at https://www.nvb.nl/media/3560/nvb-crypo-assets_eng.pdf (accessed 9 November 2020).

[51] Bericht des Bundesrates, Op. cit. 66.

[52] Vase Air-Kel (Edms) Bpk h/a Merkel Motors v Bodenstein 1980 (3) SA 917 (A).

the application of §§930 and 931 BGB when chattels are tokenized.[53,54]

3.3. *Title by registration legal systems and coordination between blockchain and other registries*

In some legal systems, the title by which property rights over real estate are created and transferred shall be entered into the land registry, which is key for third parties to get notice of the existence of property rights, which are universally effective. This is the case for real estate transactions in Germany and Austria (§ 873 BGB, §431 ABGB), and the same may be said in Torrens-like systems, such as England and Wales (s. 4 Land Registration Act 2002 (Simón Moreno, 2019). The title by registration system poses difficulties in the tokenization of assets due to the formalities required, in particular, the need to transfer the right in a certain form (e.g. a public deed, §925 BGB) and the subsequent registration (Sparkes, 2019). This is why the acquisition of real estate using blockchain technology has already been called into question if the legal system requires compulsory registration.[55] Even though blockchain technology has the potential to become (by itself) an automated disintermediated registry that can fulfill some essential functions equivalent to land registries (reliable publication of the parties, the date, the fact, etc.), the acceptance of this kind of registration as having equivalent legal effects to current national land registries is a public policy matter, thus depending upon decisions taken by the policymakers that oversee each of the different legal systems. As a result, the full coordination between the current land registries and the blockchains seems to be the most feasible solution at present for these legal systems.

In those legal systems in which registration is not compulsory as a general rule (e.g. Portugal, Spain, France or Italy), third parties may now find two types of publication: the one included in official registries (Land Registries, Registry of Movable Property) and the other included in blockchains. For the time being, coordination between land registries and blockchain could be an option: the parties could ask the official Registry to include information about the blockchain where real estate has been tokenized, so that third parties may trace the blockchain transactions to the registered holder.[56]

Indeed, what is important in the field of property rights is to determine the moment that the right was duly constituted, something that third parties should be able to verify, and blockchain is useful for that purpose (Dirix, 2006)[57] as the date on which the block was approved may be certified in a reliable and unalterable way. Italian law (art. 8-ter.3 *Legge* of 11 February 2019) established in this regard that the storage of an electronic document through the use of technologies based on distributed registers produces the legal effects of the electronic time stamps to which art. 41 Regulation 910/2014 refers.

As for chattels, possession is ordinarily the main way of notifying property rights. In this case, an *ad hoc* public register may provide information about the chattels that are tokenized so that third parties may trace the blockchain transactions to the registered holder.

3.4. *The intervention of a notary to control the content of the contract and the identity of the parties*

Notwithstanding the freedom of form principle in contract law, property law may require some property rights to be formalized in a notarial deed in Latin notary systems, such as for selling immovable property in Germany (§ 925 BGB). In addition, liens and encumbrances, such as mortgages, must be entered into the land register in order to be recognized (arts. 2416 French Civil Code and 145 Spanish Mortgage Law 1946).

The intervention of the notary in worldwide legal transactions (the civil law notary is present in 86 countries around the world and in 22 of the 28 EU countries[58]) has some implications: they check the legal correctness of the content of the agreement and the identity and the legal capacity of the parties (Garcia Teruel, 2020). Furthermore, the role of the notary in continental legal systems goes beyond the mere time stamp and allows the State to fulfill the duty to prevent disputes and to provide the institutions to resolve them, while in common law preventive justice is a free option for the parties, who have the duty to defend their own interests (which can cause asymmetries at the time the contract is concluded and generate subsequent conflicts) (Murray and Stürner, 2010). This is particularly relevant in those legal systems that belong to the causal system. This relevance would not be the same, as pointed out above, in German and Austrian law (abstract systems).

The absence of notarial intervention in the tokenization of property rights means that any disputes need to be settled via an ex-post conflict resolution system. However, the potential detrimental effects for the parties (e.g. no control of the content of the contract and no verification of their identity) could be mitigated in five ways:

a) First, by including in the metadata or in a file attached to this metadata (available in ERC-721 tokens) the content of the contract in natural language, in the clearest and least

[53] Maume, P., Maute, L. and Fromberger, M., Op. cit. 135. §930 BGB lays down the constructive delivery (if the owner is in possession of the thing, the delivery may be replaced by a legal relationship being agreed between the owner and the acquirer by which the acquirer obtains indirect possession) and §931 BGB the assignment of a claim for possession (if a third party is in possession of the thing, delivery may be replaced by the owner assigning to the acquirer the claim to delivery of the thing).

