TAXATION IN THE DIGITAL SECTOR: CHALLENGES AND OPPORTUNITIES FOR TAX AND ECONOMIC LAW

LA TRIBUTACIÓN EN EL SECTOR DIGITAL: DESAFÍOS Y OPORTUNIDADES PARA EL DERECHO FISCAL Y ECONÓMICO

TRIBUTAÇÃO NO SETOR DIGITAL: DESAFIOS E OPORTUNIDADES PARA O DIREITO TRIBUTÁRIO E ECONÔMICO

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Abstract

Digital economy has reshaped business models and exposed significant gaps in traditional tax systems rooted in physical and territorial principles. This article explores core challenges in digital taxation, including tax residency, aggressive planning, avoidance, evasion, and the influence of blockchain and cryptocurrencies. It examines international regulatory efforts by the OECD and the EU, as well as developments in Latin America, with emphasis on Ecuador. Based on qualitative doctrinal and regulatory analysis, the study underscores the need for fairer, more effective tax frameworks and recommends digital services taxes, greater international coordination, and blockchain integration to improve transparency and revenue collection.

Keywords: Tax law; Economic law; Digital law; Tax-digital interconnectivity; Latin America; Ecuador

Resumen

La economía digital ha transformado los modelos de negocio y evidenciado importantes vacíos en los sistemas tributarios tradicionales, concebidos para realidades físicas y territoriales. Este artículo analiza los principales desafíos de la tributación digital, como la residencia fiscal, la planificación agresiva, la evasión y elusión, y el impacto de tecnologías como *blockchain* y las criptomonedas. Examina respuestas regulatorias internacionales impulsadas por la OCDE y la UE, así como desarrollos en América Latina, con énfasis en Ecuador. A partir de un enfoque cualitativo, doctrinal y normativo, el estudio destaca la necesidad de marcos fiscales más justos y eficaces, y recomienda impuestos a los servicios digitales, mayor coordinación internacional y el uso de *blockchain* para fortalecer la transparencia y la recaudación

Palabras clave: Derecho tributario; Derecho económico; Derecho digital; Interconectividad fiscal-digital; América Latina; Ecuador

Resumo

A economia digital transformou os modelos de negócios e revelou lacunas significativas nos sistemas tributários tradicionais, concebidos para realidades físicas

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e territoriais. Este artigo analisa os principais desafios da tributação digital, como residência fiscal, planejamento tributário agressivo, evasão e elisão fiscal, além do impacto de tecnologias como blockchain e criptomoedas. Examina respostas regulatórias internacionais lideradas pela OCDE e pela UE, bem como desenvolvimentos na América Latina, com foco no Equador. Com base em uma abordagem qualitativa, doutrinária e normativa, o estudo destaca a necessidade de marcos fiscais mais justos e eficazes, recomendando impostos sobre serviços digitais, maior coordenação internacional e o uso de blockchain para promover transparência e aumentar a arrecadação.

Palavras-chave: Direito Tributário; Direito Econômico; Direito Digital; Conectividade fiscal e digital; América Latina; Equador

INTRODUCTION

Over the past decade, the global economy has undergone a profound transformation driven by the rise of digital technologies. E-commerce platforms, cloud services, mobile applications, social media, and the increasing use of cryptocurrencies have redefined traditional business models, giving rise to a new economic paradigm. In this context, the digital sector has emerged as a key driver of economic growth, while also challenging traditional tax frameworks, which were originally designed for a physical and territorially confined economy.

Taxation in the digital environment presents significant challenges due to the transnational nature of digital businesses, the dematerialization of operations, and the absence of physical presence in jurisdictions where income is generated. This situation raises concerns about tax fairness, tax competition, and the effectiveness of traditional tax systems in addressing new forms of value creation. Moreover, the development of emerging technologies –such as artificial intelligence, blockchain, and cryptocurrencies– adds further complexity, making it increasingly difficult for legislators and tax administrations to regulate and enforce tax compliance effectively.

Tax law and economic law must face the challenge of adapting fiscal regulations to an ever-evolving reality. Core concepts such as tax residency and profit attribution –fundamental to international taxation– have become outdated or difficult to apply in this new digital landscape. Failure to adapt could lead to loss of state revenue and increased incentives for tax evasion and avoidance, ultimately undermining tax equity and fair competition.

In response, there is a growing need to innovate in tax collection systems by leveraging technology to close regulatory gaps and enhance transparency. The automation of tax processes, the implementation of digital services taxes (DSTs), and the application of blockchain technologies may contribute to greater efficiency and fairness. This issue has gained international attention, as shown by initiatives such as the OECD's Inclusive Framework on BEPS, which aims to reform international taxation in line with the realities of the digital economy.

Against this backdrop, the central research question arises: How can tax systems effectively adapt to the digitalization of the economy without compromising tax equity or encouraging tax avoidance? This article explores the main challenges and opportunities of taxation in the digital sector, offering strategies to ensure an effective and equitable regulatory framework for this evolving economic ecosystem.

CONCEPTUAL AND THEORETICAL FRAMEWORK

Definition of the Digital Economy

Technological advancements have profoundly transformed the structure of sciences and economic models, generating new dynamics of production, exchange, and consumption. In this regard, Rincón de Parra states:

> Technology reshapes the structure of sciences and creates a new space for knowledge generation through the design of solutions to specific problems. Thus, when referring to technology, it implies a representation of the world based on the design of social, political, economic, cultural, and ecological relationships, alongside conditions that generate both scientific and technological knowledge. (Rincón de Parra 2007,184)

Within this framework, the digital economy is based on the generation, processing, and utilization of digital data as the central element in value creation. In this context, Armijos-Orellana et al. (2023, 76) emphasize that digital data is the critical element of the digital economy, as its transformation into useful information enables economic agents to optimize processes and enhance real-time decision-making.

