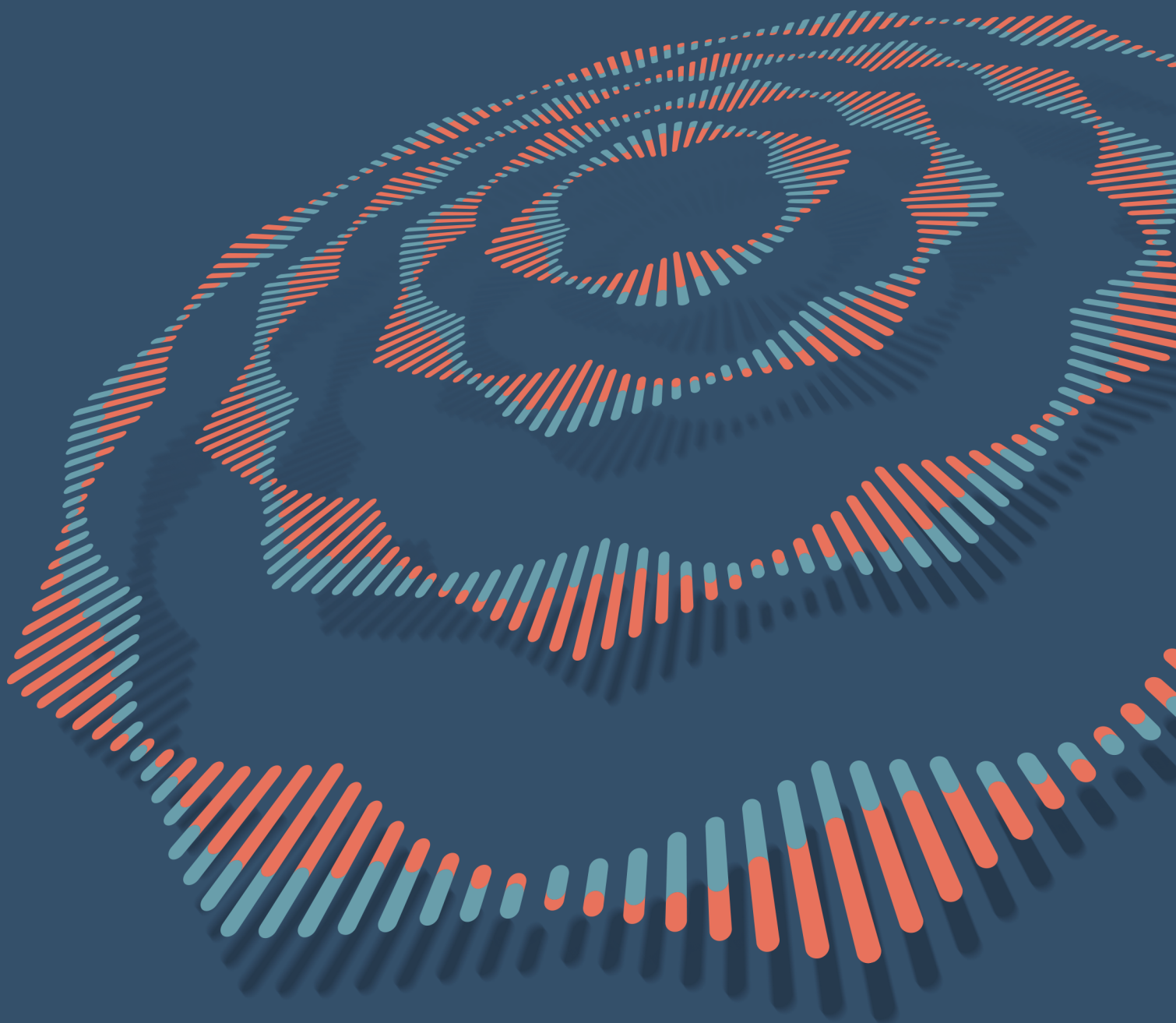# Tax Harmonisation in the EU
Intelligent Tax Administration

dGen

BEYOND

Tax Harmonisation in the EU
Intelligent Tax Administration

December, 2020

Written and researched by Tomás Le Terrien Fragoso

dGen is a not-for-profit think tank based in Berlin, Germany. We focus on how blockchain technology can contribute to a decentralized future in Europe and what this might mean for people, society, private entities, and the public sector over the coming decades.

We're working with a team of researchers exploring how decentralisation will shape our future. Our insight reports focus on specific topics and industries to drive ideas for adoption in Europe. To find out more, please visit us at dgen.org.

dGen, 2020

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Foreword

Covid-19 is at the nexus of many developments this year. But, aside from the serious health crisis and severe impact on our daily lives, Covid-19's fallout has largely been economic. Unlike the majority of the others, these impacts will not go away with the release of a vaccine.

So, while everyone continues to watch developments, and waits to see when travel restrictions will lift, cities will reopen, and business can resume as usual, we must prepare.

So far, in the EU, we have been largely lucky. The €750 billion in grants and loans that the EU approved for individual and business support have been fundamental to keeping many of us afloat.

Taxes will be the main means of settling these debts. But, increasing taxes on people already working their way out of a recession is often counterproductive. This demands that taxes be collected more precisely and used better.

Governments have been working to make tax systems more effective for centuries, though. Making these systems less expensive and more transparent for both taxpayers and tax administrations needs to be the main focus.

As €150 billion of the bailout was dedicated to digital investments, with a special mention of modernising tax systems, the importance of technology to improve tax systems, and overcome this crisis while mitigating the strain on citizens.

In this report, we take a look at some of the issues that have been apparent in the EU for a while, and how technology can help to minimise these issues. While technology will not be the cure-all, it can play a significant role in improving them.

With the end of the pandemic on our mind, we must prepare for what comes next. Improving our tax system is just one aspect of this, but one that should be at the top of the list. With better systems in place, the EU can continue to provide some of the greatest services, while reducing the strain on citizens and residents.

Jake Stott & Nick Dijkstra

Founding Board, dGen

Executive Summary

While this will minimise strain on citizens now, the burden of repaying it must not fall entirely on future generations.

To tackle the economic crisis caused by the Covid-19 pandemic, the EU's reached a consensus on a recovery package totalling €750 billion in loans and grants. While this will minimise strain on citizens now, the burden of repaying it must not fall entirely on future generations.

The primary means to pay for this is tax collection, as it has always been the main source of revenue for nations. But, raising taxes at this moment could be counterproductive. So, how can the EU support the economic recovery without increasing pressure on taxpayers? Improving the efficiency of current tax regulations and policies, especilly with the application of intelligent, emerging technologies, stands out.

Although the EU is in an advantageous position in terms of tax cooperation and interaction - thanks to its integrated system and market - there are still some major issues barring more complete harmonisation, namely:

● Competitive Tax

● Data exchange

● Barriers to Fundamental Freedoms.

By achieving a more integrated tax policy and harmonised tax system, it has the opportunity to address a broad set of tax related topics.

Emerging data management solutions - such as AI and blockchain - might improve and simplify tax collection and compliance, but can also make the whole system more transparent and trustworthy. Their application is already being debated, not only in the private and academic sectors, but also by the public sector.