[54] . This is not applicable to real estate transactions, since a public deed is required (§925BGB, §431 ABGB, see Section 3.4)

[55] In the case of Austria, see Buchleitner, Ch. and Rabl, T. (2017) 'Blockchain und Smart Contracts', *Fachzeitschrift für Wirtschaftsrecht*, Vol. 1, 12.

[56] For Konashevych, the concept of land tokenization is "based on the idea of a free choice of how and where rights are registered. The right to choose means that a landlord decides where he or she wants to manage their property rights, that is, in the conventional public registry or transfer the title to the blockchain and use smart contracts", see Konashevych, O. (2020) Op. cit. 35.

[57] Dirix points out regarding security rights that "In order to have a right that is enforceable against third parties and to determine the ranking with competing entitlements, it is sufficient that there is a fixed point in time that allows, without, discussion, to establish the creation of the security right".

[58] Source: https://www.notariato.it/en/notaries-around-world.

ambiguous way possible. For example, it would be possible to establish the period of validity of the right or a time limit within which the right must be exercised, when required by law. In addition, the contracting parties may request professional advice, if they so wish, without this guidance necessarily having to be provided by a notary.[59]

b) Second, by implementing artificial intelligence (AI) so as to compare the contractual terms written in the smart contract's metadata with an existing database of unfair terms. This system could work as an oracle itself (Nasarre Aznar, 2020),[60] in such a way that the contract would be executed provided that the oracle (the register of unfair terms) checks that none of the written clauses are similar to an unfair one. This could be applied not only in consumer contracts related to the acquisition of property (e.g. mortgages), but also in other contracts related to real estate (e.g. rights of tenants).
c) Third, by implementing alternative conflict resolution mechanisms (e.g. mediation or arbitration) within the blockchain mechanism itself, provided that decisions are not only made according to *lex chryptographica*, but also in accordance with the applicable law in force. For instance, there are "arbitration courts" conducted by artificial intelligence or by privileged users who manually resolve disputes by voting, but usually without taking into account the applicable legal framework.
d) Fourth, by solving the problem of determining the identity of the parties in a public blockchain system, since it is usually anonymous (or pseudoanonymous) and no ID is required when creating a wallet (e.g. in Ethereum or Bitcoin). To avoid this problem, scholars propose linking the identity of the contracting parties with their digital user by means of a "sovereign identity", or even by referral to a trusted third party, such as a notary, or by consulting the Civil Registry as an oracle. In this sense, the decentralized system could benefit from incorporating the electronic signature regulated in eIDAS (Regulation 910/2014) (Garcia Teruel, 2020), recognizing valid authentication across all EU member states. In fact, the European Commission is working on a European Self-Sovereign Identity, allowing users to create and control their own identity without relying on centralised authorities (Project ESBI[61]).
e) Fifth, by addressing the need to ensure that the consent of the parties is not exercised under any type of undue influence or vice (e.g. violence or intimidation). In this sense, technology is rapidly evolving and there are emerging companies dedicated to the recognition of emotions when advertising any product, such as Emotient (dependent on Apple)[62] or the Spanish Emotion Research lab,[63] which allow users to verify whether the customer's response is positive or negative and what kind of reaction it indicates (happiness, surprise, anger, disgust, fear or sadness). This technology could be linked with the smart contract to check for signs of any vice of consent.

4. The tokenization of the ownership

4.1. *The rights and duties of the token holder*

As stated above, parties may transfer the ownership of an asset with the transfer of a token. The effect of being an owner in Civil law countries (also via smart contract) is the acquisition of the faculties of use, enjoyment and disposition of the tokenized asset (e.g. art. 348 CC, art. 544 French Civil Code, art. 832 Italian Civil Code) (Simón Moreno, 2011); in Anglo-American law, property ownership is described as a "bundle of rights"(Honoré, 1961). The condition of ownership may attribute not only rights, but also obligations. For instance, owners are obliged to keep the property in an adequate state of conservation, since its poor condition or the existence of dangerous elements (e.g. falling trees) may entail the obligation to compensate for the damage caused (e.g. arts. 1907-1908 CC, §836 BGB, art. 2053 Italian Civil Code and art. 1244 French Civil Code).

However, some of the rights and obligations of the owner might be difficult to apply to ownership acquired through the transfer of a digital token, as stated in the following sections.

4.2. *The need to identify the parties to prove the ownership*

The acquisition of the ownership with tokens will also entail, just as occurs in ordinary off-chain cases, the possibility of using the protection mechanisms established by law, e.g. the vindication of real estate in both Anglo-American law – through ejectment – and continental legal systems (in this case, also chattels) against trespassers requesting both the restitution of the property and the liquidation of the possessory situation (§985 BGB, art. 348 CC, art. 948 Italian Civil Code) (Martin Santisteban and Sparkes, 2015). This may be the case when a person who acquires a property via a smart contract, realizes that a third party, who does hold any title to the property, is currently in possession of it.