The digital economy is closely linked to the information society, a concept that describes socio-economic systems in which information is widely employed across all areas of activity (Joel 2001, 80). However, while the information society emphasizes the dissemination and access to knowledge, the digital economy extends this notion by integrating digital technologies into the production and commercialization of goods and services. Consequently, its scope is not limited to communication and information exchange but also redefines market structures and global economic dynamics.[1]

In this regard, Choi and Kim (2016, 49) define the digital economy as follows:

> The digital economy refers to the economic ecosystem in which digital technologies, such as the Internet, mobile devices, artificial intelligence, blockchain, and Big Data, are fundamental to the production, distribution, and consumption of goods and services. This economic model is characterized by the digitization of processes and the interconnection of actors through online platforms, transforming traditional sectors and giving rise to new forms of business, employment, and trade. The digital economy drives innovation, the creation of new markets, and efficiency improvements, but it also poses challenges in terms of regulation, privacy, and equitable access to technology. (Choi and Kim 2016, 49)

In light of the above, the digital economy refers to the economic activities that arise from the integration of digital technologies into the production, distribution, and commercialization of goods and services. Its impact extends beyond the mere adoption of technological tools, as it fundamentally transforms the relationships between businesses, consumers, and governments. This economic model is characterized by the use of digital platforms, communication networks, Big Data, artificial intelligence, e-commerce, and cryptocurrencies, among other elements, generating both new opportunities and significant regulatory challenges, particularly in the realm of digital taxation and fiscal equity.

Key Actors in the Digital Sector

The digital sector has assumed a central role in the evolution of the global economy, transforming the way goods and services are produced, exchanged, and consumed. The sustained growth of the information technology (IT) sector has driven productivity, employment generation, and economic competitiveness worldwide (Leal Güemez & Porras Duarte 2019, 20). However, this development has not been homogeneous. According to a 2006 report by the United Nations

1 United Nations Conference on Trade and Development (UNCTAD), "Digital Economy Report 2019: Value Creation and Capture – Implications for Developing Countries" (Geneva: UNCTAD, 2019). https://unctad.org/es/system/files/official-document/der2019_overview_es.pdf

Conference on Trade and Development (UNCTAD), significant inequalities persist in access to, and participation in, the digital economy between developed and developing countries.[2] Castells (2001, 522) warns of this phenomenon, stating:

> Countries and regions may effectively be marginalized from the global economy by lacking the means to participate in Internet use and value creation for the global market, as evidenced by the unequal spatial pattern of the rapid worldwide diffusion of the Internet. (Castells 2001, 522)

In this context, the digital sector is structured as an interconnected ecosystem of businesses, governments, and users, where each actor plays a crucial role in innovation, connectivity, and economic growth. Given the significance of its function, it is essential to analyze its characteristics and contributions within this environment.

Technology companies such as Google, Apple, Microsoft, Amazon, and Meta lead the development of digital infrastructure, artificial intelligence, cloud computing, and social networks. They dominate technological innovation and control vast digital ecosystems that connect millions of users worldwide. Their market power concentration has sparked debates over competition in digital markets and the need for antitrust regulations.

Software developers and tech startups, including independent creators, play a fundamental role in generating innovative solutions, ranging from productivity platforms to automation tools. In numerous instances, these entities have successfully challenged the dominance of major corporations, contributing to greater sectoral diversification.

Telecommunications providers such as AT&T, Verizon, Telefónica, and Vodafone are essential to global connectivity, as they provide the network infrastructure required for digitalization. The deployment of 5G technology presents both opportunities and regulatory challenges, given its impact on the speed, coverage, and accessibility of digital services.

E-commerce platforms such as Amazon, eBay, and Alibaba have transformed global trade by enabling cross-border transactions and redefining traditional distribution models. Beyond facilitating the exchange of goods, they have developed proprietary financial ecosystems that integrate digital payment systems, intelligent logistics, and data-driven market strategies to optimize the user experience.

Governments and regulatory bodies, while not directly involved in technology creation, play a central role in regulating the digital sector. Initiatives such as the General Data Protection Regulation (GDPR) in Europe have set global precedents for privacy and digital rights. Nonetheless, important challenges persist in balancing regulation, innovation, and fiscal oversight of digital activities.

End users and consumers, though often overlooked, directly shape the evolution of digital platforms. Their interaction with social networks, applications, and cloud services determines market trends and influences industry dynamics through data consumption and service personalization.

The digital sector, through the integration of these interdependent actors, constitutes a dynamic and ever-evolving environment. Its regulation and development not only affect the global economy but also shape the equity and sustainability of the future digital ecosystem.