Blockchain

Private blockchains stand to improve specific areas of taxation by providing a single system for:

● Real-time exchange of taxpayers data

● Cryptographically secure and immutable storage of taxpayers' data

● Real-time tax collection and refunds, and reducing

middlemen and administrative burden for tax collection/ reporting.

Beyond a shared tax records system, smart contracts - or pre-programmed computer code with set triggers - could automate the application of complex tax law and collection of taxes. This can be applied to several areas of tax.

Value Added Tax (VAT)

VAT is a consumption tax applicable to all commercial activities. As businesses act as middlemen in collecting and reporting VAT transactions, this system is prone to human error and very time-consuming - especially in VAT refunds and calculations. Further, there is VAT fraud, a phenomenon particularly relevant in the EU.

Through smart contracts, governments would be able to collect tax in real-time eliminating the need for middlemen. The EU VAT Mini One-Stop-Shop (MOSS) and impending expanded One Stop Shop (OSS), which centralises VAT registrations and payments in one country, lays the groundwork for a single, EU-wide blockchain for tax, but would be greatly improved by the automation of smart contracts, especially for cross-border sales. However, to put such a system into place, a great level of political consensus is required.

Payroll Taxes & Income Taxes

Similar to VAT, these taxes are triggered by an event, such as a salary payment. However, given reporting demands, there is often a significant delay between the triggering event and tax collection. Smart contracts could simplify the process, automatically deriving tax to states as soon as the tax triggering event takes place.

The same principle applies in cooperation between different member states, as the application of tax rates, exemptions, and double tax credits, which could be applied automatically.

This system would facilitate tax compliance for cross-border taxpayers and businesses, allocation of taxes between different tax administrations and pave the way for tax harmonisation in the EU.

Information Exchange & Storage

Blockchain may also be a game-changer for the information exchange between taxpayers and tax administrations. As the

distributed ledger is available to all participants, burdensome reporting would be reduced. For instance, whenever tax is collected on an automated basis, tax withheld could be added automatically to taxpayers' annual returns. Moreover, blockchain could also contribute to information reporting to fight against abusive tax practices.

Advanced Data Analytics & AI

With digitasion, traditional economic models have changed and adapting tax systems to this mutating reality is a big challenge for states.

Collecting and exchanging data play a crucial role in this, especially within the European single market. To improve the usage of data by tax authorities, AI and advanced data analytics can offer viable solutions.

While there are a variety of uses, per haps the most prominent is an EU Cloud Database to improve tax collection, and taxpayer profiling systems to predict abusive practices and enhance tax compliance.

Challenges

Despite high expectations, there are challenges that may delay the practical application of these technologies to taxation, namely:

● Personal Privacy

● Technology Speed

● Costs of Implementation

● Qualified Hires and Human Resources

● Quantum Computing

● Political Consensus

● Oracle Security

● Further Developments for Smart Contracts.

Economic recovery will require increased government spending. And, although tax systems have seen some improvement, there is still room for further steps and increased efficiency. Hopefully, governments will keep a keen eye on

To improve the usage of data by tax authorities, AI and advanced data analytics can offer viable solutions.

blockchain and AI to digitalise taxation.

Based on our analysis, we predict and recommend the following:

1. The EU must adopt a cloud system for information sharing in the next 5 years.

2. AI will become an essential tool for governments to adapt tax systems to the world of the digital economy.

3. Harmonisation of EU tax regulations could be partially realised with technology.

4. Blockchain smart contracts could disrupt current tax collection in the EU.

1

Introduction

Introduction

The Covid-19 pandemic led to an unprecedented global economic crisis. Some even call it a "depression" similar or worse than the 1929 great crash.[1]

In order to tackle this, European Union (EU) leaders, during the longest council meeting ever held, reached a consensus over an extended recovery package which amounts to €390 billion in grants and €360 billion in loans.[2]

While the measures agreed on by EU leaders minimise the strain on citizens now, as we attempt to continue through this crisis, extensive measures must be put in place to ensure that this does not create an unbearable burden on coming generations. To guarantee the reimbursement of these loans, member states will have to increase their resources and budgets. The EU, for its part, has to increase its own resources and expand its income sources (as provided by Articles 311 and 322(2) of the Treaty on the Functioning of the European Union).[3]

For centuries, tax collection has been the main source of revenue for states all over the world — in the EU, it accounts for just over 90% of the total revenue.[4] Therefore, it is the primary means of offsetting the impact of this downturn and ensuring the repayment of vast amounts of debt. However, raising taxes in times of economic recovery might have counterproductive effects, and lead to economic slowdown instead of economic reboot.

So, how can taxation contribute to the reduction of the effects and foster economic recovery? To begin with, instead of increasing pressure on taxpayers, in general, the EU should turn its focus into improving the efficiency of its current tax regulations.

Beyond crisis response, though, taxes are essential to healthy governments. They permit investments in infrastructure, healthcare, and education — all to support and improve their citizens' quality of life and allow stable economies and societies to thrive and evolve.

The EU is in an advantageous position in terms of tax cooperation and interaction. By combining an extensive network of tax treaties between its member states (and other non-member states) with an acquis of directives, they have the opportunity to address a broad set of tax related topics. These range from indirect taxation to exchange of information,
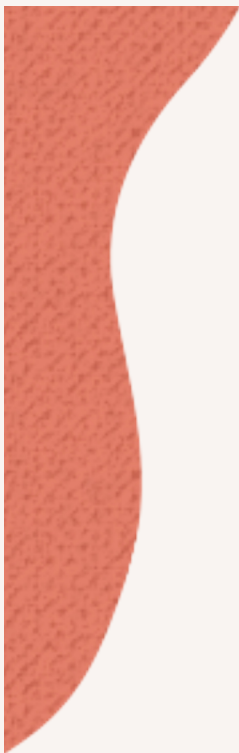
outlining the steps for a more integrated tax policy within its single market. This lends to the overall goal of a single market to provide citizens and companies with the right to freedom of movement of removing barriers to other cross-border economic activity, while minimising the risk of double-taxation or removing tax revenue from member states.[5]

However, there are several barriers to an integrated and efficient tax collection and remittance system that remain. While harmonisation may take longer to achieve, with different laws, rates, and even definitions of a taxable presence not aligned, there are distinct steps towards a common system that could improve this. This would improve the functioning of the single market, and level the playing field for taxpayers with less resources. Currently, SMEs often have to be tax compliant in two jurisdictions, while organisations with large amounts of resources can "shop" for more advantages policies.[6]

Therefore, the issues that a single integrated system, utilising big data and automation could address are:

● Competitive Tax Practices

Competitive tax rates are a legitimate means of attracting foreign investments. All the same, they degrade trust between EU member states by creating a system where member states may feel they do not get their full share of tax.[5] The implementation of clear and harmonized rules that increase transparency between member states could lead to a more integrated and cohesive system.