The vindication usually requires[64] the concurrence of three requirements: a title documents that proves the token holder is the legitimate owner of the property; full identification of the tokenized property; and evidence that a third party is in unfair possession of said asset. In this sense, the token holder may face some difficulties in proving their right. It will be necessary for the judge to check the content of the asset-backed token and see what was specified in the smart con-

[59] A study claims that it "provides convincing evidence that deregulated systems (or systems with lower levels of restrictive regulation) produce better outcomes for consumers overall in terms of price and choice" see Schmid, C. and Sebastian, S. (2007) *Conveyancing services market*. Available at: http://ec.europa.eu/competition/sectors/professional_services/studies/csm_study_complete.pdf (accessed 15 May 2020).

[60] See this example in Fig. 3 – Nasarre Aznar, S. (2018) "Collaborative housing and blockchain", Op. cit. 15, showing a register of abusive clauses for mortgages in blockchain.

[61] https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/EBSI.

[62] See https://elpais.com/economia/2016/01/08/actualidad/1452248259_528087.html (accessed 15 May 2020).

[63] https://emotionresearchlab.com

[64] Ibid. See also for the vindication action of the BGB, J. Staudinger, K.H. Gursky (1999) *BGB Kommentar*, s. 985–1011. Berlin: Sellier.

tract or in the token metadata in reference to the acquired right. If neither the token nor the smart contract include natural language about the transferred right, an independent expert must be proposed, who, being familiar with the programming language used in the "tokenization" (e.g. the solidity language of Ethereum), may state that the will of the parties was to respectively transfer and acquire the ownership of an asset: for instance, through private documents or instruments that may be digitally stored or that can reproduce words or data, such as the smart contract itself or even the content of the technical article of an ICO, may contain answers to questions that were posed to the parties or witnesses, that can be used to identify the parties, etc.). The method of interpretation will vary according to the legal system, e.g. Latin legal systems take a subjective interpretation as a starting point, whereas the Romano-Germanic ones and Anglo-American Law take an objective approach (Cemil Yildirim, 2019).[65]

However, despite the diversity of evidentiary means, proof of ownership of the property can be difficult for the token holder when the blockchain used is anonymous or pseudoanonymous, such as in Ethereum o Bitcoin. If the crypto-assets services provider does not undertake a Know Your Client (KYC) process or the parties do not use a valid electronic signature to conclude the transaction,[66] the acquirers, apart from proving that the token represents ownership, will have to prove their ownership of the wallet (e.g. through the private key associated with the public key).

4.3. *The plurality of owners*

The faculties the right of ownership entails could be limited when the tokenization has been made in favor of several people (co-ownership case). This situation may take place in the following ways:

1 The token representing the ownership could be transferred to several people, if sent to a multi-signature address (co-owned by two or more people). In this case, although initially there is only one asset-backed token representing the ownership, an ordinary co-ownership has been created as it has been accepted by two or more wallets (which would be the case, for instance, of arts. 392 ff. CC, §742 BGB, art. 1873 French Civil Code or art. 1100 Italian Civil Code). See Fig. 1.
2 The "tokenization" of an asset in a number of different shares represented in different tokens, so that a multitude of people can acquire tokens that refer to a part of the asset, creating an ordinary co-ownership and facilitating their subsequent transfer.[67] In this case, the powers of each co-owner are limited by the existence of the others, who must agree on how to distribute the use. See Fig. 2.

Figs. 1 and 2 are based on Roman co-ownership (or ordinary co-ownership, *comunidad de bienes, Miteigentum nach Bruchteilen, comunione*), by which every co-owner has an ideal share of ownership over an asset. This type of ownership may not work properly for the tokenization of the ownership. On the one hand, if the tokenization is used as an investment mechanism, the acquirers will be responsible for the property-related burdens and responsibilities (such as the need to maintain and repair the commonly-owned asset, art. 1104 Italian Civil Code, art. 395 CC). Moreover, except in very specific cases, any co-owner will be entitled to request the division of the commonly-owned asset, which would put an end to the co-ownership arrangement (art. 400 CC or §749 BGB). In addition, such co-ownership may be created with a multitude of owners (e.g. 100 co-owners each holding 1% of the total, if the "tokenized" real estate has 100m2, as proposed by the Atlant project).