Evolution of Taxation in Digital Environments

The rapid expansion of the digital economy has transformed the global landscape, generating new business models, transactions, and commercial relationships that transcend physical borders. In this context, taxation in digital environments has emerged as a major challenge for tax systems around the world. Traditional tax structures, originally designed for localized and physical economies, have proven insufficient to address the global

2 United Nations Conference on Trade and Development (UNCTAD), "Information Economy Report 2006: The Development Perspective," Geneva, 2006.

and often intangible nature of digital activities. One of the primary concerns is that many digital enterprises can shift profits to low-tax jurisdictions, thereby avoiding fiscal obligations in the countries where economic value is created. As e-commerce platforms, cloud-based services, social networks, and cryptocurrencies become increasingly prominent, tax authorities face the complex task of adapting their regulatory frameworks to ensure both fairness and efficiency in taxation.

New digital business models, along with the complexity of certain e-commerce operations, have found on the Internet an ideal medium for relocating profits to jurisdictions with minimal or no taxation–and in some cases, for avoiding tax liabilities entirely. The difficulty in monitoring such transactions and the lack of effective control mechanisms have facilitated aggressive tax planning strategies that erode the tax base in jurisdictions where value is genuinely produced. As Borrego Zabala notes:

> The rapid evolution of new technologies often exposes the limitations of legislators, who, at times, fall behind in addressing the complex operations emerging almost daily in the virtual world. This forces tax administrations to engage in a continuous exercise of updating and adapting tax regulations to align with the new realities brought by the digital economy. (Borrego Zabala 2014, 51)

From a tax perspective, tax systems have had to reconsider how e-commerce transactions are classified to ensure proper taxation. One of the most common classification methods is based on the type of transaction. In this regard, three primary models are commonly distinguished: B2B (business-to-business), involving transactions between enterprises; B2C (business-to-consumer), where companies sell directly to end users; and C2C (consumer-to-consumer), in which consumers exchange goods or services through digital platforms such as eBay or Mercado Libre.

Another significant classification criterion is the nature of the good or service involved. While some goods are tangible–such as electronics or clothing–others are intangible, including software, music, and multimedia content. This distinction is critical, as many countries apply different tax regimes to physical goods and digital services, creating asymmetries in tax burdens.

From a territorial perspective, tax administrations have also had to reassess digital commerce based on the presence or absence of physical operations. In domestic models, businesses maintain a physical establishment or branch in the country where goods or services are consumed, enabling the application of traditional income and value-added tax (VAT) rules. By contrast, cross-border models involve digital transactions in which the platform lacks physical presence in the destination country, raising substantial challenges for enforcement and effective taxation.

E-commerce, due to its flexibility and cross-jurisdictional reach, presents a unique challenge for contemporary tax systems. Adapting tax regulations to this evolving landscape is essential to prevent base erosion and tax avoidance in the digital domain.

Key Concepts in Tax and Economic Law

Tax law and economic law are foundational branches of the legal system that regulate the relationship between the state, individuals, and businesses within the fiscal and economic spheres. These disciplines are closely interconnected, as tax regulation directly influences economic policymaking and the equitable allocation of public resources.

One of the core concepts in tax law is taxation, understood as the set of taxes, fees, and contributions that individuals and corporations are obligated to pay to the state to finance public administration. Taxes serve as the primary means of public funding and are generally categorized into direct taxes, such as income tax, and indirect taxes, such as the value-added tax (VAT). Two essential elements of any tax system are the tax base, which refers to the amount subject to taxation, and the tax rate, which determines the applicable percentage.

Another fundamental principle is the ability-to-pay principle, which holds that taxation should be proportional to the economic capacity of taxpayers. This concept is intrinsically linked to the principle of tax justice, which aims to ensure that the tax system does

not impose disproportionate burdens on vulnerable sectors. Recently, various courts in Latin America have reaffirmed the relevance of this principle. For example, in Mexico, the Supreme Court has held that taxation must not only ensure public revenues but also promote a more equitable redistribution of national income (Villalobos López 2023, 27).

From a legal perspective, the principle of tax legality establishes that no tax may be levied without a formal legal provision, thereby guaranteeing transparency and legal certainty in the implementation of the tax system. This principle protects taxpayers from potential state arbitrariness and strengthens the predictability of the fiscal framework.

In contrast, economic law governs market operations and state intervention in the economy, aiming to balance economic development with the protection of consumer and business rights. A central concept in this domain is economic competition, which seeks to prevent monopolistic practices or anti-competitive behavior that could distort markets and harm consumers. Economic regulation also encompasses rules overseeing strategic sectors such as energy, telecommunications, and the financial system, ensuring that these operate under principles of equity and efficiency.

The relationship between tax law and economic law is so close that the former can be understood as the set of rules governing how the state secures financial resources through citizen contributions. In this regard, Sedeño López (2021, 26) affirms that both disciplines are interdependent, as tax regulations can shape public policies that support a specific economic model within a country or region.

In this context, new economic models have emerged that prioritize sustainability and social innovation, such as the social economy, the collaborative economy, and the economy of the common good. These models have not only been examined from an economic standpoint but also require an interdisciplinary legal analysis that incorporates sociological, environmental, and normative considerations, particularly within the scope of tax law (Sedeño López 2021, 52).

The evolution of taxation in the digital economy necessitates a reconsideration of these key concepts to develop regulatory frameworks that ensure the fair taxation of new forms of wealth generation and foster an efficient tax system in a globalized and digitalized environment.

CHALLENGES OF TAXATION IN THE DIGITAL SECTOR

The digital economy has assumed a central role in global economic activity, posing unprecedented challenges for international taxation. The transnational nature of digital services has created the need for coordinated regulatory efforts among countries to prevent tax distortions and ensure a fair distribution of tax revenues. In this context, major technology companies–such as Google, Amazon, and Meta–have generated substantial income from digital services provided to users in various jurisdictions, without such revenues necessarily being taxed in the countries where their consumers reside (Quimbayo Díaz 2022, 297). This situation has intensified the debate on the urgent need to reform the international tax system to effectively capture the value created in the digital economy.

