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INTERNATIONAL TAX ISSUES RELATED TO BITCOIN AND OTHER CRYPTOASSETS IN DOUBLE TAX TREATIES

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International Tax Issues related to Bitcoin and Other Cryptoassets in Double Tax Treaties

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Introduction

The need for standardized quantification of economic content of commercial operations led to the creation of money as it is currently known. It is difficult to precisely establish the moment that payments began to be made through some type of money or currency, however, it is estimated that this occurred circa 2022 BC.[1]

The evolution of money in society can be summarized as follows: (i) first, society used raw commodities (v.g. gold) as a universally accepted means of exchange (the barter period); then (ii) currencies surged that were supported by commodities, also known as commodity-backed money such as gold certificates and paper money backed by the same ore; and (iii) the commodity-backed money was substituted by fiat currencies and their variants such as electronic money and "book money" that are still currently being used.[2]

Fiat currencies would function much like genuine "government tokens", especially if the fact is taken into consideration that the use of "paper money" (currency and bank notes) is being surpassed by electronic currencies (e-money), "book money", and other means of payment such as credit cards.[3]

Thus, the main pillars of traditional monetary systems are: (i) the existence of a central banking authority that is responsible for controlling the banking system and (ii) fiat currencies for which its issuance is a government monopoly. Thus, money has generally been associated with three distinct roles regardless of how it is issued:

1. Medium of exchange: Money is used as an intermediary in trade to avoid the inconveniences of a barter system, i.e. the need for a coincidence of wants between the two parties involved in the transaction.

1 EUROPEAN CENTRAL BANK (EUROSYSTEM). Virtual Currency Schemes (Oct. 2012), pp. 9-10. Available at: https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemes201210en.pdf. Access: March, 13th, 2022.

2 ULRICH, Fernando. Bitcoin: a moeda na era digital. 1ª edição. São Paulo: Instituto Ludwig Von Mises Brasil, 2014, p. 57; EUROPEAN CENTRAL BANK (EUROSYSTEM), supra n. 3, p. 10, item 1.2; GLASS, Jeffrey E. What Is a Digital Currency. IDEA: The Journal of the Franklin Pierce Center for Intellectual Property, Vol. 57, Issue 3 (2017), p. 465.

3 MARTIN, Felix. Money: the unauthorized biography – from coinage to cryptocurrencies. New York: Knopf, Ranfom House, 2013, p. 14-15.

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2. Unit of account: Money functions as a standard numerical unit for the measurement of the value and costs of goods, services, assets, and liabilities.

3. Store of value: Money can be saved and retrieved in the future.

4. Money is a social institution: It is a tool created and marked by society's evolution. It has exhibited considerable capacity to evolve and adapt to the character of the times. It is not surprising that money has been affected by recent technological developments and especially by the widespread use of the internet.[4]

However, the evolution of money did not stop with the fiat currency standard. The continuous growth of mankind, the creation of new technologies in ever briefer periods of time, the critics regarding centralization of money, and the loss of financial privacy led humanity to witness the creation of the first decentralized cryptographic (encrypted) virtual currency: Bitcoin. Its emergence is remarkable evidence on how the digitization of the economy is undermining the bricks and mortar economy as well as the standards that were the foundation of the OECD Model Tax Convention.

The virtualization of transactions through cryptoassets has rendered the difference between material and immaterial obsolete in the post-20th century industrial economy. That is why domestic tax legislation and double tax treaties' (DTT) rules will face challenges for addressing the taxation of cryptoassets, especially if considering the wide variety of tokens that exist (token taxonomy): payment, utility, and security tokens as well as non-fungible tokens (NFTs).

It is widely known that a basic premise of international tax law is that states are sovereign to fully tax all economic activities that have a genuine link with their territory. As a result of globalization and the increase of transnational transactions, DTTs became the tool to limit tax jurisdictions and allocate taxation rights between source and residence states and avoid the double taxation of income and capital.

It is important to recall the circumstances that surrounded the sharing of tax rights between source and residence states in the context of international tax law before analyzing the international tax issues related to operations with cryptoassets. The current methodology for doing so in the context of international taxation was designed by the "Four Economists" (Bruins, Einaudi, Seligman, and Stamp) and was the basis for the OECD Model Tax Convention. This approach can be summarized in the following statement:

4 EUROPEAN CENTRAL BANK (EUROSYSTEM), supra n. 3, p. 10.

> In this context the group identified the concept of economic allegiance as a basis to design such international tax framework. Economic allegiance is based on factors aimed at measuring the existence and extent of the economic relationships between a particular state and the income or person to be taxed. The four economists identified four factors comprising economic allegiance, namely (i) origin of wealth or income, (ii) situs of wealth or income, (iii) enforcement of the rights to wealth or income, and (iv) place of residence or domicile of the person entitled to dispose of the wealth or income. Among those factors, the economists concluded that in general, the greatest weight should be given to "the origin of the wealth [i.e. source] and the residence or domicile of the owner who consumes the wealth". The origin of wealth was defined for these purposes as all stages involved in the creation of wealth: "the original physical appearance of the wealth, its subsequent physical adaptations, its transport, its direction and its sale". In other words, the group advocated that tax jurisdiction should generally be allocated between the state of source and the state of residence depending on the nature of the income in question. Under this approach, in simple situations where all (or a majority of) factors of economic allegiance coincide, jurisdiction to tax would go exclusively with the state where the relevant elements of economic allegiance have been characterised. In more complex situations in which conflicts between the relevant factors of economic allegiance arise, jurisdiction to tax would be shared between the different states on the basis of the relative economic ties the taxpayer and his income have with each of them.[5]

At that time, the premise for allocating tax rights between source and residence states was the physical transfer of goods and the provision of services. Currently, the "physical presence element" may not be efficient for dealing with the dematerialization of economy and technological enhancements made possible by cryptoassets and Web3. These circumstances challenges the international tax law framework, especially considering the decentralized and distributed nature of such assets.

The international taxation of cryptoassets operations shows the lack of congruence between the digital reality imposed by technology and the traditional principles of international taxation based on the physical presence as an indication of economic connection to a jurisdiction.

Nevertheless, the challenges arising from digitalization are not something exclusively related to cryptoassets since such issues were identified long ago at the Ottawa OECD Ministerial Conference in 1998, "A Borderless World: Realizing the Potential of Global Electronic Commerce"[6].

5 OECD (2014), Addressing the Tax Challenges of the Digital Economy, OECD/G20 Base Erosion and Profit Shifting Project, OECD Publishing, Paris, p. 36-37. Available at: https://doi.org/10.1787/9789264218789-en Access: April, 1st 2022.

6 OECD. A borderless world: realising the potential of global electronic commerce. OECD Ministerial Conference. Ottawa, 7-9 October 1998. Available at: https://bit.ly/2JaT-Qbv Access: 4 April 2022.

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Conclusions were established there in the context that the ring-fencing of the digital economy should not be accepted. This same premise was the basis for the OECD Base Erosion Profit Shifting (BEPS) Action Plan 1.[7] In addition to this initiative, this topic was addressed in March 2018 by the presentation of the "Tax Challenges Arising from Digitalisation – Interim Report 2018".[8]

While Action Plan 1 focused on identifying a way to prevent base erosion and profit shifting, the report "Tax Challenges Arising from Digitalisation" demonstrates that the OECD's attention was also focused on the reconceptualization of the distribution of tax jurisdiction and taxing rights between source and residence states in the digital economy.[9]

Discussions and studies evolved as proposed solutions to deal with such issues which effectuated Pillars 1 and 2. Pillar 1 is titled the Unified Approach and intends to establish new nexus rules to allocate taxing rights in the digital economy without relying on the physical presence in source states.[10] Pillar 2 is known as the Global Anti-base Erosion Proposal (GloBE) and aims to create a new international system of taxation of minimum income in cross-border transactions.[11]

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7 "Action 1 – Address the tax challenges of the digital economy. Identify the main difficulties that the digital economy poses for the application of existing international tax rules and develop detailed options to address these difficulties, taking a holistic approach and considering both direct and indirect taxation. Issues to be examined include, but are not limited to, the ability of a company to have a significant digital presence in the economy of another country without being liable to taxation due to the lack of nexus under current international rules, the attribution of value created from the generation of marketable location-relevant data through the use of digital products and services, the characterization of income derived from new business models, the application of related source rules, and how to ensure the effective collection of VAT/GST with respect to the cross-border supply of digital goods and services. Such work will require a thorough analysis of the various business models in this sector". Available at: www.oecd.org/ctp/BEPSActionPlan.pdf. Accessed: 28 March 2022.

8 OECD. Tax challenges arising from digitalization – Interim Report 2018: inclusive framework on BEPS. OECD/G20 Base Erosion and Profit Shifting Project. Paris: OECD Publishing, 2018. Available at: http://dx.doi.org/10.1787/9789264293083-en. Accessed: 18 March 2022.

9 Different understandings on how to deal with the challenges arising from the digitalization of economy have been presented by several countries: "The first group agrees that the characteristics of highly digitalized business models may lead to a misalignment between the location in which profits are taxed and the location in which value is created. This is the result of the unique features observed in such business models which are not captured by the existing international tax framework. Therefore, the issues are confined to certain business models and may be addressed through targeted changes to existing tax rules including a reconsideration of the rules relating to profit allocation and nexus. The second group of countries believe that the issue is wider and that ongoing digital transformation of the economy and more general trends associated with globalization present challenges to the continued effectiveness of the existing international tax framework for business profits. The third group of countries considers that the BEPS package has largely addressed the concerns of double-nontaxation although many consider that it is too early to make a full assessment. The Report concludes that despite the differing views there is general agreement that there should be more exploration of potential changes to the nexus and profit allocation rules (5.4.3). The next stage of work will therefore require refining the analysis of the value contribution of certain characteristics of highly digitalized business models with a view to studying its impact on any revision of the nexus and profit allocation rules. The intention is to work towards a consensus-based approach through the Inclusive Framework by 2020." (KPMG. Observations on OECD Interim Paper and EU Commission Digital Tax Proposals. April, 2018. p. 6. Available at: https://home.kpmg.com/content/dam/kpmg/sk/pdf/TaxNews/GM-FTS-0440-Digital-Tax-report_V5_high%20res.pdf. Accessed: 5 April 2022.

10 OECD (2019), Public consultation document. Secretariat Proposal for a "Unified Approach" under Pillar One. OECD, Paris. Available at: https://www.oecd.org/tax/beps/public-consultation-document-secretariat-proposal-unified-approach-pillar-one.pdf Accessed: 5 April 2022.

11 The details related to Pillars 1 and 2 are beyond the scope of this paper.

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The tax challenges arising from digitalization are even greater regarding assets negotiated through distributed ledger technologies (known as cryptoassets). Besides being intangible, these assets are also decentralized and distributed which is the reason why they do not exist in the ontological sense that other assets do. Tokens and/or cryptoassets are mere accounting records (inputs and outputs) in a ledger, meaning they are everywhere and nowhere at the same time.