● Data Exchange

Data exchange is an increasingly important part of tax collection and management, with the latest amendments to the Directive for Administrative Cooperation (DAC) — DAC 6 and the proposed DAC 7 — upping the amounts of data to be transferred between member states tax authorities.[7] [8] However, under the current system, this data exchange is often a burdensome process, for both taxpayers and tax administrations, and not being used effectively.

● Barriers to Fundamental Freedoms

Lack of integration impedes the freedom of movement of goods, companies, and individuals within the single market. Work from home orders for EU nationals from one country, but with employers in different countries made this clear, as there was no simple system to accommodate tax when they moved

back to work from their home country. However, language barriers in tax filing, different tax rates, and having to deal with multiple tax administrations further add to these burdens.

What options to improve EU-wide tax systems are available?

Tax Technology

Research into different applications of technology to tax is growing, not just in the private sector and academia, but also at the governmental level and by tax administrations. Emerging technologies such as blockchain and Artificial Intelligence (AI) stand out as possible solutions to improve current forms of tax collection, submission of tax returns, and taxpayer information management and collection. €150 billion of Covid-19 relief funds have been set aside for digitisation, including to improve tax systems, with a heavy focus on these solutions.[9]

Rethinking existing tax systems is clearly a priority for governments in the EU. Yet, in most cases, tax collection and payment systems are obsolete, impeding the efficiency of the collection of revenue necessary for the state.

Initiatives such as the 2016 eGovernment[10] and the more recent Fair and Simple Taxation action plans or the Fiscalis Programme,[11] put forward by the European Commission (EC), demonstrate the willingness of EU member states to evolve from their current systems to more efficient, fair, and transparent schemes.

This technology is not without its own difficulties or flaws, but presents a potential solution to greatly improve the functioning of tax policy and collection. Overall, we explore the opportunity presented by technology to address the lack of transparency and efficiency between different member states and their taxpayers, without removing fiscal sovereignty.
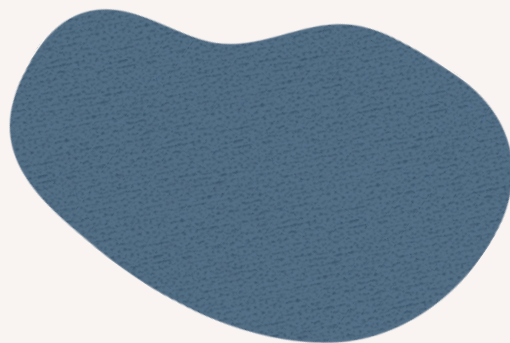
€150 billion of Covid-19 relief funds have been set aside for digitisation, including to improve tax systems, with a heavy focus on these solutions.

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EU Tax Issues

EU Tax Issues

As taxation plays a crucial role in the lives of citizens — both on the side of payments and services — its improvement is a central topic of debate at both the level of governments and of institutions, such as the OECD or the European Commission (EC).

While EU-wide harmonisation is a controversial topic for some member states, who wish to remain competitive in a global tax market, with the bill for Covid-19 bail-out coming, it may be necessary to implement more integrated tax reporting, collection, and remittance systems across the EU. This will not only make the latest amendments to the DAC effective, but will also drive forward the goals of the single market. This is paramount now, as ensuring that Covid-19 funds do not fall on certain countries or future generations.

Last year alone, the combined gap on Value Added Tax (VAT) and Corporate Income Tax (CIT) collection, reached approximately €750 billion.

Last year alone, the combined gap on Value Added Tax (VAT) and Corporate Income Tax (CIT) collection, reached the impressive amount of approximately €750 billion.[12]

To increase revenues, EU member states must find ways to shorten these gaps, by making their tax systems more resilient in relation to aggressive and abusive tax practices and ensure that all taxpayers pay their fair share.[13] Collecting taxes that should have been paid in the first place is a good start.[13]

But in order to reach the ambitious objectives, member states, and more importantly the EU as a whole, need to focus on pursuing profound reforms to their tax systems. However, such reforms should be put forward once the crisis has passed — so that they do not jeopardise economic recovery.[14] This will require concerted efforts from all member states.

Harmonisation

EU member states have not yet reached a consensus on a set of rules for a common EU tax basis, rates, and deductions.[15]

Most aspects of taxation are determined and handled individually by member states, and are not a part of the shared competencies within the EU. While member states do cooperate in several areas related to taxation, such as the fight against abusive and aggressive tax practices, no common set of taxation rules are in place within the EU.[15]

Competitive Tax

The harmonisation of tax systems has always been a controversial matter given that different tax policies can be a major economic boost to different nations and concerns over fiscal sovereignty. Some governments use attractive tax policies (e.g. reduced tax rates, exemptions on certain types of income) and state aid practices to attract foreign investment to their own jurisdictions.

Although these are legitimate investment attraction policies (especially in jurisdictions which are normally less attractive to foreign investment), some are considered harmful practices which undermine competition and lead to the erosion of national tax bases.[16]

Harmful tax practices include the use of nil or reduced tax rates, or the promotion of treaty shopping practices.

Harmful tax practices are often associated with tax havens (e.g. Cayman Islands), but have also been pursued by some member states, giving rise, in some cases, to infringement procedures against those same states (e.g. Starbucks case procedure against the Netherlands)[17]. Harmful tax practices include the use of nil or reduced tax rates, or the promotion of treaty shopping practices.[18]

According to the OECD:

> 'treaty shopping is a practice through which an entity, establishes itself in a given country via the implementation of a vehicle, with the specific objective of benefiting from low or nil tax rates provided by the treaty network of that state'.[6]

The issue is that they allow MNEs to incorporate shelf companies whose only purpose is to divert profits from other jurisdictions to benefit from lower CIT rates or from treaty benefits.[19] This puts undue burden on SMEs to carry taxes, while MNEs have the resources to significantly cut tax rates.

However, they also reduce trust between member states, increasing barriers to EU-wide harmonisation.

Data Exchange

In addition to the issues caused by the lack of harmonisation of tax policies, member states also face challenges in managing the increasing taxpayer information they receive on a daily basis.

Changes in legislation have greatly increased the amount of data that member states have to collect and share. First, there is the automatic exchange of information between EU member states, in place since 2014. Beyond that, the latest amendments to the EU Directive for Administrative Cooperation (DAC) — DAC6 and the proposed DAC7 — increased/will increase mandatory reporting obligations for taxpayers and allowed the automatic exchange of information between tax authorities of different member states — largely to prevent abusive tax practices.[7] [8] However, if leveraged effectively, this data can be used to the benefit of tax authorities and taxpayers.

At present, tax authorities of most member states do not have the means to organise and use such amounts of data efficiently. This impedes the DAC's effectiveness in tackling abusive tax practices.[20]

The DAC6 directive introduced the obligation to report cross-border arrangements which may entail tax advantages or be abusive. On the other hand, the DAC7 directive will impose the mandatory exchange of information on income generated by sellers on digital platforms.[21]

Before these latest amendments, and following the OECD guidance on Action 13 of the Base Erosion and Profit Shifting (BEPS), the DAC was amended to introduce country by country reporting regulations, which demanded MNEs with revenues over €750 million to report their 'aggregate data on the global allocation of income, profit, taxes paid, and economic activity among tax jurisdictions in which it operates'.[22]

After collection by each tax administration, this data is then exchanged with the revenue agencies of all jurisdictions where the multinationals operate. This gives tax administrations an idea of the global level of effective taxation that these MNEs are actually paying.