In this case, it remains to be seen how the use of the asset would be distributed among 100 people, or how they would avoid possible conflicts, bearing in mind that the co-owners may come from different countries and cultures. Similar problems regarding the use of the asset may be found under the Anglo-American concept of "joint tenancy" (each co-owner has an undivided interest in the entire property and a trust for sale is created, s. 1(6) Law of Property Act 1925[68]) or the concept of a "tenancy in common" (in which tenants may own different percentages of the asset), which is more relevant in the USA (Karp and Klayman, 2003). This is the reason why some of the tokenization projects, such as Bitcar[69] or Atlant,[70] incorporate an on-chain decision-making mechanism or directly limit owners' rights, stipulating that they can only obtain the proportional income received when renting the asset. At this point, the Decentralized Autonomous Orga-

[65] Thus, in France (art. 1188 ff. French Civil Code) the intent of the parties prevails (as derived from the literal meaning of the words), and objective interpretation of the contract (e.g. through good faith, systematic interpretation of the contract, etc.) plays a subsidiary role. The same may be said in Italy (art. 1362 ff. Italian Civil Code) and Spain (arts. 1281 ff. CC), where the rules of interpretation are conceived to be applied to the contract as a whole (covering the content, rights and obligations and interests), even though the rules have a compulsory nature, contrary to French law. For its part, German law (§§133 and 157 BGB) makes a distinction between the content of the contract (which must be valid and it is a question of fact) and its legal consequences, which is a legal issue and may be conducted ex officio by the judge, there is no hierarchy as for the remedies to be used and takes an objective interpretation, which is not based on the will of the parties but on how they have understood the declaration of intent. Anglo-American law countries also take an objective approach as a starting point, i.e. the way a reasonable person has interpreted the contract is what matters.

[66] This identification procedure is usually used by the legal tender and cryptocurrency exchange services, because these services work directly with financial entities, which are obliged, according to Directive 2015/839, on the prevention of money laundering (arts. 2 and 13), to identify the client and verify his identity based on documents or information obtained from reliable and independent sources.

[67] Although transferring the share via blockchain may not be very interesting, it would be a more agile way for co-owners to enter and exit the shared ownership of property, which is complicated under the conventional methods of property acquisition: who would be interested in acquiring a share? How would such a sale be advertised?

[68] Chapter 3. Available at: https://www.legislation.gov.uk.

[69] https://bitcar.io.

[70] https://atlant.io.

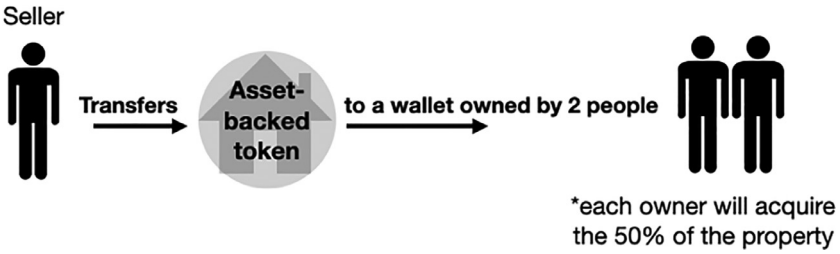

Fig. 1 – Asset-backed tokens acquired by a multi-signature account. Source: own elaboration.

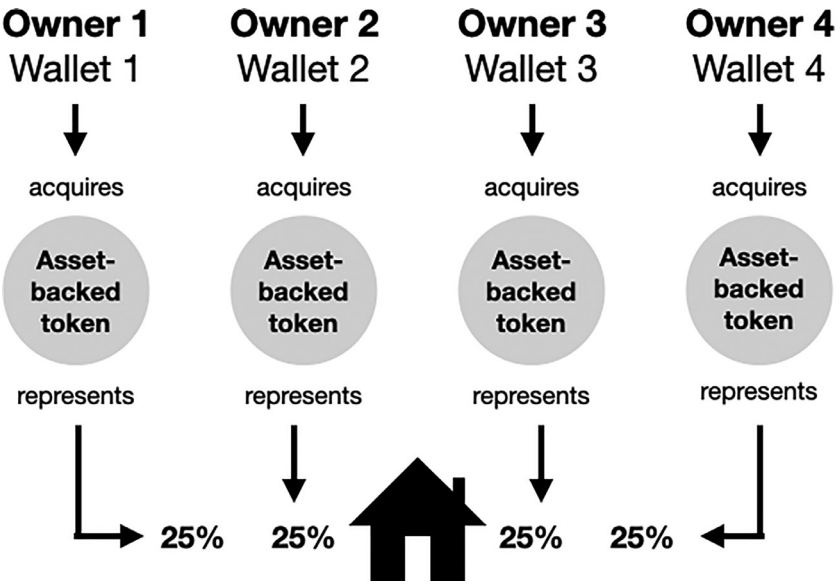

Fig. 2 – Asset-backed tokens representing shares of ownership. Source: own elaboration.

nizations (DAO) come into operation, these are autonomous entities that allow decisions to be made and executed on the blockchain through the votes of the token holders or autonomously (e.g. if the way they should act in a certain case has been programmed).