In this context, this objective of this paper is to analyze double taxation issues arising from operations with cryptoassets and to propose practical solutions that could be more effective for dealing with the taxation of transactions with this type of asset.

In this brief introduction, a summary was presented of the evolution of the concept of money in society and the background surrounding the OECD discussions on the taxation of the digital economy. Subsequent to the previous discussion, in order to identify the international tax issues related to cryptoassets operations regarding the application of DTT, this paper will present the concepts of digital currencies, virtual currencies, cryptocurrencies, cryptoassets, digital tokens (payment tokens, utility tokens and security tokens) and BLCAs (Bitcoin like Crypto Assets), as a premise for analysing the qualification of the income arising from operations with such assets.

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1. Distributed Ledger technologies, blockchain, and cryptoassets

It is first important to accentuate the fact that centralized virtual currencies are not necessarily new; frequent flyer points are a classical example of IOU (I owe you) centralized non-distributed and non-encrypted virtual currencies. The first cryptocurrencies, however, appeared in the early 1990s with the emergence of the cypherpunk movement and the intention to use cryptography to avoid state control of data on the internet. The first documents that emerged from the cypherpunks' meetings were, respectively, the "Crypto Anarchist Manifesto" and "A Cypherpunk's Manifesto". Both texts advocated the idea of using decentralized systems that could not be destroyed or disabled in order to enhance privacy and anonymity. To achieve this, cypherpunks made use of a science derived from mathematics: cryptography.

In fact, centralized cryptographic (or encrypted) virtual currencies existed long before bitcoin as can be discerned from David Chaum's Ecash project, a centralized cryptocurrency. He pursued the idea of "cryptographic protocols for establishing trust between mutually untrusting parties"[12] but still relying on a centralized entity.

Everything changed, however, with the creation of bitcoin, the first decentralized cryptocurrency created by Satoshi Nakamoto through the publication of the report "Bitcoin: A Peer-to-Peer Electronic Cash Payment System" on 31 October 2008.[13] Its primary characteristic is decentralization provided by a peer-to-peer system that dismisses the existence of a central authority to control the validation of transactions and the creation of new bitcoins.[14]

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12 CHAUM, David. Blind Signatures for Untraceable Payments. Advances in Cryptology Proceedings of Crypto 82.3 (1983), p. 199-203.

13 NAKAMOTO, Satoshi. Bitcoin: A Peer-to-Peer Electronic Cash Payment System. Bitcoin. Available at: https://bitcoin.org/. Access: February, 27th 2022.

14 EUROPEAN CENTRAL BANK (EUROSYSTEM), supra n. 3, p. 6.

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Therefore, bitcoin is considered as the first decentralized, distributed, and open-source cryptocurrency in the history of virtual currencies. It precisely initiated the phase of decentralized cryptocurrencies and was later followed by several alternative cryptocurrencies known as altcoins.[15]

Simply stated, everything is about trust that is currently placed in governments and central banks. After bitcoin's creation, we place our trust in peer-to-peer (P2P) systems. Actually, these are also not new and have been used since the creation of the Napster application that was used to share music, videos, and data.[16] The technology emerged as a reaction to the centralized client-server model. In this latter traditional model, the client computer requests data while the server computer sends the information request back to the user. In the event of a central server failure, all of the data and information will be unavailable to client users.

In contrast, in a decentralized system, informational logs are scattered over the computers of various users with no central server to maintain control of it. The search for data and information is carried out "peer to peer" so each computer, while being a "client", simultaneously acts as a "server". This allows the permanent execution of computational operations and the sharing of data. These peers share information that is publicly available in a decentralized ledger referred to as a blockchain. It is the technology that is the basis for the Bitcoin Core and can be considered as the groundbreaking change leading humanity towards an evolution from Web2 to Web3.

However, blockchain is just one type of distributed ledger technology (DLT). These two concepts have in common the fact that they are distributed registries in a decentralized network among several devices. Blockchains are organized in blocks so it can be stated that every blockchain is a DLT but not every DLT is a blockchain.

A DLT is a system of "electronic records that (i) enables a network of independent participants to establish a consensus around; (ii) the authoritative ordering of cryptographically-validated ('signed') transactions. These records are made (iii) persistent by replicating the data across multiple nodes, and; (iv) tamper-evident by linking them by cryptographic hashes. (v) The shared result of the reconciliation/consensus process- the 'ledger'- serves as the authoritative version for

15 For further details regarding this topic: ANTONOPOULOS, Andreas M. Mastering Bitcoin: Unlocking Digital Cryptocurrencies. Sebastopol (CA): O'Reilly Media Inc., December/2014, p. 216-218 and 221-222; JEANS, Ethan D. Funny Money or the Fall of Fiat: Bitcoin and Forward-Facing Virtual Currency Regulation. Colorado Technology Law Journal, Vol. 13, Issue 1 (2015), p. 108; FINANCIAL ACTION TASK FORCE (FATF). Virtual Currencies Key Definitions and Potential AML/CFT Risks Report. Paris: June/2014, p. 6; FRANCO, Pedro. Understanding Bitcoin: Cryptography, Engineering and Economics**.** Chichester: John Wiley & Son Ltd., 2015; NIAN, Lam Pak. CHUEN, David LEE Kuo. Chapter 1 – Introduction to Bitcoin. In: CHUEN, David LEE Kuo (editor). Handbook of Digital Currency: Bitcoin, Innovation, Financial Instruments, and Big Data. Londres: Elsevier, 2015, pp. 8-9; and MULLAN, Carl P. The digital currency challenge: Shaping Online Payment Systems through US Financial Regulations**.** New York: Palgrave Macmillan, 2014, p. 91.

16 SHIRKY, Clay. Prestando atenção ao Napster. In: ORAM, Andrew. Peer-to-peer: o poder transformador das redes ponto a ponto. São Paulo: Editora Berkeley, 2001, passim.

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these records".[17] It is a term used to refer to two concepts: "(i) the set of data held by an individual network node, and (ii) the set of data held in common by the majority of nodes".[18] The criteria commonly used to evaluate if one system is a DLT are the following: (i) shared recordkeeping; (ii) multiparty consensus; (iii) independent validation; (iv) tamper evidence; and (v) tamper resistance.

According to the ISO 22739/2020, a blockchain is one type of a "distributed ledger with confirmed blocks organized in an append-only, sequential chain using cryptographic links". Gomes and Bossa[19] summarizes blockchain and the way such technology works as follows:

> Blockchain's primary function is to reduce uncertainties in the course of virtual environment transactions between unknown parties by ensuring the authenticity of the transaction, as financial institutions do. Authenticity stems from the encryption-based electronic payment system (proof of secure execution) rather than trust, so transactions conducted directly between unknown parties do not require the participation of third parties. This technology can be compared to an electronic ledger, shared among users, which records transactions carried out in the digital world. The recorded content is validated by the participants of the network, whereas the presence of an intermediary is unnecessary. It consists of a "chain of blocks" and each block contains information about the transactions occurred, indicating the users who validated the transaction and its history. The tool is based on the following elements: (i) shared record of transactions; (ii) consensus on its verification; (iii) operating rules; and (iv) encryption. Each set of computers connected together is responsible for validating transactions in compliance with blockchain rules and takes into account transactions previously recorded. Accordingly, it is possible to verify the origin of the transactions, all the resulting splits and the electronic recording of the respective participants. Blockchain records may refer to digital assets or to the digital representation of assets in the phenomenal space, which, upon scanning, will be represented by a token. Blockchain allows transactions to be digitally recorded and stored on transparent, shared and decentralized systems, and such records, as a general rule, cannot usually be altered or deleted. In fact, information will only be added to the blockchain in the event of consensus among the participants assigned to the transaction. And once validated, they are permanently recorded so that the information cannot be deleted.

17 RAUCHS, Michel; GLIDDEN, Andrew; GORDON, Brian; PIETERS, Gina C.; RECANATINI, Martino; ROSTAND, François; VAGNEUR, Kathryn; ZHANG, Bryan Zheng. Distributed Ledger Technology Systems: A Conceptual Framework (August 13, 2018), p. 24. Available at: https://ssrn.com/abstract=3230013 or http://dx.doi.org/10.2139/ssrn.3230013 Accessed: 13 March 2022.

18 RAUCHS (et al.), supra n. 19, p. 25.

19 GOMES, Eduardo de Paiva. BOSSA, Gisele. Blockchain: Technology as a Tool for Tax Information Exchange or an Instrument Threatening the Taxpayer's Privacy? (September 12, 2019). Available at SSRN: https://ssrn.com/abstract=3540277 or http://dx.doi.org/10.2139/ssrn.3540277 Access: March, 13th 2022.

> Its two major characteristics are: (i) elimination of intermediate parties for transactions; and (ii) immutable and shared records. It is a technology that produces a transparent and decentralized recording system of traceable operations with great potential not to be affected by corruption and forgery. It was developed with the purpose of enabling data sharing, replication, synchronization and access, allowing reduced costs with information processing, storage and sending, as well as the monitoring of transactions in real time. The difference between blockchain and other shared-recording technologies lies in the fact that "it is designed to achieve a consistent and reliable agreement on an event record between independent participants who may have different motivations and goals.

Bitcoin (first generation blockchain) is the sum of (i) encrypted transactions (cryptography) and (ii) a distributed and decentralized ledger. Nevertheless, decentralized processes are not equal to a distributed process. In this context:

> A decentralised process should not to be confused with a distributed process. When storage or computation is distributed, it is divided into parts and occurs across multiple servers or nodes ('parallelised'), offering efficiencies and higher resilience over using just a single node. A distributed process may still rely on a central coordinator to act as an authoritative source of records. When a process is decentralized, multiple nodes are again in use - but in this case, the process is typically replicated across the various nodes, which are generally controlled by different entities. This means that each node is managing the same storage or executing the same program as all of the others, redundantly.[20]

Bitcoin's success relied on the fact that (i) the confirmation of transactions did not depend on the existence of a third party and (ii) even though there is no central authority involved in the system, the double spending problem is avoided.

To achieve such a result, bitcoin solved what is referred to as the Byzantine Generals Problem[21] by using a consensus algorithm called proof-of-work (bitcoin mining). A consensus algorithmic mechanism is the set of "rules and procedures by which consensus is reached" while the consensus is the "agreement among DLT nodes that 1) a transaction is validated and 2) that the distributed ledger contains a consistent set and ordering of validated transactions" (ISO 22739/2020).

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20 RAUCHS (et al.), supra n. 19, p. 45.