Although the exchange of taxpayer data is a great step towards state cooperation, the objective of such information trade will not be attained unless the data involved is used efficiently.

As things currently stand, tax administrations may not have the adequate means to manage, select, and cross-reference taxpayers data efficiently.[23] This leads to situations where taxpayer data is available to tax authorities, but is not being used correctly. Ultimately, it calls into question whether the extra burden and costs incurred by wide reporting and data
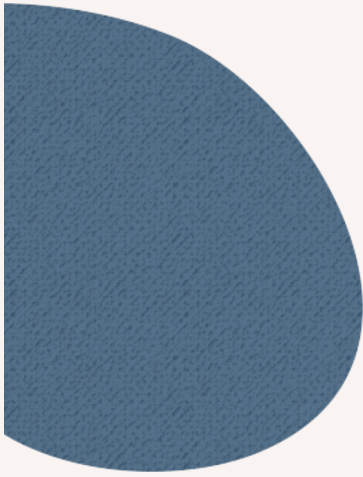
exchange are worthwhile given the inefficient and the limited improvement to the taxation processes.

Big data solutions present some of the greatest improvements to this system.

The EU has the advantage of a common market and an, albeit limited, common set of rules regarding the exchange of information. Its institutions play a great role in bolstering the investment in data technology and promoting the creation of EU databases of taxpayers data to allow EU revenue agencies real time access to taxpayers information.

Barriers to Fundamental Freedoms

The existence of different rules, rates, and tax basis in each member state creates barriers to the mobility of both companies and individuals within the EU.[24]

Furthermore, given that no single EU tax compliance mechanism or tax authority exists, EU tax compliance is still a major burden, especially to SMEs, whose compliance costs account for around 2.5% of their total turnover, whereas larger corporation's compliance costs makes up only 0.7%.[29]

On the other hand, the fact that no level playing field exists regarding EU tax regulations, allows MNEs to exploit loopholes created by the lack of alignment between different member states tax policies. Smaller companies do not have as many resources, often leaving them without the option to hire tax specialists that improve their tax efficiency.

The lack of harmonisation of tax policies, combined with harmful tax competition within the EU, promotes distortions in competition within the single market.

Most of these issues are caused by poorly aligned tax regulation between member states. The creation of one stop shops — which allow taxpayers, including corporate taxpayers, to file and pay all taxes in one jurisdiction, although it may be remitted to others — or an EU electronic platform dedicated to improve the compliance of cross border companies and mobile employees, would reduce these impacts until more integration is achieved.

Further, as mentioned in the introduction, the rise of remote work, especially cross-border remote work, creates undue difficulties for EU nationals. The fragmentation of the current

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tax system limits freedom of movement for individuals within the EU.

Current Solutions

The hard work of the EU institutions and its member states cannot be ignored, but all the same, these issues have not been fully eradicated. In line with the BEPS programme, the EU approved different directives and measures to improve cooperation between tax administration and pave the road to more efficient, fair, and transparent tax systems. In some cases, these efforts go even further than the BEPS.

The Anti-Tax Avoidance Package released in 2016, included, among others, a new directive (ATAD) — already in effect, along with one other directive, in several member states — and a study on aggressive tax planning.[25] These were important steps to a common approach by member states towards ending abusive tax practices. The package aims to provide an EU wide framework of anti-abuse regulations and to tackle practices that directly affect the functioning of the internal market.

The ATAD implemented relevant measures, such as the Control Foreign Company (CFC) rule — to restrict profit shifting to low tax jurisdictions — or an interest limitation rule, which prevents the implementation of artificial debt arrangements put in place to reduce taxation.[26]

The Anti-Avoidance Package also amended the DAC to include country-by-country reporting, creating mandatory reporting obligations for certain multinationals in the EU. Together, with the recent publication of DAC6 and impending adoption of DAC7, these measures reveal the strong emphasis the EU is putting on the exchange of information between member states. This is a primary objective to reduce tax avoidance and ensure all taxpayers pay their fair share.

For indirect taxation, the EU implemented several mechanisms to combat fraud — the VAT Information Exchange System (VIES) — or the EUROFISC, for the purpose of combating VAT fraud.[30] In addition to those, the One-Stop Shop (which will enter into force next July, replacing the Mini One-Stop Shop), will allow taxpayers to pay and report in a single jurisdiction.[30]

However, there is still a long path in the integration of EU tax regulations. The EU has failed to reach consensus regarding more ambitious projects, such as the Common Consolidated Corporate Tax Base (CCCTB) and Common Corporate Tax Base

(CCTB),[27] which have the potential to consolidate the different tax policies within the EU. Perhaps a common tax reporting and filing system would be a more achievable solution, rather than set tax rates. We explore the possibility of such an intelligent system, which addresses these issues, without requiring member states to cede fiscal sovereignty.

Furthermore, the lack of common compliance mechanisms for the single market and different definitions of a taxable presence between member states presents obstacles to the freedom of movement of both companies and individuals.

Lastly, member states' ability to filter and make efficient use of taxpayer information is still below an optimal level. According to an evaluation by the European Commission (EC), information exchanged under the DAC is either of low quality or never put to use.[28]

What's Next?

The European Commission recently, in 2020, released a new Fair and Simple Taxation Package,[21] which addresses and tries to find long term solutions for some of the issues described above. It includes a set of 25 initiatives to tax simplification (to reduce tax obstacles and administrative burdens), improve tax compliance (to secure reliable tax revenues), and promote taxpayers' rights.

The package also includes recommendations on tax goods governance, in which the commission suggests a revision of the EU code of conduct to reduce harmful tax practices within the EU.

Moreover, the Fair and Simple Taxation Package intends to explore the use of technology as a means to the reform and improve the EU's tax systems and to reduce the gap in tax collection.

Hopefully, the Fair and Simple Taxation Package will contribute for the modernisation of tax systems, and for a more harmonised tax policy within the EU.
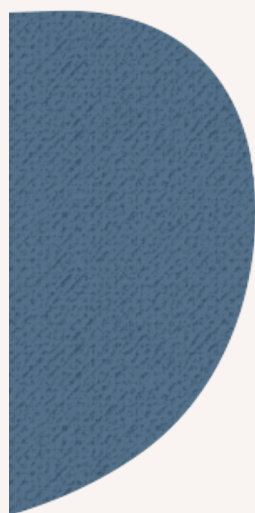
3

Digital Transformations of Tax Administrations

Digital Transformation of Tax Administrations

Digitisation can address a number of current issues in tax:

● Enforcing taxation to all taxpayers

● Tax evasion

● Managing taxpayer data efficiently.