The challenges of digital taxation stem from the rapid expansion of digital commerce and the globalization of business operations. One of the core issues is the lack of physical presence of digital companies in the jurisdictions where they operate, which complicates the application of traditional tax rules. E-commerce platforms, cloud-based services, and mobile applications can operate across multiple countries without falling under local tax regimes, thereby creating regulatory gaps and contributing to market fragmentation.

Another significant challenge is the taxation of digital services, whose intangible nature complicates classification and the application of conventional taxes. Value-Added Tax (VAT) and corporate income tax are

not always applied uniformly to these transactions, resulting in regulatory inconsistencies and potential competitive advantages for companies that exploit jurisdictional differences to minimize their tax burdens.

Aggressive tax planning and tax avoidance have also become increasingly prominent. Many digital enterprises shift their profits to low-tax jurisdictions, thereby eroding the tax base of the countries where economic value is generated. The absence of harmonized tax regulations enables companies to structure their operations to be taxed in more favorable jurisdictions, weakening state revenue collection and creating unfair competition for local businesses.

The collaborative economy and platform-based business models–such as Uber, Airbnb, and other digital marketplaces–introduce further complexities. By facilitating transactions between users without requiring a centralized physical presence, these platforms hinder tax enforcement and the identification of liable taxpayers. This phenomenon compels governments to develop innovative control mechanisms and withholding tax schemes to ensure the effective taxation of digital transactions.

Additionally, the lack of harmonization in international tax regulations has led to the proliferation of unilateral measures, such as digital services taxes (DSTs) implemented in various jurisdictions across Europe and Latin America. These measures have sparked controversy and conflict among countries, as well as tensions with technology companies that have questioned the fairness of such regulations.

In the absence of a global consensus on tax system reform, the Organization for Economic Co-operation and Development (OECD) has played a key role in seeking coordinated solutions. Through its Inclusive Framework on Base Erosion and Profit Shifting (BEPS), the OECD has engaged 137 countries in a consultative process aimed at designing a comprehensive reform of international taxation. This initiative is structured around two fundamental pillars:

1. Reallocation of taxing rights: Aims to redistribute the profits of multinational corporations, allowing the countries where consumers are located to tax a portion of these revenues.
2. Global Anti-Base Erosion (GloBE) Rule: Proposes the implementation of a global minimum tax for multinational enterprises, intended to reduce tax competition among jurisdictions and limit tax base erosion.

On May 31, 2019, the OECD published a work program aimed at reaching a global agreement on the taxation of multinational enterprises. Although a final solution was expected in 2020, the COVID-19 pandemic delayed its implementation until 2021 (Quimbayo Díaz 2022, 298).

Taxation in the digital sector faces structural challenges, including issues of territoriality, service classification, tax evasion, and the lack of global harmonization. Addressing these challenges requires coordinated efforts among governments, international organizations, and businesses to develop fairer and more adaptable tax frameworks suited to the evolving dynamics of the digital market. International cooperation and the modernization of tax systems are essential to ensure an efficient, equitable, and sustainable tax environment in the digital era.

Globalization and Localization of Digital Operations

Globalization and localization of digital operations have profoundly transformed the economy and present significant challenges for tax regulation. Globalization has allowed digital companies to operate without geographical boundaries, offering products and services worldwide without the need for a physical presence in the countries where their consumers are located. This has created a misalignment with traditional tax frameworks, as many national tax systems continue to rely on physical presence to establish tax liability. Consequently, income can be easily shifted to low-tax jurisdictions, undermining states' revenue collection capacity and generating inequities in competition between local and global enterprises.

The expansion of economic globalization has been closely linked to technological progress in areas such as microelectronics, robotics, biotechnology, artificial

intelligence, data processing, and computing. These innovations have fueled large-scale digital production and trade while contributing to the concentration of wealth in specific markets and job losses in traditional sectors. At the same time, trade liberalization and the removal of restrictions on capital flows have been promoted by multilateral organizations such as the World Trade Organization (WTO), and through regional agreements such as the North American Free Trade Agreement (NAFTA) and the Southern Common Market (Mercosur). However, these dynamics have also exposed tensions in the harmonization of tax regulations, underscoring the need for a more coordinated international regulatory framework (Jiménez 2013, 124).

Conversely, the localization of digital operations presents a critical regulatory challenge, as many income-generating economic activities in a jurisdiction lack any physical presence there. This has prompted various states to adopt alternative mechanisms for taxing digital transactions, such as digital services taxes (DSTs) or new income allocation criteria based on the consumer's location. However, the absence of international coordination in these efforts has led to tax disputes and the risk of double taxation, affecting both businesses and tax administrations.

Regulating the intersection of globalization and localization in digital operations is essential to prevent market distortions and ensure a fair competitive environment. The lack of fiscal harmonization may encourage regulatory arbitrage, enabling certain companies to artificially reduce their tax burdens by shifting profits to low-tax jurisdictions. Moreover, an inefficient regulatory framework can generate uncertainty for investors and hinder the growth of the digital sector.