As a result, it seems that the ordinary co-ownership regime only makes sense in tokenization projects when the token holders do not intend to use the asset for a long period of time, but they wish to obtain a financial return on a long-term basis. But even in such a case, investors would also be responsible for the obligations arising from this regime, which could be an onerous agreement, if the costs are higher than the benefits obtained (e.g. if a tokenized real estate asset is in a state of ruin). In the case of this investment, it would be more convenient to use a Special Purpose Vehicle (SPV) -either created as a company or as a trust- instead of becoming direct co-owners of the property, so token holders would become the SPV's shareholders instead of being co-owners of the asset. Fig. 3 shows how a token representing a participation in a SPV could be articulated:

Lastly, there is a type of ownership that would encourage both investments and the exclusive use of an asset: the shared ownership, which is explained in more detail elsewhere (Garcia Teruel, 2020).

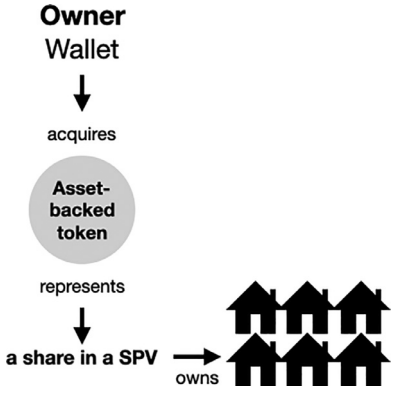

Fig. 3 – Asset-backed token representing a share in a SPV. Source: own elaboration.

4.4. *The extinction of the ownership*

Ordinarily, the ownership of chattels and real estate extinguishes when they are abandoned or destroyed (e.g. art. 460 CC, §959 BGB). In the decentralized and global world of blockchain, a third party may have possession of the tokenized

assets (e.g. a management company), so token holders are more dependent on private third-party audits to check the physical condition of the tokenized asset. For example, if an auction house has tokenized a painting, in its role as a depository, it should function as an oracle that can certify at all times that the painting exists, that it has it in its possession and testify that it is still in a good state-of-repair. This is the function that, for example, the TrustToken Platform[71] performs: it builds bridges between the "blockchain world" and the "real world" through the creation of a trust (coined as "SmartTrust") that grants equity ownership of the trust (Nasarre Aznar, 2003) and the control of the assets that are deposited there in favor of the acquirers. It allows the owner of any asset to issue the tokens through this application, give their holders voting rights, the enjoyment of the asset, etc.; and it means that buyers can verify, through the authoring system that has been coined as TrustProtocol, the existence of the tokenized asset. The trustee that controls and manages the tokenized property can be freely chosen by the token holders among an open market of professionals (called TrustMarket). Furthermore, the "*Physischen Validator*" regulated in Liechtenstein, an entity that verifies the condition of the "tokenized" asset, may be useful for assessing its real condition.

In addition, the ownership can be terminated if it is renounced (art. 6.2 CC, art. 827 Italian Civil Code, §959 BGB). The waiver may be of interest for the token holder so as to avoid possible charges and other related-property costs. The question remains whether it is possible or not to waive the ownership or abandon an asset through smart contracts and blockchain. On the one hand, the abandonment of off-chain possession over the tokenized asset may still be done, without there being any notable distinction in relation to any other asset not represented by an asset-backed token. On the other hand, the on-chain abandonment could also be considered, for instance, abandoning the token itself or the portfolio in which it is included. One way would be removing the tokens from the respective wallet. But this functionality is not possible with the current state of technology. So, in practice, unwanted tokens are sent to either random "burn" addresses, which are those for which no one has the private key (and therefore nobody can use the tokens; an example would be wallet n. 0 × 00 ...) or to an ad hoc address of unwanted tokens created by the holders themselves, for the sole purpose of transferring the tokens they want to abandon. The problem, in any case, would be to prove that the true intention of the token holder was to waive their right, since the abandonment is not clearly established and it cannot be presumed (e.g. §959 BGB, art. 5:18 BW).