21 More details on the Byzantine Generals Problem can be found at: https://satoshi.nakamotoinstitute.org/emails/cryptography/11/ In summary, it is "not sufficient that everyone knows X. We also need everyone to know that everyone knows X, and that everyone knows that everyone knows that everyone knows X which, as in the Byzantine Generals problem, is the classic hard problem of distributed data processing".

There are several consensus algorithmic mechanisms, but those generally used are proof-of-work (PoW) and proof-of-stake(PoS):[22]-[23]

> Proof of work is the original blockchain consensus protocol, pioneered by Bitcoin. In a proof-of-work system, network participants compete to be the fastest to solve the cryptographic puzzles required to add a new block to the blockchain. The input to these puzzles consists of all previously recorded information on the blockchain, along with the new set of transactions to be added in the next block. Therefore, the input becomes larger and the calculation more complex over time, necessitating increased processing power. This causes the high energy intensity discussed above. When the puzzle is solved, the machine involved proves that it completed the work, and is rewarded in any given system with a token of value. In the Bitcoin blockchain, this comes in the form of a newly-mined bitcoin. Note that while successful mining is rewarded with new bitcoins, one does not have to own any bitcoins as a prerequisite to engage in bitcoin mining.
>
> Proof of stake is the most common consensus protocol after proof of work. We have chosen to illustrate its functionality on the example of the NXT cryptocurrency, which uses a pure proof-of-stake system in transaction validation In the NXT system, anyone can set up a node and buy NXT cryptocurrency. A validator must prove ownership of a certain amount of NXT in order to participate in forging, i.e., transaction validation. The validator's probability of forging the next block is equal to its share of all NXT in existence. This is a clear distinction from proof of work, in that NXT ownership is a prerequisite to participation in 'forging' and therefore to earning the associated fees. Note that transaction fees earned by the validator are paid by the transacting parties. Forging creates no new tokens, as all NXT is pre-mined. 'Transparent forging' constitutes a recent improvement to the protocol, its aim being to increase the threshold for an attack on the system from 51% to 90%, i.e., with transparent forging, a bad actor would have to own over 90% of all NXT in issue in order to manipulate the ledger. Under this system, the node which will validate the next block is randomly selected in advance, but only the next 10 validators are known. A node that fails to take up its role is penalized by

22 DANIEL, Jiří (George). GREEN, Amanda. IFRS (#) Accounting for crypto-assets. ERNST YOUNG REPORT. 2018.

23 Stated otherwise, the differences between the PoW and PoS are: "Proof-of-Stake (PoS) is a consensus mechanism in which a new record producer is chosen proportionally to the amount or age of coins 'staked', i.e. held by users during the election period. Tokens are usually bonded (locked up) to motivate honest behavior, and risk destruction if malicious actions are detected by the network. A Proof-of-Work (PoW) is a piece of data which satisfies a set of requirements and is difficult to produce (e.g. resource- or time-consuming) but it is easy for others to verify. Producing a PoW can be designed as a low probability random cryptographic challenge which requires trial and error to produce a valid answer (e.g. Bitcoin's PoW) or it may be a true PoW which is a complex mathematical computation. In a competition to be the first to complete a random puzzle PoW, anyone has a chance to win; in a true PoW, the most powerful and fastest computer will win. PoW computations are used in programmes designed to prevent spam email (e.g. Hashcash) as well as in cryptocurrency applications". (RAUCHS (et al.), supra n. 19, p. 107)

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> temporary exclusion from forging. One node forges each block, which allows data to be sent directly to it, speeding up the forging process. Unlike proof-of-work mining, forging requires little computing power and electricity. Even the simplest computers, such as the Raspberry Pi, can forge. Proof-of-stake systems such as NXT's can thus deliver transaction speeds approaching those of the Visa network, and may therefore prove useful in driving wider adoption of cryptocurrency.

In PoW protocols like the Bitcoin Core, the validators may receive subsidy block rewards (originally created and new bitcoins) and transactional fees (that are paid by one of the users of the validated transaction). In PoS protocols, the tokens are usually pre-minted (created before the public offering of the tokens) meaning that the validators receive only transaction fees (or gas fees) since there are no "new tokens" to be created.

Exceptionally, there may be PoS protocols that create new tokens and insert them into the market's supply. Thus, the validators would be able to also receive newly minted tokens (similarly to a bitcoin subsidy block reward).

By using these consensus algorithmic mechanisms, the protocols stimulate the trustful behavior of their validators by offering them positive results or rewards which enables the chain to work properly. The transactions are publicly recorded in the blockchain, meaning the public addresses of the users are available for anyone to check[24]. The transactions are done by using wallets that contain public and private keys.[25]

Bitcoin was the event that gave birth to Blockchain 1.0. The Blockchain 2.0 phase began with the creation of Ethereum and its integration into the (evolved) concept of "smart contracts" that were created long before Ethereum. The authorship of the expression "smart contracts"

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24 The majority of blockchains are pseudo-anonymous but not completely anonymous. There are cases such as Monero and Secret in which the transactions are totally anonymous. Additionally, there are secondary tools, like Mixers, that can be used to turn a pseudo-anonymous protocol into a completely anonymous one.

25 About this topic, Antonopoulos states that: "Ownership of bitcoin is established through digital keys, bitcoin addresses, and digital signatures. The digital keys are not actually stored in the network, but are instead created and stored by users in a file, or simple database, called a wallet. The digital keys in a user's wallet are completely independent of the bitcoin protocol and can be generated and managed by the user's wallet software without reference to the blockchain or access to the Internet. Keys enable many of the interesting properties of bitcoin, including decentralized trust and control, ownership attestation, and the cryptographic-proof security model. Every bitcoin transaction requires a valid signature to be included in the blockchain, which can only be generated with valid digital keys; therefore, anyone with a copy of those keys has control of the bitcoin in that account. Keys come in pairs consisting of a private (secret) key and a public key. Think of the public key as similar to a bank account number and the private key as similar to the secret PIN, or signature on a check that provides control over the account. These digital keys are very rarely seen by the users of bitcoin. For the most part, they are stored inside the wallet file and managed by the bitcoin wallet software. In the payment portion of a bitcoin transaction, the recipient's public key is represented by its digital fingerprint, called a bitcoin address, which is used in the same way as the beneficiary name on a check (i.e., 'Pay to the order of '). In most cases, a bitcoin address is generated from and corresponds to a public key. However, not all bitcoin addresses represent public keys; they can also represent other beneficiaries such as scripts, as we will see later in this chapter. This way, bitcoin addresses abstract the recipient of funds, making transaction destinations flexible, similar to paper checks: a single payment instrument that can be used to pay into people's accounts, pay into company accounts, pay for bills, or pay to cash." (ANTONOPOULOS, supra n. 17, pp. 61-62).

is attributed to Nick Szabo in the paper "Building Blocks for Digital Markets" that was originally published in 1996. According to Szabo[26]:

> New institutions, and new ways to formalize the relationships that make up these institutions, are now made possible by the digital revolution. I call these new contracts 'smart', because they are far more functional than their inanimate paper-based ancestors. No use of 'artificial intelligence' is implied. A smart contract is a set of promises, specified in digital form, including protocols within which the parties perform on the other promises.

The core of Blockchain 2.0 protocols is the concept of smart contracts that are defined and automatically executed/enforced by the code itself which affords no opportunities for discretion.[27] Smart contracts are not legal contracts nor are they are intelligent or smart. In this sense, Antonopoulos and Wood[28] state that:

> The term smart contract has been used over the years to describe a wide variety of different things. In the 1990s, cryptographer Nick Szabo coined the term and defined it as 'a set of promises, specified in digital form, including protocols within which the parties perform on the other promises.' Since then, the concept of smart contracts has evolved, especially after the introduction of decentralized blockchain platforms with the invention of Bitcoin in 2009. In the context of Ethereum, the term is actually a bit of a misnomer, given that Ethereum smart contracts are neither smart nor legal contracts, but the term has stuck. In this book, we use the term "smart contracts" to refer to immutable computer programs that run deterministically in the context of an Ethereum Virtual Machine as part of the Ethereum network protocol—i.e., on the decentralized Ethereum world computer.

Smart contracts are software. According to Ferreira, two types of smart contracts can be identified: (i) non-legal smart contracts (an "if-then logic" software) and (ii) smart legal contracts ("real legal" contracts).[29] In a similar approach, Clack, Bakshi, and Braine present a different and

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26 SZABO, Nick. Building Blocks for Digital Markets (1996). Available at: http://www.alamut.com/subj/economics/nick_szabo/smartContracts.html Accessed: 12 April 2022.

27 SWAN, Melanie. Blockchain: Blueprint for a New Economy. Sebastopol (Califórnia): O'Reilly Media Inc., 2015, p. 16.

28 ANTONOPOULOS, Andreas M.; WOOD, Gavin. Mastering Ethereum: Building Smart Contracts and Dapps. Sebastopol (CA): O'Reilly Media, 2019, pp. 413-414 (cap. 7).

29 FERREIRA, Agata. Regulating smart contracts: Legal revolution or simply evolution? Telecommunications Policy, Volume 45, Issue 2 (2021), pp. 7-8.

interesting taxonomy for the concept of smart contracts: (i) smart contract; (ii) smart contract code; (iii) technical smart contract; (iv) smart legal contract; and (v) computable smart contract.[30]

At last, Blockchain 3.0 is the next step: Expanding the applications of this type of distributed ledger technology for other fields that are not related to currencies or financial markets like governance, education, science, smart cities, and the Internet of Things (IoT), among others.

The third generation of blockchains also focus on the scalability issues related to the blockchain trilemma[31] and the interoperability between different protocols (interactions with different blockchains). In addition to that, DeFi (decentralized finance) protocols that operate in a user-to-smart contract architecture are also one of the main characteristics of this phase.

All of the technical details that exist in the context of a DLT show that the regulation and taxation of cryptoassets should target the functions performed by the token (or protocol) regardless the name granted to it. This is what is known as the "chameleonic nature" (our premise) of cryptoassets (or tokens) which highlights the importance of having an adequate taxonomy for such a class of digital assets.[32]

In summary, it could be argued that a "digital token is simply a string of characters that constitutes a cryptographically-secure representation of a set of rights that can be used within a specific context".[33] There are, however, three positions that could be taken to identify the limits of the concept of digital token as follows:

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30 For Clack, Bakshi and Brain, such categories could be described as follows: "Smart contract: A smart contract is an automatable and enforceable agreement. Automatable by computer, although some parts may require human input and control. Enforceable either by legal enforcement of rights and obligations or via tamper-proof execution of computer code. Smart Contract Code. Where computer code (such as a script developed for a distributed ledger) is used directly to automate some aspect of an agreement between counterparties (such that the counterparties of the agreement associated with that script can be identified), we call it 'smart contract code'. Technical Smart Contract. Where such computer code is used indirectly in automating some aspect of agreements (where the code is not solely associated with one particular agreement), we currently call it a 'technical smart contract' or sometimes a 'tactical smart contract'. Smart Legal Contract. Where necessary to avoid ambiguity, we use the term 'smart legal contract' to refer to a legal agreement that is the subject of automation (e.g. whose performance is automated through the running of smart contract code). Computable Contract. A 'computable contract' is a legal contract that is understandable by both humans and computers." (CLACK, Christopher D.; BAKSHI, Vikram A.; BRAINE, Lee. Smart Contract Templates: foundations, design landscape and research directions (2017), passim. Available at: https://arxiv.org/abs/1608.00771 Accessed: 12 April 2022. CLACK, Christopher D.; BAKSHI, Vikram A.; BRAINE, Lee. Smart Contracts Terminology. Available at: https://christopherclack.com/research/smart-contracts/9-uncategorised/156-smart-contracts-terminology Accessed: 12 April 2022).