To address these challenges, it is imperative to develop balanced tax policies that allow for the effective taxation of digital companies without hampering innovation. International cooperation plays a key role in this process, as a coordinated approach would facilitate the implementation of fairer tax mechanisms and prevent cross-border disputes. Measures such as the adoption of common rules for allocating digital income, the creation of global tax registries, and the strengthening of information exchange between tax administrations could contribute to more efficient and equitable regulation of digital trade.

The development of tax policies tailored to this new reality will allow for enhanced revenue collection without hindering the growth of the digital sector. Ensuring that technology companies fairly contribute to the public resources of the countries where they generate value constitutes an urgent challenge that demands state collaboration and the modernization of regulatory frameworks.

Difficulties in Determining Tax Residency in the Digital Era

E-commerce and, more broadly, the business models of the digital economy have intensified challenges in international and domestic tax law, as a company may generate profits in a country without maintaining a taxable physical presence within its territory. This situation has facilitated the implementation of aggressive tax planning strategies, including tax avoidance and evasion practices, which reduce the tax burden of large corporations without substantial economic justification.

In response to this issue, international organizations have promoted initiatives to ensure greater fairness and efficiency in tax collection. In 2013, at the request of the G20, the Organization for Economic Co-operation and Development (OECD) introduced the BEPS (Base Erosion and Profit Shifting) Action Plan, aimed at restructuring the international tax system and countering tax optimization strategies used by multinational corporations to artificially shift their profits to low- or zero-tax jurisdictions (Gutiérrez Taborda 2015, 3).

The determination of tax residency is a crucial aspect of international tax law, as it establishes the tax obligations of individuals and entities within a specific jurisdiction. However, the lack of uniform criteria among countries has created difficulties for both taxpayers and tax administrations, particularly in a digital and globalized context. Discrepancies in residency rules have led to scenarios of double taxation or, conversely, to instances where income is not taxed in any jurisdiction, thereby undermining tax equity and revenue efficiency.

The absence of harmonization in tax residency criteria has resulted in disputes among jurisdictions and increased legal uncertainty for businesses and individuals. In some cases, multinational enterprises have leveraged these regulatory differences to establish tax structures in jurisdictions with favorable tax regimes, thereby minimizing their tax burden without maintaining a genuine economic presence. This situation disadvantages local businesses, which are unable to access similar tax optimization strategies and are obliged to pay taxes in full in their countries of operation.

For this reason, it is essential to develop clear and coordinated regulatory frameworks at the international level. A well-structured legal system would not only provide greater transparency in international transactions but also reduce unfair tax competition and prevent double taxation conflicts among countries. Furthermore, a consistent regulatory framework would reduce administrative costs for both taxpayers and tax authorities, thereby optimizing the efficiency of the tax system and fostering a fairer and more predictable tax environment.

In this context, there has been growing support for the establishment of uniform international standards–or, at a minimum, closer cooperation among countries–to clearly define tax residency criteria in the digital era. Regulating this aspect has become a priority to ensure a fairer tax system, one that is adapted to the increasing mobility of individuals, capital, and services in the global economy.

The Limited Physical Presence of Digital Service Providers

The increasing digitalization of the global economy has created significant tax challenges, particularly regarding the taxation of digital services. One of the most pressing issues is the difficulty of taxing digital service providers due to their lack of physical presence in the countries where they operate. The absence of tangible infrastructure and personnel in the jurisdictions where they generate revenue has allowed many digital companies to minimize their tax burden or even avoid taxation in certain territories. This situation has created a fiscal gap that affects state revenue collection and leads to unfair competition with local businesses, which remain subject to full taxation.

The lack of an updated regulatory framework adapted to the digital economy has enabled these platforms to structure their operations in a way that allows them to be taxed in jurisdictions with more favorable tax regimes, regardless of where the actual value is created. This phenomenon not only impacts tax revenues but also undermines confidence in the tax system and hinders economic development in emerging economies.

Given this scenario, it is crucial for countries to establish legal frameworks that adapt taxation to the realities of digital services, incorporating mechanisms to tax income generated within their territories without requiring a physical presence. Among these measures, the creation of specific digital services taxes, the implementation of withholding tax mechanisms, and the strengthening of multilateral agreements to prevent tax avoidance are particularly relevant.

Additionally, international cooperation is essential to prevent tax arbitrage and promote a global tax system aligned with the principles of tax equity and economic competitiveness. The work of organizations such as the OECD in developing a global tax framework has been key to enhancing coordination among countries and avoiding the fragmentation of tax regulations.

In this context, asymmetric information constitutes a key factor in generating transaction costs within the digital economy. This problem arises when participants in a transaction do not have the same access to relevant information, generating imbalances in decision-making. As Salas Fumás (2001, 6) states: "The most immediate consequence of asymmetric information is that low-quality products or services 'drive out' high-quality ones from the market, preventing potentially beneficial transactions for both parties from being completed".

This issue is exacerbated in the digital environment, where the lack of information about service quality or provider identity creates uncertainty among consumers and complicates the accurate valuation of goods and services offered. Often, users must base their purchasing

decisions on factors such as price or delivery speed rather than the actual quality of the product or service.

Nevertheless, digitalization also offers tools to mitigate problems arising from asymmetric information. The more accessible and transparent the information is to economic agents, the lower the transaction costs and the more efficient the market exchanges become. The development of information technologies has improved the collection, transmission, and processing of data in digital markets, facilitating informed decision-making and reducing the risks of uncertainty in transactions (Rodríguez López et al. 2003, 9).