These are fundamental steps to increase governments' access to resources and coping with the coming times of economic slowdown.
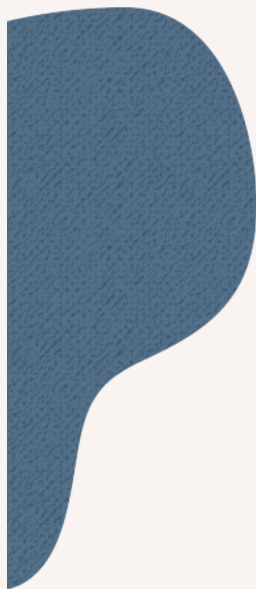
Particularly, current systems are overly complex, driving down compliance.[30] However, new business models have emerged from the digital economy, adding to the strain. Online filing systems, better data management, and automation can greatly improve taxation, especially in today's market.

Further, improved tax systems can bring greater transparency, and increase the probability of voluntary compliance from taxpayers and trust between member states.

However, implementing these technologies will not be straightforward. Some are still in early stages of development, making them expensive and, in some cases, insufficiently reliable for application to taxation. Additionally, political consensus between EU member states is always a difficult task. However, with certain mechanisms already in place or on the way, such as one-stop shops, and greater ease of adopting a common technological solution compared to a common tax scheme, we believe these are still viable options to explore.

Blockchain

Blockchain is a distributed ledger technology that allows information to be stored automatically, immutably, and securely.[32] Blockchain uses consensus mechanisms to approve specific data or transactions (blocks). Participants (nodes) verify the authenticity of the transaction by solving complex cryptographic puzzles and store new data (blocks) into the chain.[32] Every participant holds part of the data, meaning that data is not stored in a centralised database (more prone to data tampering), but distributed.

Online filing systems, better data management, and automation can greatly improve taxation, especially in today's market.

Data is therefore available in real-time to every participant in the blockchain, making it easier to access.

Apart from data storing capabilities, smart contracts embedded in blockchain databases allow the self-execution of agreements. Smart contracts are computer programmes, which may be programmed to replicate regular contract clauses and to self execute based on a specific triggering event.[32]

Real estate provides a particularly good illustration of how this works. Acquisition contracts can be replicated in code, with the receipt of payment acting as the triggering event to transfer property ownership automatically via the smart contract. The payment could be verified by a public authority or registry, enabling this system to be fully verified under current systems.

Public and Private Blockchains

Not all blockchains have the same properties. One of the greatest differences is between public and private blockchains. Public blockchains allow participants to freely enter the blockchain and solve cryptographic puzzles to add transactions to the blockchain in exchange for compensation.[32] Bitcoin is an example of this.

However, due to the transparency, lack of central control, low-transaction speed, and high energy demands in these types of blockchains, they are unlikely to be suitable for government use.

As opposed to public blockchains, in private and enterprise blockchains, only known parties are allowed to participate in the blockchain, and therefore only those parties have access to the information in the database and can approve and add data to the chain.

In private or permissioned blockchains, all users have a specific identity and require permission to add, download, or participate in the consensus processes — often referred to as Proof of Authority. This way, all data added to the blockchain can be traced back to a specific user.

Application for Tax

Private blockchains have the potential to widely improve current tax systems, and offer an auditable record of tax documents. Furthermore, blockchain features, such as smart contracts, offer tax administrations a range of possibilities,

from automatic tax collection to instant real-time information exchange.
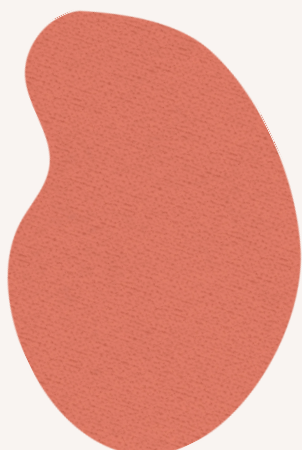
Tax administrations and organisations, such as the OECD and the EC, are already paying close attention to the developments of blockchain technology and exploring the application of such technology to improve tax systems.[33] [34] According to a survey by the World Economic Forum (WEF) in 2015, 73% of the respondents expected governments to collect tax for the first time via a blockchain by 2025.[35] This goal may be closer than ever, as countries like the Netherlands begin studying the implementation of blockchain-based payroll taxes to eliminate intermediaries in tax collection.[36]

In short, blockchain technology has the potential to improve the following areas of taxation

- **Real-Time Exchange of Taxpayer Data:** All participants on the blockchain have access to the information added to the chain in real-time.[45] With more taxpayer data sharing demands already, this can be used between different tax administrations or for taxpayers to report information directly to the chain in cases where the information is to be shared with more than one tax administration (e.g. DAC6).[7]

- **Secure and Immutable Information:** The security of taxpayers data is essential, as it may include sensitive or even secret information. Information added to the blockchain is secure as it is cryptographically stored, as well as being immutable and time-stamped[32] — both useful features to fight tax evasion and fraud.

- **Real-Time Tax Collection and Refunds:** Using blockchain-based smart contracts may improve tax collection, by eliminating time between the taxable event and tax collection.[45] Instead, smart contracts allow the tax to be transferred directly to tax administrations without the need for companies to act as middlemen in collecting tax. This reduces the tax burden and reporting obligations that these middlemen have to comply with.

With greater integration on a single platform, Nemitari Ajienka, Senior Lecturer of Computer Science, Nottingham Trent University, noted that:

> 'support and relief packages can be data driven, transparent, and deployed in real-time, rather than based upon requests by member states who need the support. Support will be made available early on to

cushion the effects on other sustainable development goals'.

These solutions will radically change crisis response. In the following sections, we cover potential use cases of blockchain for specific tax systems, with the goal of greater integration at their core.

Value Added Tax (VAT)

VAT is a consumption tax applicable to all commercial activities, including the production and distribution of goods and the provision of services. The tax is borne by consumers, not businesses, although the latter act as intermediaries (taxable persons) to governments; they collect VAT from consumers and deliver it to the relevant tax administrations.

Therefore, taxable persons (VAT registered businesses) deduct VAT they have collected, from the VAT they have paid to other taxable persons. The amount resulting from this deduction should then be remitted to the tax authorities in partial payments on a fractional basis (e.g.every quarter).

VAT collection and reporting is complex, especially with regard to cross-border transactions. Common issues regarding VAT are:

- **Burdensome Reporting:** Because businesses act as middlemen, they must report every taxable event. This is not connected to e-invoicing in every jurisdiction, a major concern given the rising importance of e-commerce in VAT collection.[37]

- **Human Error:** GIven that VAT calculation and reporting VAT involve a lot of paperwork and record keeping, human errors, misreporting and therefore miscalculations are common.[38]

- **VAT Fraud:** Given that governments do not directly collect this tax, fraudulent organisations have the opportunity to disappear before remitting it. Missing Trader Intra-Community (MTIC) is a common form of fraud, accounting for €60 billion yearly losses alone. In this type of fraud, delays between collection and payment as well as the exemption of intra-community supply of goods, are exploited, with fraudsters disappearing without remitting the tax to the correct tax authorities.[30]

Current VAT collection involves the need for businesses to act as government intermediaries. Conversely, the use of smart

contracts could simplify VAT collection and reduce the risk of fraud.