31 Decentralization, scalability and security. This trilemma problem was first identified by Vitalik Buterin (https://vitalik.ca/general/2021/04/07/sharding.html).

32 GOMES, Daniel de Paiva. Bitcoin: a tributação de criptomoedas – Da taxonomia camaleônica à tributação de criptoativos sem emissor identificado. São Paulo: Thomson Reuters Revista dos Tribunais, 2021, *passim*.

33 BLANDIN, Apolline; CLOOTS, Ann Sofie; HUSSAIN, Hatim; RAUCHS, Michel; SALEUDDIN, Rasheed; ALLEN, Jason G.; ZHANG, Bryan Zheng; CLOUD, Katherine. Global Cryptoasset Regulatory Landscape Study (April 16, 2019). University of Cambridge Faculty of Law Research Paper No. 23/2019, p. 14. Available at: https://ssrn.com/abstract=3379219 http://dx.doi.org/10.2139/ssrn.3379219. Access: March, 15th 2022.

> Broad: encompasses all types of digital tokens issued and transferred via both open and permissionless as well as closed enterprise DLT systems;
>
> Intermediate: includes all types of digital tokens issued and transferred via permissionless DLT systems with open access and public transaction history. The tokens do not necessarily need to perform an essential function for the underlying network to operate properly;
>
> Narrow: exclusively refers to digital tokens issued and transferred via open, permissionless DLT systems that play an essential role in the functioning of the underlying distributed ledger or application. There is no formal issuer; instead, a network of nodes creates new units according to a transparent and pre-defined schedule specified by an intangible software protocol. The token is inextricably linked to the underlying network by acting as an indispensable economic coordination mechanism without which the network would cease to function. (…) The 'broad' view considers any digital token issued and transferred via any type of DLT system to be a cryptoasset. The 'intermediate' view limits the scope to both open and permissionless as well as hybrid DLT systems, whereas the 'narrow' view further restricts the scope exclusively to open and permissionless infrastructure.[34]

Different criteria will give rise to the creation of different taxonomy structures that will vary according to: (i) the asset layer that allows identifying which type of asset is being referenced (backed or not; economic purpose, etc.); (ii) the technological aspects related to the type of protocol and the consensus mechanisms, among other aspects related to distributed ledger technologies; and (iii) the layer referring to the token itself (fungible, non-fungible, identifiable, or non-identifiable) and whether it is traded on a centralized or decentralized exchange, among others.[35]

From the European Union's perspective, a "basic taxonomy distinguishes between payment tokens (means of exchange or payment), investment tokens (have profit rights attached) and utility tokens (enable access to a specific product or service)".[36] The proposal for a "Regulation of The European Parliament and of the Council on Markets in Crypto-assets" (MiCA) through

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34 BLANDIN (et al.), supra n. 35, p. 16.

35 The "International Token Classification (ITC)" from ITSA – International Token Standardization Association (https://my.itsa.global/), the "Token Taxonomy Framework" from the Inter Work Alliance (IWA) (https://github.com/InterWorkAlliance/TokenTaxonomyFramework) and the taxonomy structure proposed by the "International Telecommunication Union (ITU)" (https://www.itu.int/en/about/Pages/default.aspx and https://www.itu.int/dms_pub/itu-t/opb/tut/T-TUT-DLT-2019-RF-PDF-E.pdf) are good examples of different taxonomy structures that can be used to study this subject.

36 Available at: https://www.europarl.europa.eu/legislative-train/theme-a-europe-fit-for-the-digital-age/file-crypto-assets-1 Access: April, 4th 2022.

amending Directive (EU) 2019/1937[37] classifies cryptoassets in three categories: (i) cryptoassets other than asset-referenced tokens or e-money tokens; (ii) asset-referenced tokens; and (iii) electronic money tokens (titles II, III and IV of the MiCA). Additionally, according to the MiCA, the definitions involved with DLT regulation could be described as:

> Article 3
>
> Definitions
>
> 1.For the purposes of this Regulation, the following definitions apply:
>
> (1) 'distributed ledger technology' or 'DLT' means a type of technology that support the distributed recording of encrypted data;
>
> (2) 'crypto-asset' means a digital representation of value or rights which may be transferred and stored electronically, using distributed ledger technology or similar technology;
>
> (3) 'asset-referenced token' means a type of crypto-asset that purports to maintain a stable value by referring to the value of several fiat currencies that are legal tender, one or several commodities or one or several crypto-assets, or a combination of such assets;
>
> (4) 'electronic money token' or 'e-money token' means a type of crypto-asset the main purpose of which is to be used as a means of exchange and that purports to maintain a stable value by referring to the value of a fiat currency that is legal tender;
>
> (5) 'utility token' means a type of crypto-asset which is intended to provide digital access to a good or service, available on DLT, and is only accepted by the issuer of that token; (…)

For the purposes of this paper, the authors are using the definitions set below for terms and concepts regarding different types of tokens that could be described as follows[38]:

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37 Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020PC0593 Access: April, 4th 2022.

38 These concepts are based on the chameleonic taxonomy structure presented in GOMES, supra n. 34 and are also based in the following references: HE, Dong; HABERMEIER, Karl F.; LECKOW, Ross B. (et al.). Virtual Currencies and Beyond: Initial Considerations. International Monetary Fund Staff Discussion Note. Staff Discussion Notes n. 16/3. Available at: http://www.imf.org/external/pubs/cat/longres_gsause.aspx?sk=43618&gsa=true; EUROPEAN CENTRAL BANK (EUROSYSTEM), supra n. 3; FATF, supra note. 17; BAL, Aleksandra. Stateless Virtual Money in the Tax System (June 1, 2013). 53 Eur. Taxn. 7 (2013), Journals IBFD. Available at: https://ssrn.com/abstract=2298537; BAL, Aleksandra M. Bitcoin Transactions: Recent Tax Developments and Regulatory Responses. 17 Derivs. & Fin. Instrums. 5 (2015), Journals IBFD; INTERNATIONAL MONETARY FUND (IMF). Treatment of Crypto

1. Digital currencies: A gender that comprises virtual currencies and electronic currencies. Digital currencies are means of exchange or payment in a digital format with its own unit of measure or based on fiat currency. Means of exchange, in the sense of encompassing 'virtual currencies', are not currencies (in their legal-economic sense); they are true non-monetary virtual assets used as a means of exchange (exchange) and endowed with its own unit of account. Means of payment include electronic currencies (e-money) and true fiat currency in intangible format.

2. Virtual currencies: A species of digital currency. It is a non-monetary virtual asset with its own unit of account. It can be decentralized or centralized and also it may or may not have a predetermined issuer and may or may not use cryptographic technologies and distributed ledger systems.

3. Electronic currencies (e-money): A species of digital currency. It is an electronic/ intangible representation of fiat currencies. They are a means of payment equivalent to fiat money.

4. Cryptocurrency: A non-monetary virtual asset ("virtual currencies"), non-financial, decentralized (after the creation of Bitcoin), distributed, with its own unit of account, without an identified issuer (as a rule), endowed with a universal and open character, encrypted and with a bidirectional convertibility flow, and used as a means of exchange that functions as a means of payment.

5. BLCA (Bitcoin Like Crypto Assets) or cryptoassets with no identified issuer: Cryptographic, non-financial and non-monetary virtual assets used as a medium of exchange in a peer-to-peer (decentralized and distributed) network and based on distributed ledger technologies with bidirectional convertibility and open (universal) flow without an identified issuer and no opposability to third parties.

6. Tokens or cryptoassets other than BLCA's: Encrypted virtual assets that represent a set of rights to be used in a defined context and endowed with the attribute of opposability to third parties with the existence of a predetermined issuer.

7. Payment tokens: Cryptographic non-monetary virtual assets possessing their own unit of account and traded via distributed ledger technologies but have a predetermined issuer (as a rule) used as a means of exchange that functions "as a currency".

Assets in Macroeconomic Statistics (2019). OECD. Taxing Virtual Currencies: An Overview of Tax Treatments and Emerging Tax Policy Issues. Paris: OECD, 2020. Available at: https://www.oecd.org/tax/tax-policy/taxing-virtual-currencies-an-overview-of-tax-treatments-and-emerging-tax-policy-issues.pdf.

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8. Utility tokens: Cryptographic non-monetary virtual assets that possess their own unit of account and are used to enable access (in a prepaid form) to specific goods and services (e.g. voucher exchangeable for a good or service) through applications based on distributed ledger technologies and have an identified issuer (as a rule).

9. Security tokens: Encrypted (cryptographic) virtual financial assets. These assets are traded within the scope of applications based on distributed ledger technologies and are used for investment purposes which is the reason why they are financial assets and/or securities. Security tokens can have an equity or debt (debt) nature and a predetermined issuer against which the right to receive interest or dividends is enforceable.

For the purposes of this paper, tokens or cryptoassets/digital assets (the correct term, in the authors' view) are bits of code or algorithms that represent encrypted data (information) that are decentralized and distributed through a DLT (a P2P system). These tokens or cryptoassets are the instrument related to an on-chain or off-chain asset and are used by the token holder for the exercise of a right or claim in relation to that asset.[39]

39 Alongside the chameleonic nature of tokens, the definition of tokens or cryptoassets set above will be the basis for the tax analysis that will be conducted in the next sections.

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2. Basis for the qualification of income in double tax treaties regarding operations with cryptoassets

A detailed analysis of cryptoassets for the purposes of double tax treaties[40] is important since, depending on the nature of the income (business profit, royalties, dividends, interest, etc.)[41], the tax rights will be shared between residence and source states in different manners.[42]

The qualification of cryptoassets' transactions, as a rule, can lead to the taxation under the following Articles of the 2017 OECD Model Tax Convention: (i) business profits (Article 7); (ii) dividends (Article 10); (iii) interest (Article 11); (iv) royalties (Article 12); (v) capital gains (Article 13); and (vi) other income (Article 21).[43] Thus, it is important to establish the premises regarding their content.