5. The tokenization of limited property rights: taking the right of usufruct as an example

5.1. *Introduction*

Most of the limited property rights of enjoyment, acquisition and guarantee can be articulated through smart contracts and tokens, since these may include not only computer codes that are automatically executed, but also natural language and additional information (rights and obligations, etc.) in their metadata. For example, in the right of usufruct, the payments the holder of the usufruct must make may be automatized; or in the right to build, the smart contract could consult directly with the local Administration to verify whether the land can be developed, or the periodic payment to which the owner of the ground is entitled may be paid automatically, with non-payment leading to the automatic resolution of the right. Despite these benefits, one of the main challenges that parties may encounter when creating property rights through the blockchain is the connection between the property right and the ownership of the asset. Tokens (in particular, ERC-721) might be created nowadays using Solidity coding language and adding metadata defining the property right represented. However, this token is not connected to another one representing the ownership of a good, which may cause inconveniences to third parties. For example, if the ownership is tokenized and this token is transferred, the acquirer may not know of the existence of a limited property right created previously with another token. A mechanism to link both tokens (ownership and limited property right) would be necessary. This could be achieved with "side-chains", defined by Pilkin (Pilkington, 2006)as "a separately managed ledger, with its own software code, that is 'pegged' to the main blockchain ledger so as to allow transfers of key information from one chain to the other".

5.2. *Case study: tokenizing a usufruct from a comparative law perspective*

In this section we propose a model for tokenizing a civil law usufruct that can be created with a legally binding contract, since it does not require registration to be valid in the majority of the analyzed legal systems.

The usufruct is the limited property right that confers its holder with the right to use and enjoy – i.e. obtain fruits or profits – an asset (art. 3:201 BW, art. 519 ABGB, art. 518 French Civil Code, art. 467 CC). The owner retains the right to dispose of the asset (encumber or sell the bare ownership) while the usufructuary keeps and controls the 'substance' or the economic use of the asset, following the Roman principle *salva rerum substantia* (Paulus: Dig. 7, 1, 1; Inst. 2.4, pr.).

Legislation allows the constitution of usufructs over real estate and chattels, but there are differences in its creation and transfer. Regardless of these differences (see below), the tokenization of a usufruct may offer the following benefits:

5- P2P constitution and transfer of rights of usufruct, while at the same time being registered and protected by the blockchain.
5- Provision of security. In some jurisdictions, parties shall make make an inventory before the usufructuary takes possession of the asset and pays the compulsory sureties (e.g. art. 491 CC, art. 1002 Italian Civil Code). Since the inventory and the surety are compulsory in some jurisdictions (art. 600 French Civil Code, art. 1002 Italian Civil Code), parties may create two smart contracts: one creating the token that represents the usufruct, and another

[71] See https://blog.trusttoken.com/introducing-the-trusttoken-platform-tokenization-you-can-trust-67f1998b77ec (accessed 15 May 2020).

one including the inventory, so that the later smart contract works as an oracle for the first one, which cannot proceed until the inventory is completed. For Dutch Law, art. 3:205 BW establishes that this inventory must be formalized in a notarial deed, unless a legal administrator of the property documents the inventory. This means that, under Dutch Law, the inventory cannot be secured through the blockchain alone, unless an administrator is designated to do so.

5- Automatic payment of the civil fruits (e.g. rents) or benefits from the asset to the usufructuary's wallet (e.g. art. 586 French Civil Code, art. 984 Italian Civil Code).
5- Automatic payment of taxes, insurances, maintenance costs and charges (e.g. property tax) from the usufructuary's wallet (e.g. art. 605 and 608 French Civil Code, arts. 1004 and 1008 Italian Civil Code, art. 504 CC, §1041 BGB).
5- Automatic payment of the rent, if agreed.

5.2.1. *Tokenizing a usufruct over chattels*

*Object:*Any type of chattel (physical, digital, or intangible, such as a copyright) may be tokenized, provided that it is not an illegal asset and it is a transferable right (art. 469 CC, art. 581 French Civil Code, §1069.2 BGB). Consumable assets can also be the object of a usufruct, and the usufructuary shall return the same amount and quality when the term expires (art. 587 French Civil Code, art. 995 Italian Civil Code, §1067 BGB). If parties want to create a non-transferable usufruct (e.g. Italian Civil Code allows it in art. 980), they may use ERC-1238 protocols. This would be the most suitable way to create usufructs in Germany, since the usufruct is essentially non-transferable, according to §1059 BGB.

Formal requirements to create the usufruct: Generally speaking, there are no specific formal requirements for creating a usufruct over chattels (e.g. the registration of this right in some specific registries – e.g. the Spanish registry of chattels – is only intended to create third party's effects; (van Erp and Akkermans, 2012)). Depending on the asset, administrative registries may now exist and thus the blockchain could be connected to said registries (e.g. registry of chattels, of cars, etc.) or the parties could ask official registries to include information (created *ad hoc* or existing) about the blockchain, when the usufruct is tokenized, as pointed out above in Section 3.3.