Current & Coming Solutions

The EU VAT Mini One-Stop Shop (MOSS) currently addresses this by centralising VAT registrations and payments for certain intra-EU activities (typically transactions where VAT is due in the location of the final consumer). It allows VAT to be recorded and paid for in one member state, instead of in multiple states.[39] However, currently, member states must then settle balances between each other and this is limited to B2C telecommunications, broadcasting, and electronics services.[39]

Given the severity of the issue, both long term and bridge solutions are in the works for the EU. From July 2021 the One-Stop Shop (OSS) will replace the MOSS, extending the scope of transactions that can be reported on the platform and further prevent MTIC fraud.[39] Expanding this system removes the opportunity for a taxpayer to disappear before paying tax in their home country.

Within the OSS, as opposed to the MOSS, VAT is paid and reported in a single country reducing taxpayer's compliance costs.[39] The VAT collected in the state of origin is then remitted by that same state to the state of final consumption.[40] It also expands the scope of businesses that can use the OSS and countries it is applicable to.[39]

Blockchain Solutions

While the OSS is a major improvement to current VAT reporting and collection, it could be further improved with blockchain and smart contracts. To put such a system into place, a blockchain would be created where tax administrations could access time-stamped information on all transactions triggering VAT payments. Using a permissioned blockchain would mean that only relevant authorities could access or change the information.

Electronic VAT chargeable transactions would be recorded on the chain and could be accessed by all relevant tax authorities. This is a major solution, but very similar to the OSS, and arguably too complex for the benefits. However, the immutable records of tax due provided by a blockchain solution could be more effective to tackle fraud. Every taxable transaction would already be recorded and visible to tax authorities, making it difficult for a business or individual to disappear with that tax without facing repercussions. In a more ambitious scenario,

VAT fraud could even be eliminated in case all VAT collections within the EU would be made in real-time via smart contracts.[41]

Smart Contracts for VAT

In the most ambitious implementation of blockchain technology, smart contracts could be used to automate much of this system based on triggering events. Taxes would be transferred directly to tax administrations whenever a taxable event — such as a payment of a good by a final consumer — takes place by linking bank accounts.[42] Governments would be able to collect tax in real-time, and at the same eliminate the burden of VAT collection and reporting from businesses.

Smart contracts could be programmed to take into consideration all electronic B2B and B2C transactions by recording e-invoices on a government blockchain to automatically calculate VAT to be remitted to the tax administration.[42]

Existing real-time reporting systems, such as the automatic VAT adopted by Portugal,[43] could be connected to the blockchain and to smart-contracts, to trigger taxation whenever a payment takes place and VAT is reported.

A step further would use smart contracts to remit VAT from final consumers directly to tax administrations by linking the payment methods. Therefore, businesses would no longer need to collect VAT on behalf of states. Further, automatic payments would reduce human error, guarantee the reporting of real-time quality data, as well as reduce the burden of submitting quarterly returns to tax authorities.

This is especially relevant to enforce EU VAT regulations regarding cross-border transactions. The EU VAT MOSS and OSS lay a secure framework to build such a system on. All the same, an automated EU VAT is currently an ambitious project, requiring immense political consensus, it is well worth exploring.

Simply put, blockchain may be relevant to improve the following features of EU VAT:

● **Real-Time Collection:** Smart contracts have the potential to allow VAT to be automatically paid to governments reducing the need of having suppliers act as government intermediaries.[45]

● **Automatic Allocation:** If pre-programmed with specific

allocation criteria, smart contracts could automatically remit VAT to the correct jurisdiction, no matter where the supplier is located, simplifying the lengthy process of determining which tax law applies.

● **Recording and Exchanging Taxpayer Data:** Information on transactions performed at the EU level may be recorded on the blockchain ledger, allowing all relevant tax administrations to access it in real-time. This can be reached by combining the existing automatic reporting systems.[45]

Payroll Taxes & Income Taxes

In general, taxes are charged based on a tax-triggering event. Personal income taxes are normally due when salaries are paid, dividends are subject to withholding tax upon payment to the shareholders, and environmental taxes are due when a factory exceeds CO_2 limits. While this is true, in most of the cases, the tax-triggering event is distant from the tax payment itself. This timing difference is related to the way tax is reported and collected.

In most of the cases, the tax-triggering event is distant from the tax payment itself.

However, the distance also creates tax filing burdens for individuals, businesses, and corporations. This also opens up the potential for taxes to go uncollected, either due to errors in filing or by individuals exploiting the delay in taxable actions and collection.

Personal Income Tax (PIT)

Similar to VAT, in some jurisdictions, businesses act as "government agents" to collect PIT. In those jurisdictions, companies withhold tax due from taxpayers and pay it to tax authorities periodically.[44]

Take the example of Portugal; companies withhold PIT from the salaries paid to their employees, pay them directly to the Portuguese Tax Authorities (PTA), and then file a specific form to report the total amount of taxes withheld every month.[44]

The PTA then cross-references the data provided by the corporate taxpayers against each taxpayer mentioned in the company's return (using tax identification number to track taxpayer). An automatically filed return is then generated, to finalise with any income earned from other sources, and, finally, approved and submitted online by the relevant taxpayer.

Although the Portuguese PIT reporting and collection system already uses technology to check information provided by
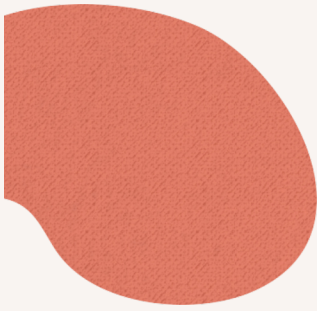
companies on individual taxpayers, the submission of frequent returns by companies, as well as the duty of managing the amounts of tax withheld in the name of the PTA, still constitutes an administrative burden for companies.

While Portugal's system is updated compared to many regions, smart contracts could simplify the process. Instead of companies acting as PIT collection agents, governments with PIT collection mechanisms, similar to Portugal, could implement a smart contract system that would calculate and directly transfer tax to the tax authority automatically as soon as the tax-triggering event (e.g. the salary payment) takes place.

Companies would register on the tax authorities' website to access the smart payment system, by submitting information on each of their employees, namely their bank account number and their tax identification number.

Smart contracts would then connect employers' and employees' bank accounts to the tax authority's blockchain, and whenever a salary payment would be performed, tax would be automatically remitted to the tax authority.

Smart contracts would then connect the employers' and the employees' bank accounts to the tax authority's blockchain, and whenever a salary payment would be performed (the tax triggering event), tax would be automatically remitted to the tax authority. Tax rates would be automatically determined depending on the amounts paid, as well as on any other relevant factors which could be programmed into the smart contract. All of these payments would be recorded in the blockchain, allowing for automatic tax returns to be generated.

This way, tax intermediaries are eliminated, allowing for real-time tax collection and reporting by states.[45] As a result, companies no longer have the burden of collecting taxes in the name of states, and at the same time, states get faster access to resources.