Tax evasion and aggressive tax optimization have become increasingly relevant in the context of digital platforms, given the ease with which these entities operate across multiple jurisdictions, complicating tax oversight. While tax evasion involves the use of illegal strategies to avoid paying taxes, tax optimization refers to the application of legal mechanisms to reduce tax liabilities, often by exploiting regulatory loopholes and inconsistencies between national tax laws. The digital environment has facilitated both practices, leading to competitive imbalances and affecting countries' tax revenues.

Large technology platforms have developed tax structures that allow them to shift profits to low- or zero-tax jurisdictions, thereby avoiding taxation in the territories where they actually generate economic value. This phenomenon, known as Base Erosion and Profit Shifting (BEPS), has raised concerns among international organizations, particularly the OECD, which seeks to mitigate the impact of these strategies on global fiscal stability.

The lack of regulatory harmonization across jurisdictions has allowed these companies to minimize their tax burden without engaging in illegal activities, placing local businesses at a disadvantage, as they are required to fully comply with tax obligations in their respective countries of operation. Beyond reducing fiscal revenues, this situation undermines confidence in the tax system, fostering perceptions of inequality and unfair taxation.

To address these challenges, it is essential for governments to adopt regulatory frameworks that combat both tax evasion and aggressive tax optimization without discouraging investment and innovation. Legislation should focus on strengthening tax transparency mechanisms and promoting international cooperation, ensuring the detection and penalization of abusive tax practices. It is necessary to develop legal tools that effectively tax income generated in the digital environment, regardless of a company's physical location.

Tax evasion and avoidance have been persistent concerns for governments, as they significantly reduce the fiscal resources needed to finance essential public services and infrastructure investments. The cost of recovering these lost revenues is often high, requiring states to allocate substantial resources to audits, enforcement, and litigation. However, the deployment of advanced technologies has proven to be an effective strategy for enhancing tax fraud detection and improving revenue collection capabilities.

The use of computerized tools, big data analytics, and cloud-based systems has allowed tax administrations to significantly strengthen their oversight functions. These technologies facilitate the collection and real-time processing of large volumes of data, enabling the identification of suspicious patterns and enhancing the detection of tax irregularities. Additionally, the automation of administrative procedures has lowered compliance costs and optimized tax monitoring and recovery efforts.

In this regard, forensic computing has emerged as a key tool in the fight against tax evasion. Regional forensic computing laboratories have proven to be an effective solution for decentralizing tax enforcement while preserving centralized investigative oversight. Their capacity to store and process data across multiple jurisdictions facilitates the identification of transnational tax evasion networks. As González-Robayo et al. (2019, 326) note:

> Regional forensic computing laboratories would be the most relevant in a country's tax framework, as they allow for the decentralization of tools for use across multiple geographic regions while maintaining control over investigative procedures,

> leveraging more efficient and persuasive forensic skills in different tax offices, and benefiting from enhanced processing and storage capacities that facilitate forensic analysis. (González-Robayo et al. 2019, 326)

The combination of effective legislation and the use of advanced technologies will strengthen efforts to combat tax evasion and aggressive tax optimization in the digital environment. Ensuring fair and transparent taxation in the digital economy represents an urgent challenge for governments, requiring a comprehensive approach that integrates international cooperation, technological innovation, and regulatory reforms tailored to the evolving dynamics of the digital economy.

Impact of Emerging Technologies on Taxation

Emerging technologies, such as blockchain and cryptocurrencies, have radically transformed the way transactions are conducted, and assets are managed globally. While these innovations have created new economic and financial opportunities, they also pose significant challenges for traditional tax systems, which were not designed to regulate decentralized digital assets.

Blockchain, as a decentralized and frequently pseudonymous transaction system, complicates the traceability of financial flows and the determination of taxpayers' tax residency. This limitation affects governments' capacity to monitor and enforce tax compliance in operations carried out through distributed networks, where conventional financial intermediaries do not report information to tax authorities. Likewise, cryptocurrencies operate in a borderless global market, which hinders the effective application of traditional tax rules, increases the risk of tax evasion, and complicates revenue collection.

Given this scenario, it is crucial for legislators to implement regulatory frameworks adapted to these new realities. An adequate legal framework should establish clear guidelines on the taxation of cryptocurrency transactions, including criteria for tax residency, valuation of digital assets, and reporting obligations. Furthermore, enhancing interoperability between national and international tax systems is essential to prevent double taxation issues or the complete absence of taxation in certain jurisdictions.

Despite these challenges, emerging technologies also offer opportunities to enhance the efficiency and transparency of tax collection. Blockchain could serve as a tool for tax auditing and control, allowing for immutable transaction records and automated tax payments through smart contracts. These innovations could optimize tax oversight and reduce administrative costs in tax management, enabling a more efficient and less fraud-prone tax system.

The cryptocurrency ecosystem is structured around three key elements: mining, financing platforms, and exchanges. Mining is the process by which transactions are validated and new crypto-assets are issued within the blockchain network. This process requires high computational power, which is compensated through cryptocurrency transaction fees.

On the other hand, Initial Coin Offerings (ICOs) emerged as an alternative financing model for cryptocurrency-based projects. In this framework, investors provide capital by purchasing crypto-assets or stakes in blockchain startups. However, the lack of regulation has led to a rise in fraudulent activities within this sector.[3]

Exchanges are platforms where cryptocurrencies are traded for other digital currencies or traditional fiat currencies. These intermediaries play a fundamental role in crypto market liquidity, but they also pose critical regulatory and tax compliance challenges. The absence of uniform regulations has allowed some exchanges to operate in jurisdictions with lax regulatory frameworks, facilitating tax evasion and money laundering practices.