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40 The analysis regarding the content of Articles 10, 11, 12, 13, and 21 for purposes of qualification of software and cryptoassets was first conducted in: GOMES, supra n. 34; and GOMES, Daniel de Paiva. GOMES, Eduardo de Paiva. Parte II – Computação na Nuvem e as Diretrizes Internacionais. Capítulo 6 – A qualificação dos rendimentos da computação em nuvem: o entendimento da OCDE e o posicionamento brasileiro. In: PISCITELLI, Tathiane. BOSSA, Gisele Barra. Tributação da nuvem: conceitos tecnológicos, desafios internos e internacionais. São Paulo: Thomson Reuters, 2018, pp. 129-140

41 For the purposes of this paper, "interpreting" is a hermeneutic phenomenon that aims to understand the abstract rules while "qualification" addresses the correct understanding of the facts and the application of the rules upon these facts. Several authors confirm this distinction: SCHOUERI, Luis Eduardo. Direito tributário internacional – qualificação e substituição – tributação, no Brasil, de rendimentos provenientes de sociedade de pessoas residente na Alemanha. Revista Dialética de Direito Tributário, n. 54, mar. 2000. São Paulo, p. 127; BELLAN, Daniel Vitor. Direito Tributário Internacional: rendimentos de pessoas físicas nos tratados internacionais contra a dupla tributação. São Paulo: Saraiva, 2010, pp. 53 e 55; SILVEIRA, Rodrigo Maito da. Aplicação de Tratados Internacionais contra a Bitributação: Qualificação de Partnership Joint Ventures – Série Doutrina Tributária, Vol. I. São Paulo: Quartier Latin, 2006, p. 48 e 56; MONTEIRO, Alexandre Luiz Moares do Rêgo. Direito Tributário Internacional: A Arbitragem nos Acordos de Bitributação Celebrados pelo Brasil – Série Doutrina Tributária Vol. XX. São Paulo: Quartier Latin, 2016, p. 71.

42 For the purposes of this paper, the residence state must be understood as the place where the holder of the cryptoassets resides. The main criteria used to define the residence of individuals are domicile, residence, and nationality. Regarding legal entities, the main criteria for determining their residence are the place of incorporation, the place of effective management, or the nationality of the investor or investors who hold control of the company. This will allow evaluating what is considered to be the residence state in each scenario. Source state refers to the place where the source of production and/or the source of payment is located. The former is the place where the activity that gives rise to the income is carried out while the latter is where the values used for the effective payment of income originate.

43 The analysis of these articles should be done alongside the rules inserted in Articles 31 and 32 of the Vienna Convention on the Law of Treaties.

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The wording of Article 7 does not clarify the meaning of "profits". This term is connected with the concept of "income". Holmes[44] identified several notions that could be used to clarify the concept of income.

> The foundation concept of income is a comprehensive income model. It views income as the increase in a person's economic power over a period. In its most practical measurement form the model focuses on the sum of consumption expenditure plus net increases in wealth plus imputed income during a period (...) the broadest notion of income is psychic income, for which consumption expenditure might, for practical reasons, be a proxy. (...) a more theoretically robust surrogate, which takes account of the benefits that arise from saving or wealth accumulation, is the foundation concept of income. It will be recalled that the foundation concept can also be viewed as changes in wealth prior to consumption (Haig's approach) or as a combination of consumption and changes in net wealth over a period (Simon's approach). Both interpretation of the foundation concept of income incorporate movements in unrealized market values. (...) some economists introduced criteria such as periodicity, productivity, and permanence to determine income. There features, which have influenced the legal concept of income, constrict the broad equity-based notion of income. (...) accounting discipline has traditionally narrowed down the foundation concept of income to recognize only realized gains from market transactions. However, accountants now recognize the theoretical shortcomings of their notion of income. By adoption (at least in principle) a comprehensive income approach, they are moving towards the foundation concept of income. Some unrealized gains are now included in the accountants' notion of income, but largely on an ad hoc basis. (...) the legal concept of income is much narrower than the economic or accounting concepts because of the judicial requirement that income must not be recognized unless certain features are present in the receipts or benefits that a person obtains, the principal consequence of which is that many real economic gains or benefits fall outside the artificial legal concept of income. (...) The traditional legal interpretation of income by the courts has breached generally agreed (at least by most economists) basic conditions for an income tax system based on ability to payor taxable capacity. (...) The legal interpretation of income needs to be broadened out towards the economists' and accountants' comprehensive concepts of income to better reflect personal attributes described by optimal tax theorists, and to achieve horizontal equity.

For the purposes of the OECD Model Tax Convention, however, the term "profits" has a "broad meaning including all income derived in carrying on an enterprise. Such a broad meaning corresponds to the use of the term made in the tax laws of most OECD member countries" as established in the commentaries for Article 7.

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44 HOLMES, Kevin. The Concept of Income. A multidisciplinary analysis (Doctoral Series Academic Council 1). Amsterdam: IBFD Publications BV, 2001, pp. 242-244.

Nevertheless, according to paragraph 4 of Article 7 of the OECD Model Tax Convention, special articles of the DTT (dividends, interest, royalties) should prevail over Article 7. This is because business profits would be applicable only to "business profits which do not belong to categories of income covered by the special Articles, and, in addition, to dividends, interest, etc." (Commentary 62 on Article 7). This is the reason why it is important to address the content of the specific articles of the DTT.

In fact, the main challenge regarding the qualification of operations with cryptoassets towards any of the categories of income described in the OECD Model Tax Convention can be summarized in one statement. The chameleonic nature of cryptoassets shows that some phenomena related to such a class of assets could be qualified as hybrid instruments.

Thus, it is important to understand the reference to the boundaries in the articles mentioned above and how they interact with hybrid instruments before setting a position on the qualification of cryptoassets in DTTs.

Hybrid instruments are "instruments which are treated differently for tax purposes in the countries involved, most prominently as debt in one country and as equity in another country"[45] leading to a situation of double non-taxation or long-term tax deferral.

This type of mismatch should be analyzed through the "economic substance"[46] of the legal transaction that gave rise to the payment that is realized. In order to do so, basic circumstances of the business (known as the "underlying relationship") must be taken into consideration: entitlement to the liquidation of funds, profit sharing, losses participation, etc.

Simply stated, hybrid instruments[47] demand a comprehensive understanding about the concepts of dividends (Article 10) and interest (Article 11) in DTTs.[48] Dividends are "corporate

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45 According to OECD's definition set for in the report "Hybrid Mismatch Arrangements: tax policy and compliance issues". Available at: https://www.oecd.org/tax/aggressive/HYBRIDS_ENG_Final_October2012.pdf Accessed: 14 March 2022.

46 This approach, however, should not lead to disregarding valid legal structures. A strict economic analysis may not be sufficient to clear the ambiguity regarding "dividends versus interest".

47 According to Helminen, hybrid instruments "are often formed by adding certain elements of equity instruments to debt instruments. Interest on a loan contract may depend on company profits, the loan may be subordinated compared to other debt, it may be convertible to corporate shares or it may be perpetual. The return and risks of a debt investment may be made economically closer to the returns and risks of an equity investment. On the other hand, a share investment may be attached with a fixed return, or the shares may be redeemable. Therefore, sometimes debtor- creditor relationship may, in its economic substance, be very close to a shareholder relationship and vice versa. (...) also depend on whether the instrument includes more debt or more equity characteristics" (HELMINEN, Marjaana. The international tax law concept of dividend. Netherlands: Wolters Kluwer, 2010, p. 164-167).

48 Regarding taxing rights, the residence state may tax dividends and interest, but the source state may also tax (limited taxation at source) if the beneficial owner is a resident of the source state.

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rights" while interest is "debt-claims of every kind".[49] The former are used to refer to "shares, 'jouissance' shares or 'jouissance' rights, mining shares, founders' shares or other rights, not being debt claims, participating in profits, as well as income from other corporate rights which is subjected to the same taxation treatment as income from shares by the laws of the State of which the company making the distribution is a resident" (paragraph 3 of Article 10).

Dividends are linked to the distribution of profits made by companies (not a mere devolution of capital), meaning they are not a credit against the legal entity. They are the return (remuneration) of the investment made in the company to the shareholders or investors in proportion to the shares of each one.

The term "interest", however, means "income from debt claims of every kind, whether or not secured by mortgage and whether or not carrying a right to participate in the debtor's profits, and in particular, income from government securities and income from bonds or debentures, including premiums and prizes attaching to such securities, bonds or debentures" (Article 11) but excluding late payments' penalty charges. Commentary 18 on Article 11 of the 2017 OECD Model Tax Convention states that the term "debt claims of every kind" includes cash deposits and other securities in the form of cash or money.

There is an interesting OECD understanding that must be taken into consideration that is set forth in Commentary 21.1 of Article 11, especially in the context of cryptoassets. The wording of this provision establishes that:

> The definition of interest in the first sentence of paragraph 3 does not normally apply to payments made under certain kinds of nontraditional financial instruments where there is no underlying debt (for example, interest rate swaps). However, the definition will apply to the extent that a loan is considered to exist under a 'substance over form' rule, an 'abuse of rights' principal, or any similar doctrine.

According to Santos[50], dividends (i) arise from an equity acquisition, (ii) are legally uncertain, and (iii) may be paid in a fixed or variable basis while interest is related to a (i) credit transaction,

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49 According to Haslehner, dividends (as corporate rights) and interest (as debt-claims) should be viewed as mutually exclusive. In summary, a good criterion for identifying dividends or interest would be analyzing if the person who receives the positive results arising from the instrument shares entrepreneurial risk assumed by the debtor company. Additionally, despite the reference to domestic tax law, Art. 10(3) provides an autonomous definition of dividends as being equivalent to "corporate rights" which involve rights that are held in a company (membership right) but not those against a company (creditor or contractual relationship). The former would be qualified as dividends while the latter would be interest (HASLEHNER, Werner. Klaus Vogel on double taxation convention – Article 10. OECD MC, Wolters Kluwer, 2015, passim).

50 SANTOS, Ramon Tomazela. Controversial issues in international tax law: BEPS, tax treaties and unilateral tax measures. 1. ed. Republic of Moldova: LAP Lambert Academic Publishing, 2017, p. 234.

are (ii) legally certain, and (iii) have a fixed amount or fixed percentage. For Helminen,[51] the distinction between interest (debt) and dividends (equity) should take into consideration the: (i) risks involved; (ii) certainty regarding the return of the value invested; (iii) enforceability of the right; (iv) existence or not of voting power (governance); (v) the fact whether the payment is subject to or prioritized above other obligations in the liquidation of profits depending on the circumstances; and (vi) the fact that interest is determined by the terms of a loan agreement while dividends arise from a resolution made at a shareholders meeting level. Thus, if the substance of the contract has a debt nature with no participation in losses (secured payment with no risk of losing capital), the interest qualification should prevail regardless of the instrument's name.