Corporate Income Tax (CIT)

To ensure that CIT is paid, as it depends on the jurisdiction where income is generated, most governments levy Withholding Taxes (WHT) on cross-border payments of different types of income, such as dividends, interest, or royalties.[46]

WHT rates depend not only on the domestic legislation of each country, but also on the tax treaties in force.[46] In the case of the EU, many of these provide exemptions for payments made between EU resident entities.

This is complex, but largely a case of applying the correct legislation at the correct time, to ensure that tax law is equally applied. However, currently, this imposes extreme compliance obligations for taxpayers (e.g. filing documentation in different jurisdictions) and more administration to ensure that all transactions are being taxed correctly.

With the implementation of a smart contract payment system at the EU level, tax rates, exemptions, and double tax credits could be applied automatically without submitting different forms of tax resident certificates.
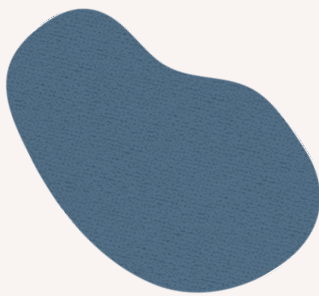
In the context of such a system, taxpayers performing cross-border payments could register in a single platform (similar to the OSS) and be attributed an EU tax number. The platform would include the taxpayers' ID, linked to the tax residence as well as details on relevant corporate structure and banking details (this data is already mandatorily disclosed to tax administrations under different regulations).

Data could be updated on the platform to use the most recent version for whenever a taxpayer changes ownership of a given subsidiary or acquires shares in other companies. Tax authorities would verify this with other sources to certify transactions (e.g., public registries) or by requiring taxpayers upload proof to the platform.

Smart contracts could be pre-programmed to apply different rates or exemptions depending on the information provided by the taxpayer and bank accounts could be directly linked to further reduce compliance costs on both sides.[47] Tax would be determined and remitted to each tax authority directly from the payment. On this blockchain-based platform, tax authorities of each relevant member state would act as nodes, approving each transaction relevant to their jurisdiction.

AI could further improve the process by automatically detecting irregular data to allow immediate approvals, although the secure records would allow all transactions to be audited, improving transparency for taxpayers and tax collectors.

This system would address the issue of harmonisation without requiring a single tax rate for EU members. At the same time, automation of systems could potentially reduce the administrative burden and compliance costs for businesses all over the EU, making it easier for companies and individuals to develop cross-border economic activity within the single market, and to ensure more efficient tax collection for states.

All of this is important for the continued growth of the EU market, but, especially as the after-effects of Covid-19 are felt, minimising barriers for businesses should be a primary concern. According to Carlos Gomez, CPA, Talent Acquisition Manager at CryptoRecruit, and dGen Fellow:

> 'With a unified code, companies will reduce the cost of red tape, because they will no longer need to submit a declaration on every EU member state'.

Cross-Border Workers

Determining cross-border workers' tax residency and tax obligations were also addressed in the Plan for Fair and Simple Taxation within the EU.[21] As a part of this initiative, the commission will propose the amendment of the criteria for determining the tax residence of EU cross-border workers. This is necessary, as currently EU member states use different criteria for determining the tax residency of individuals. This often leads to double taxation or non-taxation.[48]

Once again, blockchain-based smart contracts may have a part in facilitating compliance for cross-border workers and allocation of taxes between tax administrations.

Cross-border workers would be able to register on an EU tax platform and be assigned a European taxpayer ID. This would allow them to pay taxes in more than one jurisdiction through only one platform.

Smart contracts could be coded to harmonise tax residence criteria, with the allocation of correct tax rights to each member state involved. By centralising tax payments of cross-border workers on a single digital platform, the need to submit different forms in different languages disappears. This would of course require political consensus on matters, such as what information is required to obtain a tax exemption in each member state. However, it is still perhaps a less involved undertaking than purely harmonising the different tax rates of various EU member states.

Companies would also register in this platform and the salary payments to cross-border employees could be made through it. By making payments through pre-programmed smart contracts, the tax would be automatically allocated to each member state according to the residence of the taxpayer. This solution will only be possible if the concept of tax residency is harmonised within the EU.

While digitally native currencies, such as a Central Bank Digital Currency (CBDC) or cryptocurrency, are ideal for such payments and programmability, there are workarounds to connect current bank accounts with these systems.

Tax Blockchain Pilot Projects

- China: Blockchain for social taxation; Digital invoicing based on blockchain.[52][59]

- Netherlands: Payroll taxes and benefits pilot project.[36]

- Japan: Blockchain-powered platform for government tenders.[60]

- Saudi Arabia: Blockchain-based VAT is being studied by the local government.[61]

Advanced Data Analytics & AI

Current economic systems are as complex as they ever were in history. Globalisation gave rise to interactions of economic players from all corners of the world, and digitalisation increased transaction speed unlike ever before. Traditional business models have changed with the age of the internet, and digitised businesses with few employees can serve millions of customers worldwide in just a day.

At the same time, governments need to improve taxpayers' trust in tax systems, by improving transparency in how resources are used, as well as promoting user-friendly collection and refund systems. While blockchain can aid this endeavour as well as improving the exchange of taxpayer data, sifting through and making efficient use of that data is still a major hurdle.[23]

Tax administrations collect increasing amounts of taxpayers' data.

Tax administrations collect increasing amounts of taxpayers' data. However, it is how these administrations manage the collected data as well as the quality of that same data that will dictate the positive effects of data collections. Currently, often data quality is still poor.[23]

Programmes, such as the Fiscalis programme,[11] are of great relevance in improving tax administrations' data collection capabilities and the overall tax systems in the EU. But, investments in improving the technological capabilities of tax administrations should be fostered.[11][58]

It is relevant to note that the use cases below are just examples

of how these technologies may improve some aspects of tax systems. The potential of these technologies goes beyond the use cases described below.

More efficient and transparent tax administrations have the potential to increase taxpayers' trust in governments and even in democracies. In a polarised and fragmented world, trust in tax administrations plays a very relevant role in guaranteeing economic and political stability globally. This is even more true in times of economic crisis, such as the approaching fall-out of Covid-19. However, when applying technology that has not always been used with utmost transparency in the private sector, the public sector needs a different approach. As Dennis Post, Ph.D, Partner at EY Advanced Technology Tax Lab & Global Blockchain Tax Leader said:

> 'For the public sector, it is key to have transparency about the algorithms, also to ensure that these are not making biased decisions (e.g. based on zipcode, age, background, etc.)'.
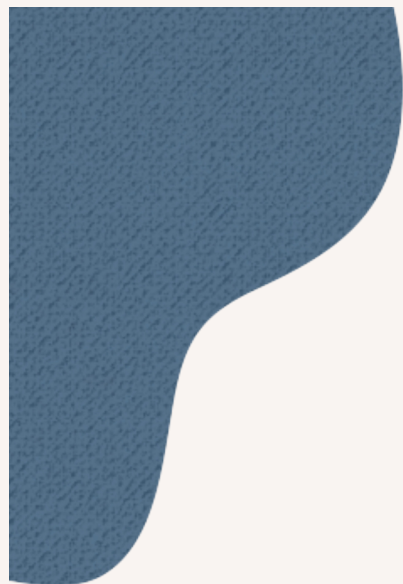
EU Cloud Database & Intelligent Administrations

Information collected and mandatorily exchanged under the DAC, includes different categories of income (e.g. employment), financial information (CRS), country-by-country reporting, and more recently cross-border arrangements. Under the rules of the directive, information may be exchanged spontaneously, on request, and/or automatically.[7][23]

Collecting, managing, and exchanging the enormous volume of data covered by the directive is a time-consuming and expensive process.[28] To make good use of data, tax administrations have to process through terabytes of information and organise it in a way that allows it to reach the main objective of such collection: improving tax systems and making every taxpayer pay their fair share.[23] This is a strain for both taxpayers and administrations.