According to Cabrera Soto and Lage Codorniu, "mining ensures the issuance of cryptocurrencies, ICOs finance their operations, while exchanges enable their interconnection with other markets" (2022, 2).

Given the impact of these technologies on taxation, governments must advance the design of regulations

3 Bank for International Settlements (BIS), *Annual Economic Report 2018* (Basel: BIS, 2018). https://www.bis.org/publ/arpdf/ar2018e.htm.

that not only prevent tax abuse but also promote a fair and balanced digital economy. Striking an equilibrium between crypto market oversight and preserving the sector's dynamism and innovation is crucial for fostering a sustainable digital financial ecosystem.

OPPORTUNITIES FOR TAXATION IN THE DIGITAL SECTOR

The expansion of the digital sector has created a wide array of opportunities for taxation, enabling governments to improve tax collection without stifling innovation. Nevertheless, these opportunities also entail challenges related to tax fairness and the adaptation of existing legal frameworks. Taxation in the digital environment must ensure that companies contribute equitably to the economies where they generate value, while preventing distortions in competition between digital and traditional business models.

E-commerce platforms, cloud services, and mobile applications have given rise to new business models that generate substantial revenue. However, national tax systems are frequently ill-equipped to address the transnational and decentralized nature of these activities, complicating effective tax enforcement and leaving room for tax evasion.

In this regard, digitalization has transformed payment methods, with significant implications for tax oversight and revenue collection. Transactions may be classified based on their context–either in-person or online–and the payment method employed–cash or electronic. The key distinction lies in whether the transaction occurs within a physical or virtual space, which affects access to broader markets and alters logistical cost structures. Furthermore, the payment method used influences transaction costs and may have specific tax consequences.

Although all payment instruments entail costs, those associated with cash handling are often underestimated, as they depend on sales volume and are less visible compared to electronic payment methods. The use of cash entails operational expenses, including infrastructure for cash counting, transaction recording, and risks associated with theft, errors, or counterfeiting (Arango-Arango et al. 2017).

Conversely, electronic payment methods involve additional transaction costs, such as commissions, account maintenance fees, and equipment rental. Some digital platforms require supplementary administrative processes to track received funds, whereas payment tools like credit cards or QR codes may reduce administrative burdens. Moreover, tax withholdings imposed by card issuers, virtual wallet providers, or banks constitute another relevant factor. Although these withholdings generate tax credits, they may also lead to financial costs due to the temporary immobilization of the retained funds (Pedroni et al. 2022, 172).

An effective tax framework could leverage the potential of digital technologies to optimize tax collection, creating more practical mechanisms for taxing digital transactions without imposing an excessive burden on taxpayers. Regulating the digital sector would not only enhance transparency and reduce tax evasion but also enable a fairer distribution of tax revenues between developed and developing countries (Pedroni et al. 2022, 173).

The creation of a tax framework adapted to the digital era would strengthen the global economy, ensuring that digital services contribute equitably to public finances without stifling innovation or slowing the sector's growth.

International Cooperation and Tax Harmonization

In a globalized world where economies are increasingly interconnected, international cooperation and tax harmonization have become crucial elements for ensuring a fair and efficient tax system. Differences in tax policies between countries have led to issues such as tax evasion, regulatory arbitrage, and unfair competition among businesses, affecting both tax

revenues and fiscal equity. In this context, cooperation among governments is essential to establish common tax rules that enable more effective taxation of transnational economic activities.

Strengthening international cooperation in taxation would enhance global efforts to combat tax fraud and evasion. A key mechanism for achieving this is the exchange of information between tax administrations, which would improve transparency and facilitate compliance with tax obligations. Moreover, tax harmonization would contribute to reducing disparities in tax burdens across jurisdictions, promoting a fairer tax environment–particularly for developing countries, which often face greater challenges in taxing multinational entities.

The adoption of multilateral agreements, such as those promoted by the Organization for Economic Cooperation and Development (OECD), represents a key step toward building a common tax framework that prevents the abuse of tax avoidance strategies. These agreements aim to foster more balanced tax competition, preventing companies from artificially shifting profits to low-tax jurisdictions.

The implementation of international tax standards would not only enhance the efficiency of national tax systems but also contribute to the stability of the global economic environment. Greater fiscal cooperation among countries would allow for the creation of a coherent regulatory framework, mitigating the negative effects of regulatory fragmentation and reducing the impact of base erosion and profit shifting (BEPS).[4]

In this regard, the OECD/G20 Inclusive Framework reached a historic political agreement in October 2021 to reform international tax rules. This consensus, endorsed by over 130 countries, is structured around two key pillars. Pillar One reallocates part of the taxing rights over multinational enterprises to jurisdictions where users and consumers are located, regardless of physical presence. Pillar Two establishes a global minimum corporate tax rate of 15%, aimed at reducing tax competition among countries and limiting the shifting of profits to low-tax jurisdictions.[5]

Regulating international tax cooperation and harmonization constitutes a crucial step toward consolidating a fair, transparent, and sustainable tax system in the digital economy. Achieving this objective requires effective coordination between governments and international organizations to ensure that tax reforms are implemented consistently and equitably, without creating trade barriers or hindering technological innovation.