It can be created *inter vivos* or *mortis causa* by the bare owner, orally or in writing. Thus, the creation of a usufruct over a chattel is possible just with a smart contract and the attached metadata. However, under German Law, §1032 BGB establishes that, for the creation of a usufruct on chattels, it is necessary to deliver the thing for an agreement to be valid. As pointed out above, when dealing with title and modus systems for the transfer of property, a way to overcome this requirement would be, for example, including into the token a code to unlock the asset (e.g. QR code, password…). If this allowed the usufructuary to use it, then the transfer of possession would be deemed to have taken place.

Transfer of the represented right: Once created, the usufruct of a chattel may be transferred to other persons (art. 595 French Civil Code, art. 980 Italian Civil Code, art. 3:83 Dutch Civil Code), As for the transfer of the right of usufruct, in consensual systems such as the French and Italian one, the smart contract transferring the token would suffice (art. 1196 French Civil Code and art. 1376 Italian Civil Code). However, rules on the transfer of rights shall be observed. As mentioned above, Spain and The Netherlands follow the title and modus system, and require the delivery of the possession of the chattel, following any of the admitted methods (art. 609 CC, art. 3:84 and 3:90 BW).

However, §1059 BGB establishes that the usufruct is not transferable itself, but the faculties (i.e. the use and enjoyment) are transferable. In this case, the usufructuary is still the holder of this property right, so the transfer of the token representing the usufruct would not be a suitable way to assign the right to use and enjoy the asset to another party, and a new token representing these faculties should be created.

In addition, some jurisdictions require that the bare owner must be notified of the transfer (e.g. art. 980 Italian Civil Code): however, the question remains whether it is really necessary to notify the bare owner if the usufruct is represented in a token, since s/he will be able to check the blockchain in any case and to know which wallet holds this token.

Information to be included in the metadata: Ideally the token representing the right of usufruct shall include in the code or in its metadata information about the duration of the right (e.g. when the usufructuary is a legal person, the limit is 30 years in Spain, Italy, The Netherlands and France, art. 515 CC, art. 979 Italian Civil Code, 3:203 Dutch Civil Code and art. 619 French Civil Code), description of the chattel (e.g. the car number plate), and any rights or obligations that diverge from the ones regulated in the respective Civil codes. In addition, additional measures need to be taken when the usufruct is subject to German law, since the abstract principle requires an agreement to transfer this right (§1032 BGB). In order to prevent litigation, this agreement could be included in the token's metadata in natural language.

Legal viability: Because of the lack of formal requirements, the constitution and transfer of a usufruct over chattels would be viable nowadays through the blockchain. In this sense, the French and Italian legislation would be the most viable for the creation and transfer of a usufruct over a chattel through blockchain, thanks to the use of the consensual system for the transfer of rights and the lack of formal requirements. In Germany, the tokenization of a usufruct may not have the same interest, as it is essentially non-transferable.

Table 1 shows the legal viability to create and transfer a usufruct over chattels through a token.

5.2.2. *Special provisions on the tokenization of a usufruct over real estate*

Real estate may also be the object of a usufruct, both built structures (e.g. housing, stores, premises) and land (art. 469 CC, art. 581 French Civil Code, §1069. 2 BGB). However, this requires more formalities, which may pose more difficulties for parties to represent a usufruct with a virtual token. For example, §873 BGB makes registration compulsory for encumbering real estate. Art. 3:89 and 3:98 BW require that for any type of transfer, involving the encumbrance and waiver of property rights, drawing up a notarial deed of transfer for this purpose between the parties, followed by its registration in the public registers for immovable property. So, the German and Dutch systems would currently require the use of notarial deeds and land registries for the creation and transfer of a usufruct over

Table 1 – The legal viability to create and transfer a usufruct over chattels through a token. Source: own elaboration.

	Germany	Spain	The Netherlands	Italy	France
Creation	No formal requirements, but the asset shall be delivered to the usufructuary	No formal requirements	No formal requirements (but the inventory shall be included in a public deed)	No formal requirements	No formal requirements
Transfer	Not possible (recommended token: ERC-1238)	Possible (but the asset shall be also delivered or, at least, the keys or the code to use it)	Possible (but the asset shall also be delivered or, at least, the keys or the code to use it)	Possible just by transferring the token	Possible just by transferring the token
Registration	Not required	Not required	Not required	Not required	Not required
Legal viability	High when creating the usufruct. But it cannot be transferred	High	High	High	High

real estate, which may prevent the implementation of the tokenization of property rights.

Likewise, the Italian Civil Code asks for the document creating or transferring the usufruct over real estate to be, at least, in 'writing' or in a public deed (art. 1350.2 Italian Civil Code). However, it would be possible to fulfill this requirement with smart contracts: this requirement could be meet by just using the metadata of the ERC-721 protocol to include a statement in natural language, declaring the fact that the usufruct is created. In addition, Art. 8-*ter Legge* 11.2.2019 recognizes that smart contracts work as a written form, for identification purposes, so they should also be considered a written form for the effects of art. 1350.2 Italian Civil Code.