When there is uncertainty about the payment related to a membership right when the holder bears risk together with the entrepreneur, the payments arising from such instrument should be qualified as dividends. According to the OECD Commentaries, the "entrepreneurial risk" (participation in profits and losses) would be the main characteristic to analyse an instrument and qualify its income as dividends or interest.

If it is not possible to qualify an instrument between Articles 10 or 11, then the positive results related to it should be qualified as "other income" in accordance with the residual rule set forth in Article 21, Its wording establishes that "items of income of a resident of a Contracting State, wherever arising, not dealt with in the foregoing Articles of this Convention shall be taxable only in that State". The comments of the OECD Model Tax Convention do not exemplify what can be considered as "other income". However, it is possible to state that "other income covered by art. 21 are atypical, unusual or minor income, which do not justify a separate conventional treatment".[52]

Some examples[53] that can qualify as "other income" could be: (i) social security annuities; (ii) maintenance payments to relatives; (iii) social security payments; (iv) game winnings and lottery prizes; (v) awards; (vi) lump sum payments to former employees; (vii) indemnities; (viii) pension plan redemption; (ix) artistic and academic awards; (x) profits from nontraditional financial instruments (v.g. derivatives) not covered by Articles 7 and 11; and (xi) rewards, etc. The application of Article 21 is residual which means that, besides analysing the possible application of Articles 10 and 11, the possibility to qualify income arising from operations with cryptoassets as royalties (Article 12) should be tested, for example.

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51 HELMINEN, supra n. 47, p. 169.

52 XAVIER, Alberto. Direito Tributário Internacional do Brasil. 8ª ed. rev. e atual. Rio de Janeiro: Forense, 2015, p. 689.

53 XAVIER, supra n. 53, pp. 689-690.

Otherwise stated, considering that smart contracts are software and that NFTs can be related to art, it is important to understand the limits of the concept of royalties for international tax purposes. According to paragraph 2 of Article 12, the term royalties is related to "payments of any kind received as a consideration for the use of, or the right to use, any copyright of literary, artistic or scientific work including cinematograph films, any patent, trade mark, design or model, plan, secret formal or process, or for information concerning industrial, commercial or scientific experience".

The qualification of income as royalties also demands the analysis of the issues regarding the qualification of income arising from operations with software. According to the OECD, in Commentary 12.1 on the article of the Model Tax Convention, software may be "described as a program, or series of programs, containing instructions for a computer required either for the operational processes of the computer itself (operational software) of for the accomplishment of other tasks (application software). It can be transferred through a variety of media, for example in writing or electronically, on a magnetic tape or disk, or on a laser disk or CD-ROM".

The qualification of income from operations with software is quite controversial, especially due to the variety of treatments given to copyrights by the legal framework of different countries around the world. This creates the possibility of qualifying income from operations with software towards articles 7, 12 or 13, depending on the content of the rights transmitted to users.[54] The income from the partial transfer of rights that are restricted only to the normal operation of the software and other digital goods (non-commercial intent) qualifies as company profit (Article 7). However, income arising from the partial transfer of rights that authorizes the commercial exploitation of the software (v.g. possibility of reproducing, distributing to the public, or modifying the software) and other digital goods is qualified as royalties (Article 12 of the CM-OCDE). In this case, therefore, the ownership of the software or digital asset remains with its owner who only licenses a portion of the rights to third parties for commercial purposes but retains ownership of the asset.

Finally, income from the transfer of the entire intellectual property, which means all rights related to the software and other digital goods (v.g. source code transfer agreement), is qualified as capital gains (Article 13).

Once the content of Articles 7, 10, 11, 12, and 21 is clear, it is possible to proceed with the analysis of Article 13 since income arising from operations with cryptoassets can also be qualified as capital gains. Article 13 of the OECD Model Tax Convention does not establish the concept of "capital gains". Instead of opting for the conceptualization of "capital gains", the wording of Article 13 focused on the idea of "alienation of property" covering: (i) the sale or barter, even if partial, of any property; (ii) expropriation; (iii) alienation of shares and securities; (iv) the sale of any right; and (v) donations and transfers derived from inheritance.

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54 GOMES and GOMES, supra n. 42, pp. 129-140; EINSEN, Oliver. VOSS, Oliver. Cloud computing under Double Tax Treaties: A German Perspective. INTERTAX, vol. 40, nº. 11, 2012, p. 586; REQUENA, José Ángel Gómez. Tax Treaty Characterization of Income Derived from Cloud Computing and 3D Printing and the Spanish Approach. INTERTAX, Volume 46, Issue 5. Kluwer Law International BV, The Netherlands, 2018, p. 413.

3. International tax issues related to bitcoin and other cryptoassets in double tax treaties

The premise of this paper is that each type of cryptoasset (token) gives rise to a different qualification, and each web3 mechanism (v.g. mining, staking, Initial Coin Offerings, etc.) also leads to a different qualification for the purposes of international tax treaties. Thus, the content and functions performed by the cryptoasset and the taxpayer's profile (natural person or legal entity; whether the main operational business is related to cryptoassets) will determine the category of income in the DTT.

The primary issues of operations with cryptoassets regarding DTTs would be (a) the lack of efficiency of the permanent establishment concept to address Web3 events and (b) the qualification of income arising from operations with cryptoassets (especially when it is impossible to identify the source of payment and source of production) such as the following: (i) businesses profits (Article 7) for the cases in which the main operational activity of the tax payer is related to the selling (or bartering) of tokens or the interaction with Web3 activities (v.g. staking, DeFi, etc.)[55] or even with an ICO (initial coin offering) or IDO (initial decentralized exchange offer); (ii) dividends (Article 10) for the security tokens of an equity nature that could be compared to corporate rights; (iii) interest (Article 11) for the cases in which there is any "lockup with yield crypto mechanism" or a DeFi (loan) application without impermanent loss risk; (iv) royalties (Article 12) for NFTs (non-fungible tokens) that have embedded intellectual property rights that generate passive income for the NFT's creator; (v) capital gains (Article 13) for selling (or barter, depending on the country) cryptoassets out of the scope of the main business of a taxpayer;

55 Considering that these phenomena have no source of payment or source of production identified (at least, easily identified), it would make more sense to qualify staking, mining and DeFi as other income. Regarding, transactional fees (in staking and mining), it would be theoretically possible to use a tool to identify the IP of the user that paid for the transactional fee. Thus, it would be possible to locate a source of payment. However, regarding coinbase transactions that generate subsidy block rewards in the Bitcoin Core context or newly minted tokens in PoS protocols, this income is self-work arising from a non-identified source which is the reason why it would be more suitable to qualify such a situation as "other income". Regarding Defi, is seems to be unfeasible to locate the source of payment/production since the income arises from the interaction with a decentralized and distributed liquidity pool governed by a smart contract. Considering the "user-to-smart contract" interaction in DeFi, the qualification in such a situation would be more adequate as "other income" regardless of the existence of impermanent loss.

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(vi) other income (Article 21) for hard forks, non-commercial airdrops, DeFi with impermanent loss, and any other event that does not fit into the previous articles since it would somehow be a nontraditional financial instrument.[56]

Operations with cryptoassets will be qualified as business profits in the cases in which the activities performed with this class of assets are the main business of the taxpayer. There will be cases, for example, for which the main activity of the legal entity is the trading (recurrent buying and selling) of cryptocurrencies. In these cases, the income resulting from the sale of these tokens will be qualified as business profits in light of Article 7 of the CM-OCDE.

Other examples of situations in which the income would be qualified as business profits are: (i) the barter of cryptoassets or their transfer as a payment in the normal course of a company's business; (ii) the acquisition of cryptoassets as transactional fees by validators that perform mining or staking as their main course of business[57]; (iii) the profits arising from the sale of effectively issued tokens with ready-to-use protocols through ICO, IDO, initial exchange offering (IEO)[58]; (iv) tokens arising from staking-as-a-service[59]; (v) cryptoassets used for exchange that act as a means of payment for the acquisition of goods or services will be qualified as business profits for the taxpayer that receives the cryptoasset but will also be qualified as capital gains for the one that used them to pay for such goods and services.

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56 Real estate tokenization is beginning to grow worldwide. The authors cannot disregard the possibility that the income arising from a "real estate NFT" could be qualified as income arising from immovable property (Article 6), for example.

57 The authors understand that subsidy block rewards and newly self-created tokens acquired by validators are not profits or income. Instead, they are self-work and should not be taxed at the moment that they are received. This should occur only upon the future alienation as business profits or capital gains depending on the main business conducted by the taxpayer. Additionally, regarding the transactional fees, a caveat must be made: The absence of a source of payment and source of production and the fact that the payor's identification would be extremely difficult (or even impossible) could justify the qualification of this income (fees from staking and transactional fees in the Bitcoin Core) as other income since Article 21 grants taxing rights to the residence state for other income wherever it arises.

58 If the initial sale of the tokens is done in a context in which the protocol is not fully operational or when there is no sale of tokens but instead the sale of a Simple Agreement for Future Tokens (SAFT), it is possible to state that there is no income. This is because the results arising from the ICO/IDO/IEO are a liability from the issuer's perspective who will be responsible for issuing the token and creating the network. Thus, it would be important to analyse the agreement to understand if the individuals buying tokens (or rights to "future tokens") will bear (or not) the entrepreneurial risk of the issuer. The application of dividends and interest articles, however, would not be possible because there is no payment realized by the "protocol" to the future token holders. The only options available in the context of SAFTs or when the protocol is not fully operational would be: (i) recognize that there is no revenue, differing the revenue recognition to the moment (in the future) when the tokens are issued and useful (before this moment, there is a crowdfunding phase) and (ii) qualify the results arising from an ICO/IDO/IEO as "other income".

59 This is a typical provision of service. The qualification as business profits, however, may be affected by the type of staking performed, i.e. staking or delegated staking, since the custody of the cryptoassets will be transferred from the token holder to the SaaS (staking-as-a-service) provider in the first case (staking) but will not be transferred in the latter (delegated proof-of-stake). If a staking pool, for example, is organized by one identified entity, the validators that interact with that pool could possibly consider that their fees derived from that entities' pool. This is the reason why the existing a source of payment and the activities performed by the validator could be qualified as business profits (at least theoretically). A case-by-case analysis must be conducted in order to assess if the income would be qualified as business profits or other income.

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Income arising from the alienation of cryptoassets from the taxpayer's normal course of business will be qualified as capital gains (Article 13). However, paragraphs 1 and 3 of Article 13 may not be applicable since they are related to real estate, ships, and aircrafts.[60] Article 13 (2) of the OECD Model Tax Convention could be relevant since its application is related to "gains from the alienation of movable property forming part of the business property of a permanent establishment". This paragraph would apply only when the alienation of cryptoassets is related to a permanent establishment. Capital gains arising from it could be qualified in paragraph 4 of Article 13 only if such tokens could be considered as equivalent to "shares or comparable interests, such as interests in a partnership or trust" (v.g. tokenized securities).