NEW TAXATION STRATEGIES AND ECONOMIC SUSTAINABILITY

The development of taxation strategies aimed at economic sustainability has become essential in a global context marked by urgent environmental and economic challenges. Economic sustainability not only entails ensuring long-term growth but also strengthening the capacity of countries and businesses to finance the transition toward more responsible and sustainable models. Within this framework, taxation plays a key role in funding public policies that foster economic practices with lower environmental impact and promote social equity.

Tax systems can serve as instruments to incentivize or discourage specific economic activities, making them pivotal in the transition toward a greener economy.[6] Fiscal strategies should align with the Sustainable Development Goals (SDGs), ensuring that tax revenues not only address immediate needs but also

4 Organisation for Economic Co-operation and Development (OECD). 2013. "Action Plan on Base Erosion and Profit Shifting". https://www.oecd.org/es/publications/2013/07/action-plan-on-base-erosion-and-profit-shifting_g1g30e67.html
5 Organisation for Economic Co-operation and Development (OECD). 2021. "Statement on a Two-Pillar Solution to Address the Tax Challenges Arising from the Digitalisation of the Economy". https://www.oecd.org/en/about/news/announcements/2021/10/statement-on-a-two-pillar-solution-to-address-the-tax-challenges-arising-from-the-digitalisation-of-the-economy-october-2021.html
6 Bank for International Settlements. 2018. "Annual Economic Report 2018". https://www.bis.org/publ/arpdf/ar2018_es.htm

drive investment in renewable energy, sustainable infrastructure, and clean technologies.

The shift to a low-carbon economy requires a revision of existing tax policies. Key measures include the introduction of carbon taxes, tax incentives for companies that adopt sustainable practices, and compensation mechanisms to mitigate economic and environmental inequalities. These tools contribute to correcting negative externalities, promoting more equitable economic development that is environmentally respectful.

The design of taxation strategies adapted to economic sustainability will allow governments to manage resources more efficiently and improve social equity. Moreover, these strategies can act as catalysts for innovation, facilitating the adoption of sustainable business practices. The implementation of sustainability-focused tax policies can reshape the global economic model while enhancing economies' resilience to environmental and financial crises.[7]

Future research can analyze the impact of sustainable tax policies across various industries and regions, helping to identify factors that influence the adoption of responsible practices in different economic sectors. This approach would contribute to identifying the most effective fiscal strategies based on context and their alignment with the SDGs.

Additionally, longitudinal studies can provide evidence on the relationship between sustainability and corporate financial performance. Examining corporate performance before and after the implementation of sustainable practices would offer a better understanding of the link between sustainability and long-term profitability. Furthermore, exploring the barriers and enablers of adopting sustainable fiscal strategies is crucial, as their success depends not only on existing regulations but also on the incentives and constraints businesses face in implementing them (Roffé & González 2024, 219).

This study is limited to open-access articles and two databases; thus, expanding the research to additional sources and a broader range of databases would provide a more comprehensive understanding of the relationship between sustainability and financial performance. Such studies would contribute to the development of more effective global taxation strategies, promoting a balance between economic growth and environmental sustainability (Roffé & González 2024, 220).

CONCLUSIONS

The digitalization of the economy has profoundly transformed global markets, challenging traditional tax frameworks and demanding a substantive reformulation of regulatory strategies. This article has shown that digital business models–characterized by their cross-border reach, lack of physical presence, and increasing reliance on intangible assets–require tax systems capable of capturing the value generated in jurisdictions where users, data, and consumption are located.

In this regard, the updating of domestic tax regulations must be accompanied by the development of international consensus. Unilateral, isolated measures have proven insufficient to address the complexity of digital transactions and frequently generate legal uncertainty or risks of double taxation. Initiatives such as the OECD/G20 Inclusive Framework on BEPS and the implementation of Pillars One and Two represent fundamental progress toward a coordinated global response. These efforts seek to reallocate taxing rights and ensure a minimum level of corporate taxation, thereby reducing harmful tax competition and reinforcing fiscal equity.

Technological innovation, in turn, has opened new possibilities for tax enforcement and oversight.

7 Organisation for Economic Co-operation and Development (OECD). 2015. "Aligning Policies for a Low-carbon Economy". https://www.oecd.org/environment/Aligning-Policies-for-a-Low-carbon-Economy.pdf

The integration of technologies such as blockchain, artificial intelligence, and big data analytics into tax administrations has strengthened their capacity to detect patterns of evasion, process large volumes of transactional information, and automate auditing procedures. These innovations not only improve efficiency but also reduce compliance costs and enhance transparency, provided they are applied with clear legal safeguards.

Moreover, the digital transformation of the economy is closely linked to sustainability objectives. Tax policy must support the transition toward environmentally responsible models by correcting negative externalities and promoting investment in clean technologies and inclusive development. The alignment of tax systems with the Sustainable Development Goals (SDGs) thus emerges not only as a fiscal necessity but also as a global ethical responsibility.

Looking ahead, the evolution of digital taxation will depend on states' institutional capacity to adapt their legal frameworks, the international community's commitment to advancing harmonized solutions, and the ability of tax administrations to incorporate emerging technologies without undermining the dynamism of the digital sector. Future research should continue exploring the fiscal implications of new technologies, the effectiveness of digital tax instruments, and the long-term impacts of sustainability-oriented tax strategies. A tax system suited to the digital age must be not only efficient and enforceable but also fair, transparent, and globally coherent.

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