France and Spain, for their part, do not require formal requirements, but registration of the usufruct into the Land Registry makes the right binding to third parties, if previously agreed in a public deed (art. 710 French Civil Code). It is true that Spanish art. 1280 CC stipulates that acts and contracts whose purpose is the creation, transfer, amendment or extinguishment of property rights over real estate must be formalized in a public deed. However, this is not actually a mandatory requirement according to the Spanish Supreme court decision 16/5/1996,[72] and neither of the parties signing such acts or contracts may compel the other party to formalize a public deed (art. 1279 CC).

As a consequence, there would be no impediment to creating and representing a usufruct with a token in Spain, France and Italy. However, note that the Spanish system, following the title and modus system for transferring rights, would require the effective delivery of the asset: e.g. in real estate, this can be done through a notarial deed, delivering the keys[73], etc. Table 2 shows the legal viability to create and transfer a usufruct over real estate through a token:

6. Conclusions and further discussion

The fast development of the collaborative economy and its related technologies, such as blockchain, showed that nowadays different types of assets may be tokenized. As argued in this paper, tokens operating in blockchain, in particular the asset-backed ones, may work as a tool to represent rights of a proprietary or obligatory nature.

As for the private law concerns addressed in this paper, there is a legislative and doctrinal trend to conceptualize tokens as digital assets (of an incorporeal nature), which could be a starting point for a proper regulation of asset-backed tokens at a national level. However, in our view, property law rules on the transfer of property may be adapted to the blockchain technology. In those countries following a consensual system, the smart contract creating and transferring the token would suffice, likewise in abstract systems, where an additional agreement would be needed. In this case, the inclusion of both agreements in the metadata of the smart contract or using Ricardian contracts could be an option. In title and modus systems, the transfer of a token would be enough to comply with the physical delivery of the asset requirement (*traditio*), provided that the buyer acquires its actual possession (e.g. with unlocking codes). Other formal requirements may be adapted or supressed as well, such as the intervention of a notary, taking into account that, apart from blockchain, there are other technologies that can contribute to preventive justice systems, such as the use of AI to control the existence of unfair terms or sovereign identity to prevent any type of vice. Furthermore, coordination between the land registry and blockchain (to a greater or lesser extent depending on whether registration is compulsory or not) could be a first step towards a fully decentralized system for the constitution and transfer of property rights.

For the purposes of checking the legal viability of the tokenization of property rights, the legal provisions of the right of usufruct have been contextualized in relation to the

[72] Westlaw Aranzadi database: RJ 1996\4348.

[73] Judgement of the Spanish Supreme Court No.1033/1999, of 3 December.

Table 2 – The legal viability to create and transfer a usufruct over real estate through a token. Source: own elaboration.

	Germany	Spain	The Netherlands	Italy	France
Creation	It requires a public deed + registration	No formal requirements (after a case law interpretation)	It requires a public deed + registration	In writing or in a public deed. Smart contracts could be considered equivalent to the written form	No formal requirements
Transfer	Not possible (recommended token: ERC-1238)	Possible (but the asset shall also be delivered or, at least, the keys or the code to use it)	Possible (but the asset shall also be delivered, and the transfer registered)	Possible in writing or in a public deed	Possible by just transferring the token
Registration	Required (public deed + Land Registry)	Not required	Required (public deed + Land Registry)	Not required	Not required
Legal viability	Low due to formal requirements	High (but deliverance of the property is required)	Low due to formal requirements	High – provided that the token is considered written form	High

blockchain technology. The analysis shows that due to the lack of formal requirements, the constitution and transfer of a usufruct over chattels would be legally possible through the blockchain, although in Germany the usufruct is non-transferable and thus its tokenization may have less practical interest. However, the tokenization of usufructs on real estate in Germany and The Netherlands would currently not be possible, since the intervention of a notary and further registration is required. In France, Spain and Italy, due to the freedom of form principle (a smart contract could be deemed equivalent to the written form in Italy) there would be no impediment for creating and transferring these rights. In any case, to work as a proper database of ownership titles and limited property rights, blockchain should allow a connection to be made between the token related to the ownership and those ones related to other limited property rights, in order to cross reference data and protect third parties.

Even though further research should be undertaken to cover other issues related to the tokenization of property rights (e.g. how other limited property rights could work in blockchain or how these databases can interconnect with the public administration), this study may definitely contribute to the establishment of a worldwide digital common market for trading asset-backed tokens, particularly in a context of COVID19 restrictions.

Data availability

No data was used for the research described in the article.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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