Nevertheless, despite the possible application of paragraphs 2 and 4 of Article 13 to operations with cryptoassets, probably the most important rule regarding the qualification of income arising from their alienation as capital gains is that described in paragraph 5. It is applicable to gains "from the alienation of any property, other than that referred to in paragraphs 1, 2, 3 and 4".[61]

The qualification of security tokens as dividends (Article 10) or interest (Article 11), however, demands the application of the criteria set forth in the previous topic related to the qualification of income arising from hybrid instruments. The former demands the evaluation of the "entrepreneurial risk" involved (or not) in the token. In cases when there is uncertainty about the payment related to the security token and when the token holder bears risk together with the token's issuer, the payments arising from it could be qualified as dividends.

However, in the majority of protocols that possess some type of passive income mechanism, the income arising from such cryptoassets does not come from a shareholding position nor is it paid by a centralized body. Non-monetary and non-financial tokens or cryptoassets cannot be considered as equity securities because income arising from their use would hardly be qualified as dividends.

In turn, if the token holder does not bear entrepreneurial risk and the security token is inserted into a creditor-debtor relationship with the token issuer, there is a possibility of qualifying the income arising from the debt security token as interest. It is important to highlight the fact that Commentary 18 on Article 11 of the 2017 OECD Model Tax Convention states that the term "debt claims of every kind" includes cash deposits and other securities in the form of cash or money[62] which can include security tokens. They are referred in money which is the

60 Nevertheless, hypothetically (and exceptionally), the authors of this paper understand that it is possible to create a reasoning by which NFTs or other fungible tokens with content directly related to the income arising from the sale of ownership of real estate, ships, and aircrafts could be qualified as capital gains under the rules of paragraphs 1 and 3 of Article 13.

61 In this scenario, taxation occurs only in the alienator's residence state.

62 Later, it will be demonstrated that this is not sufficient for qualifying income arising from security tokens as interest.

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reason why it would be theoretically possible to admit the qualification of the income arising from them as interest.[63]

In summary, equity security tokens could be qualified as dividends (Article 10) if they can be considered as equivalents to corporate shares. Debt security tokens could be qualified as interest (Article 11) if they are equivalent to a debt claim. However, this reasoning requires a more detailed analysis regarding the technology itself that leads to the qualification of income arising from holding security tokens as other income (Article 21). A case-by-case analysis must be conducted in order to assess if Articles 10 and 11 or 21 would be applicable, and the conclusion must be set based on the existence (or not) of a centralized counterparty against whom the enforceability of the token could be exercised.

First of all, the enforceability of the taxation based on such qualification (dividends/interest) would only be feasible in a scenario in which the "know your costumer" (KYC) rules were applied by the issuer.[64] Otherwise, it would be extremely difficult to identify the residence of the token holders.[65]

Actually, the definitions of dividends and interest were not created to encompass nontraditional financial instruments (Commentary 21.1 of Article 11). There are tokens for which the income shares the characteristics of dividends and interest at the same time. This is the reason why they could be conceptualized as nontraditional financial instruments. Thus, hybrid tokens would be true hybrid instruments thus income arising from them should be qualified as other income.

As indicated previously, "other income" could be applied to: (i) social security annuities; (ii) maintenance payments to relatives; (iii) social security payments; (iv) game winnings[66] and lottery prizes; (v) awards; (vi) lump sum payments to former employees; (vii) indemnities; (viii) pension plan redemptions; (ix) artistic and academic awards; (x) profits from nontraditional financial instruments (v.g derivatives) not covered by Articles 7 and 11; and (xi) rewards, etc.

In this context, Article 21 (other income) could be applicable for income arising from: (i) security on-chain tokens (despite possessing equity or debt nature) by which the token holder

63 Usually, values arising from investments in cryptoassets are not equivalent to interest since there is no obligational relationship between the creditor and debtor from which interest could possibly emanate as remuneration on capital. Additionally, there is no central authority responsible for issuing and controlling cryptoassets after the deployment of the smart contract. Hence, in the case of amounts arising from investments in this type of virtual currency, there is no creditor-debtor relationship since the token holder does not have a debt-claim that can be enforced against a third party that justifies the receipt of interest. Therefore, there is no binding debt-claim relationship. The absence of an underlying debt linked to the values arising from the token operation shows the impossibility of qualifying such values as interest.

64 It will be demonstrated at the end of this section that the Web3 model poses difficulties to the qualification as dividends or interest.

65 Even though there is software like CypherTrace that could allow the geolocation of the token holder, it would still be necessary to discover the identity of the taxpayer behind the IP address.

66 Awards in play-to-earn games could qualify as other income.

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interacts directly with a user-to-smart contract interface; (ii) DeFi (decentralized finance) protocols; and (iii) GameFi.

In DeFi protocols, the user usually provides loans and receives income for this lending operation which could be regarded as a debt-claim (interest). However, if the taxpayer is exposed to impermanent loss, this situation would rule out the possibility of qualifying such income as interest. In fact, even in DeFi protocols that do not expose the user to impermanent loss, he would have no debt-claim directly exercisable against the creator of the protocol nor against the non-identified user that took the loan (the borrower). The token holder (loan provider) interacts with the protocol in a "user-to-smart contract" model, meaning that the token holder that locks up tokens is interacting with a decentralized, distributed, standalone software. Thus, it would be more logical to qualify all income arising from DeFi protocols as "other income".

In GameFi (play-to-earn), there are two ways of receiving income. As a first option, it may occur (in the form of tokens) from self-work or as a reward for winning battles or competitions in the game. Additionally, cryptogames may have yield programs with lockup mechanisms that lead the user to interact with a smart contract. This is not necessarily in a direct relationship with the company that owns the intellectual property of the game which is why such token holders are also incurring several different types of risks. Thus, income arising from such operations would be better qualified under the rules of Article 21 (other income).

Therefore, regarding the qualification as dividends or interest, such an approach would be restricted to tokenized securities and tokenized debt claims which are different from DeFi and security on-chain tokens that are completely decentralized and distributed.

Once the cases in which it would be possible to qualify income arising from operations with cryptoassets as (i) business profits, (ii) capital gains, (iii) dividends, (iv) interest, and (v) other income have been clarified, it is important to address the cases that could possibly be qualified as royalties. The importance of analysing Article 12 (royalties) stems from the fact that this provision is applicable to operations with software. This analysis is necessary since cryptoassets are directly related to smart contracts (software). Additionally, Commentary 17.1 of Article 12 establishes that the guidelines regarding the qualification of software are also applicable to transactions made with other types of digital products, meaning they could encompass tokens.

Therefore, considering Article 12 (royalties) can also be applied to other types of digital products and also that cryptoassets are related to smart contracts (software), it is necessary to evaluate the feasibility of applying said reasoning (qualification as royalties) to values arising from operations with tokens.

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In a situation in which a content creator mints an NFT for which its content is related to an artistic work, for example, and all of the subsequent sales of the NFT will generate new payments for the creator, the qualification of such recurrent income as royalties would be possible.[67] A second scenario that could raise doubts would be when an entity created a layer 1 protocol (v.g.: Ethereum) for which an open-source smart contract was deployed and is currently decentralized and distributed.

Ordinary people that make transactions within the protocol must pay gas fees "to the protocol" (not to the entity). Moreover, companies that create decentralized apps (Dapps) and 2nd layer protocols using the 1st layer protocol in a "commercial way" need to also pay gas fees for its usage. The payment of gas fees in these scenarios could be qualified as business profits (ordinary people paying gas fees) and royalties (Dapps creators), respectively. It could be argued that Article 7 would be applicable to the gas fees when users pay them for the protocols in a daily non-commercial way in order to see their transactions realized.

As explained previously, the income from the partial transfer of rights that are restricted only to the normal operation of the software and other digital goods (non-commercial intent) is qualified as company profit (Article 7). In turn, income arising from the partial transfer of rights that authorizes the commercial exploitation of the software (v.g. possibility of reproducing or distributing to the public or modifying the software) and other digital goods is qualified as royalties (Article 12 of the CM-OCDE).

In this perspective, it could be argued that Article 12 would be applicable to the gas fees when Dapps or companies use the layer 1 infrastructure in a commercial way since they or developers would need to pay gas fees to the protocols.

This reasoning would be incorrect, in the authors view. This is simply because for income to be qualified as royalties, the ownership of the software or digital asset should remain with its owner (creator), who only licenses a portion of his rights to third parties for private (non-commercial) or commercial purposes, but always retaining ownership of the asset.

In fact, as described previously, the gas fees are not paid to those who created the protocol. Moreover, the smart contract is an open-source decentralized and distributed software (that can be subject to hard forks) This means that royalties' qualification could not be applicable because, as with the deployment of the immutable software (smart contract) on the blockchain, the developer ceases to be the owner which indicates that this situation is the opposite of the concept of ownership.

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67 The same caveat regarding the lack of the source of payment and source of production would be applicable which could lead to concluding that, even in this case (artistic NFT), the better solution would be "other income".

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In the example, the gas fees are actually paid to the validators of the network, and they lack a source of payment and a source of production. The validation (data processing) activity that is remunerated by fees paid to the validator should be qualified as business profits or other income depending on the way such activities are conducted.[68]

Nevertheless, still regarding the qualification as royalties, it is worth mentioning that cryptoassets or tokens units (v.g. bitcoins, ether, etc.) are not to be confused with the software (smart contract) itself. As seen before, software is a program or series of programs that contain instructions for a computer. Therefore, the decentralized and distributed software that runs the operating protocol is not to be confused with the units of account of the tokens that are transacted between users and serve as a means of exchange that acts as a payment.

The software that makes the technology work should not be mixed with the units of account (the tokens) that are used by the token holder. Even though cryptoassets are a line of code, they do not contain operating instructions for the user's computer nor are they used for making it perform certain functions. For a computer code to be software, it must be functional, enabling the operation of a piece of hardware or being used for reading and editing other digital files or other software. This is not the case for tokens since such assets are lines of code (digital files) representing values that are owned by each user but are not in their possession[69] and are registered in the blockchain. Tokens are not used for enabling the operation of machines, instruments, or other equipment nor for reading and editing other digital files or other software.

From everything presented above, the best possibilities for qualifying income arising from operations with cryptoassets would be: (i) business profits (Article 7); (ii) capital gains (Article 13); and (iii) other income (Article 21).

To conclude the case analysis proposed in this section, the last phenomenon to be analyzed would be that related to decentralized autonomous organizations (DAOs). According to Commentaries 24 and 26-28 of Article 10, distributions of profits made by partnerships (pass-through entities) are not considered dividends unless the tax treatment that is given to such partnerships is similar to that granted to companies limited by shares[70]. This is sufficient for concluding that income arising from DAOs are not dividends since DAOs are similar to a general partnership or an atypical pass-through "entity". Additionally, it could be argued that income arising from a DAO could be qualified as interest because there is no risk involved in this unincorporated structure. However, a DAO is not an entity nor a central party against which a

68 Regarding the conflict between business profits and other income, check supra n. 59.

69 There is no possession of tokens. Instead, the users possess private keys that give access to a wallet allowing the expenditure of such tokens.

70 OECD (2017), Model Tax Convention on Income and on Capital: Condensed Version 2017, OECD Publishing, Paris, pp. 239-241. Disponível em: https://doi.org/10.1787/mtc_cond-2017-en. Access: 12 nov. 2020.

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debt-claim could possibly be enforced. For these reasons, income arising from one and benefiting token holders could only be qualified as other income and taxed directly to the token holders.

The last challenging question regarding DAOs in the international taxation context would be their characterization (or not) as a permanent establishment. Since 1977, the concept of a permanent establishment set forth in Article 5 has not been extensively modified. This situation changed with Action Plan 7 of the OECD BEPS Project since it modified the way that auxiliary activities exemptions are applied. In fact, the new rules proposed by the Action Plan 7 are not focusing on establishing new wording for the concept of permanent establishment. Instead, it presents a different interpretation and the exceptions. According to Article 5 of the OECD Model Tax Convention, a permanent establishment still means a "fixed place of business through which the business of an enterprise is wholly or partly carried on". This concept still depends on the existence of a fixed (physical) placed of business, and it is considered an independent entity from the company to which it is related. Thus, assets and liabilities will be assigned based on the functions performed and risks assumed.

Moreover, the auxiliary activities described in paragraph 4 of Article 5 are still exemptions to the characterization of a permanent establishment. However, this exemption will be applied only if the "overall activity of the fixed place of business, is of a preparatory or auxiliary character". Stated differently, it must be analysed whether, in relation to the main activities performed by the company, the said ancillary activities are genuinely of that nature for the development of its core business. Thus, even a distribution center or warehouse for storing goods could be characterized as a permanent establishment depending on the main activity carried out by the company (this would be a type of antifragmentation rule).

When the definition of permanent establishment according to the Web3 reality is analysed considering the challenges brought by decentralized and distributed cryptoassets, it is clear that the concept of permanent establishment is outdated and cannot qualify DAOs as permanent establishments.

Can they be considered permanent establishments? Moreover, considering that non-custodial wallets and smart contracts are software, can it be stated that such intangible phenomenon qualify as permanent establishments?[71] The answer to both questions is negative since the concept of a permanent establishment depends on the concept of a "fixed place of business". DAOs, non-custodial wallets, and any other intangible, decentralized, and distributed phenomenon are activities carried out in a digital or intangible scenario (purely on-chain). Thus, the inexistence of a fixed place of business that could be considered as a permanent establishment is clear.

71 The authors understand that not even the personal scope of a permanent establishment (dependent agent) would be applicable since such structures (DAOs and non-custodial wallets) are software and not legal binding contracts. The utilities and interactions created by DAOs and non-custodial wallets, for example, are not sufficient for creating obligations on behalf of third parties and, as a rule, such "structures" interact with unidentified cryptoholders.

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The discussion about digital events that could not be absorbed by the current concept of permanent is not new in international tax law, especially when taking into consideration the fact that the OECD has been studying this topic (the limitation inherent to the tangible definition of a permanent establishment's concept) since the e-commerce era.[72] At that time, OECD's report "Taxation and Electronic Commerce: Implementing the Ottawa Taxation Framework Conditions" considered that: (i) a computer server could be qualified as a permanent establishment;[73] (ii) software and websites are not permanent establishments since both are intangible phenomenon; and (iii) a computer server will be a permanent establishment as long as the server is at the disposal of the foreign company and regardless of the existence of company personnel[74] in the place.[75]

A server[76] will not be a permanent establishment for the simple reason that it is a server. The functions performed by the hardware equipment in relation to the company's main activity should be investigated in order to verify its importance to revenue generation.[77]

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72 OECD (2001). Taxation and electronic commerce: implementing the Ottawa Taxation Framework Conditions, OECD Publishing, Paris. Available at: http://dx.doi.org/10.1787/9789264189799-en Accessed: 23 March 2022.

73 Commentary 125 of Article 5: "125. Computer equipment at a given location may only constitute a permanent establishment if it meets the requirement of being fixed. In the case of a server, what is relevant is not the possibility of the server being moved, but whether it is in fact moved. In order to constitute a fixed place of business, a server will need to be located at a certain place for a sufficient period of time so as to become fixed within the meaning of paragraph 1." OECD (2017), supra n. 64.

74 Commentary 127 of Article 5: "127. Where an enterprise operates computer equipment at a particular location, a permanent establishment may exist even though no personnel of that enterprise is required at that location for the operation of the equipment. The presence of personnel is not necessary to consider that an enterprise wholly or partly carries on its business at a location when no personnel are in fact required to carry on business activities at that location. This conclusion applies to electronic commerce to the same extent that it applies with respect to other activities in which equipment operates automatically, e.g. automatic pumping equipment used in the exploitation of natural resources." OECD (2017), supra n. 64.

75 Commentary 123 of Article 5: "123. Whilst a location where automated equipment is operated by an enterprise may constitute a permanent establishment in the country where it is situated (see below), a distinction needs to be made between computer equipment, which may be set up at a location so as to constitute a permanent establishment under certain circumstances, and the data and software which is used by, or stored on, that equipment. For instance, an Internet web site, which is a combination of software and electronic data, does not in itself constitute tangible property. It therefore does not have a location that can constitute a 'place of business' as there is no 'facility such as premises or, in certain instances, machinery or equipment' (see paragraph 6 above) as far as the software and data constituting that web site is concerned. On the other hand, the server on which the web site is stored and through which it is accessible is a piece of equipment having a physical location and such location may thus constitute a "fixed place of business" of the enterprise that operates that server." OECD (2017), supra n. 64.

76 Even in a scenario in which a server is qualified as a permanent establishment, it would still be necessary to address the challenges related to the attribution of profits to such a permanent establishment by a "functional and factual analysis of the risks assumed by the PE and of how the PE uses the assets" and "arm's length principle" (v.g. identification of who owns the IP in a Web3 scenario is usually unfeasible since smart contracts are immutable and open source). (BAL, Aleksandra. Tax Implications of *Cloud computing* – How Real Taxes Fit into Virtual Clouds. Bulletin for International Taxation, v. 66, n. 6, jun. 2012, p. 335-339; BAL, Aleksandra; GUTIÉRREZ, Carlos. Chapter 9: Taxation of the Digital Economy. In: COTRUT, Madalina et al. (Ed.). International Tax Structures in the BEPS Era: An Analysis of Anti-Abuse Measures (IBFD 2015), Online Books IBFD; GIANNI, Monica. The OECD's flawed and dated approach to computer servers creating permanent establishments. Vanderbilt Journal of Entertainment & Technology Law, v. 17, n. 1, 2014. p 15-18).

77 MCGILL, Sandra P.; YODER, Lowell D. From storefronts to servers to service providers: stretching the permanent establishment definition to accommodate new business models. Taxes – The Tax Magazine, v. 81, n. 3, mar. 2003. p. 157.

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These premises lead to the following conclusion. If websites (Web2) are not permanent establishments because they lack the "fixed place of business" requisite for the characterization of a permanent establishment, non-custodial wallets and smart contracts (software) could never be considered as such for the (i) person that interacts with them or (ii) even the developer, especially when we take into consideration that this phenomena are decentralized and distributed (and, usually, open source), meaning that they are not locate in one specific place, but spread all over the network.

DAOs cannot be considered permanent establishments since they lack physical presence[78] (they are an unincorporated group of people that only interact via Web3 software) and do not possess a fixed place of business of their own. They can be considered as something similar to an unincorporated association or a general partnership, meaning that they are pass-through entities for tax purposes. In summary, taxation should occur at the hands of the DAOs' token holders.

In summary, it is very unlike that Web3 phenomena (DAOs, non-custodial wallets, and smart contracts) could be qualified as permanent establishments since they are an intangible, decentralized, and distributed technology with no fixed place of business that could possibly be considered as a physical place at the disposal of anybody.

The only possible case in which the characterization of a permanent establishment could be imagined would be that related to "mining farms" (warehouses full of hardware that would engage in proof-of-work consensus mechanism validation with the purposes of receiving subsidy block rewards or transactional fees). The reason for that is simple as the "fixed place of business" criteria would have been met.

78 Depending on the local laws of the states involved, if the criteria used for considering one as a resident of a contract state is the "place of management", it would theoretically be possible to consider a DAO as a resident where the essential managerial decisions are taken. However, the decentralized and distributed nature of such an arrangement (DAO) would pose difficulties in identifying the country where its effective management is realized. This would be practically impossible in a high decentralized DAO across token holders located in several different jurisdictions. By using software like Cyphertrace, it would be possible to geolocate the IP related to the tokens. Still, the effective identification would demand that the internet service provider (connection provider) is able to expose the identity of the person "behind the IP" (it is important to also consider if this "exposing" of the IP's user identity would be feasible regarding the IP's generation).

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4. Conclusion

The traditional rules for the qualification of income arising from operations with cryptoassets lack efficiency for addressing the challenges arising from Web3 phenomena since they are nontraditional, hybrid, decentralized, and distributed instruments.

Generally, the majority of scenarios analysed would lead to the qualification of income as business profits (cryptoassets as a means of payment for provision of services and selling goods), capital gains (disposal/alienation of crypto), or other income (all of the "crypto events" that are qualified as hybrid instruments or that lack an effective source of payment).

It is interesting to see that the residual rule set forth in Article 21 (other income) begins to be a protagonist for the purposes of the qualification of income arising from operations with cryptoassets mainly because it taxes other income "wherever arising". In practice, this expression ("wherever arising") allows the application of Article 21 to cases in which there is no source of income identified which is exactly the case for the main crypto phenomena.

The application of Article 21 seems to be an interesting solution since it would free the tax authorities from creating assumptions and fictions in order to try to "choose" (or "guess") where the operation took place (based on where the token seller and token holder are located, for example).

As described before, tokens are everywhere and nowhere at the same time. Being mere accounting inputs and outputs, it would be technically wrong to say that international operations with tokens could actually take place in a specific location. Besides that, the token holder does not interact with the token issuer directly. Instead, it is a user-to-smart contract interaction. If the protocol is open source, decentralized, and distributed and the user interacts with an immutable smart contract, the "wherever arising" expression set forth in Article 21 (other income) seems to be a good option to address such challenges.

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