Apart from identifying what type of information should be exchanged, the DAC also provides practical information on how tax administrations should exchange such information.

According to the directive, data may be exchanged either via the submission of specific forms (in case of information exchange by request or spontaneously) or via the Common Communication Network (CCN) — the EU's central infrastructure for information exchange (in case of automatic exchanges).[23]

'For the public sector, it is key to have transparency about the algorithms, also to ensure that these are not making biased decisions'.

- Dennis Post, Ph.D, Partner at EY Advanced Technology Tax Lab & Global Blockchain Tax Leaders

The CCN is a common software for the secure exchange of information between tax administrations. It includes security equipment (e.g. firewalls), a central help desk, and communications gateways. Although the CCN is a good starting point for cooperative use of information technologies, it is still based on the following set of procedures:

1. Taxpayers report information, occasionally, in two different jurisdictions simultaneously.

2. Each tax administration of the relevant jurisdiction receives and processes the information submitted by taxpayers.

3. Tax administrations send relevant information to other tax administrations under the DAC.

Although there is some interest from the EU, AI and advanced data analytics are not yet used in the context of CCN. However, cloud platforms integrated with AI and advanced analytics offer significant upgrades to this system at the EU level.

According to a recent study, the use of advanced analytics to improve tax administrations' capabilities for data management has the potential to increase tax revenues between 5-15% and decrease 30-50% of compliance costs.[52]

Cloud platforms provide much of the same solutions as blockchain, by sharing real-time data to all relevant tax administrations and enabling taxpayers to report information in a single place, while side-stepping some issues. Already AI and cloud computing are commonly used by businesses to predict consumers' behaviour. Given the quantity of data, this technology would greatly improve tax systems and enable governments to adapt tax policies based on emerging patterns.

While this presents a solution which could be implemented in the fairly short term, AI algorithms can actually be given access to information stored on a blockchain. Therefore, if a blockchain-based system was implemented at the EU level, this could be paired with the improvements of AI as well.

Such a platform could improve DAC6 compliance by:

- Taxpayers would report DAC6 cross-border arrangements directly into the EU tax cloud or blockchain, through a user-friendly interface, with harmonised reporting forms.

- Data collected in the context of the DAC6 would be

A recent study estimates advanced analytics for tax data management has the potential to increase tax revenues between 5-15% and decrease 30-50% of compliance costs.

associated with a specific profile and crossed with information from other sources to build a complete profile for each taxpayer. Through the use of machine learning and AI neural networks, tax authorities could flag a specific taxpayer for anomalous or abusive behaviour and perform tax inspections.

- Stream analytics would allow tax administrations to automatically notify specific taxpayers whenever a relevant transaction/arrangement raises suspicions and request more information.

- The information would be stored in a cloud or on a blockchain and accessible to each relevant tax administration. Relevant jurisdictions would be selected depending on the nexus with each reported arrangement. This nexus would be taken into account by the AI in the platform, which would select which arrangements should be accessed by the correct tax administration.

- Visualisation technologies, such as Power BI (a software developed by Microsoft),[41] could efficiently present information with graphics and charts representing statistics on cross-border arrangements patterns, which are commonly used by taxpayers. EU tax administrations would be more informed on the general behaviour of taxpayers and adapt tax policies to economic reality.

Implementing either a cloud system or a blockchain would require high levels of investment and cooperation. However, the savings of this system would more than pay for development, implementation, and upkeep, as this cooperative approach would allow tax administrations to make the best use of the information collected under the directive, and meet its central objective 'to improve the functioning of the internal market by discouraging the use of aggressive cross-border tax-planning arrangements'.[51]

Taking the above into consideration, the main arguments to adopt an EU tax cloud are the following:

- Reduces reporting costs

- Reduces information processing costs[52]

- Increases the quality of reported information and data collection

- Improve the use of reported information

● Improves traceability and the goal of information exchange.

Apart from the use of these technologies at an EU level, governments could use these technologies domestically. At a domestic level, AI can create profiles for each individual and corporate taxpayer.

Using information from different sources (e.g. banking, social security, or social network) allows tax administrations to have a clearer view of taxpayer behaviour and even predict non-compliance or late payments. Canada is already using predictive-modelling to anticipate late-filing, and according to official data, this has already increased tax revenues by $100 million.[52]

Based on real-time transaction data, machine learning can perform simulations on the amount of tax that, according to available data, a given company is likely to pay. This would allow tax administrations to compare the simulation with the tax paid in a given period, and notify the taxpayer for inspection in case the difference is substantial.

In general AI taxpayer profiling may improve taxpayer compliance by:

● Predicting abusive practices and tackling tax evasion.[54]

● Understanding taxpayers' ability to pay tax debts and adapting tax debt collection mechanisms to each specific taxpayer.[54]

● Red flags for non-compliant taxpayers, allowing tax audits to be made to taxpayers with suspect behaviours.[55]

● A wider understanding of specific taxpayer profits and expenses and predictive simulations of amounts that tax taxpayers are likely to pay before corporate tax is assessed.[54]

● Inductive risk modelling for taxpayer compliance.[54 55]

Intelligent Tax Pilot Projects

● Canada: Late filing predictive modellings.[54]

● Singapore: Use of social network analysis to identify fraud; Emails data mining for understanding taxpayers queries and publishing official responses.[54]

● Finland, Ireland, Singapore, and Sweden: AI to predict the likelihood of taxpayers insolvency.[54]

- Australia and Norway: Real-time debt management services that put in place different payment arrangements depending on the taxpayers' ability to pay.[54]

- UK: Risk modelling for taxpayers likely to fail submission deadlines.[54]

Challenges

The application of the above mentioned technologies is not a straightforward process, and raises a number of challenges that may delay the practical application of these technologies to tax:

It is essential that EU regulations similar to the GDPR are specifically approved to limit the use of taxpayer information.

Privacy: Personal privacy is one of the most relevant issues when discussing the use of taxpayers data. Specific regulations may be required to establish limits on use of taxpayers data, especially for electronic uses. Emerging technology adds to this difficulty, so new standards and regulation for use of personal data on blockchains or for taxpayer profiling will need to be established. Machine learning solutions present the possibility of governments predicting and controlling citizen behaviour. Therefore, it is essential that EU regulations similar to the GDPR are specifically approved to limit the use of taxpayer information. The use of information stored on governmental blockchains should be limited to tax purposes, and the implementation of blockchains tax authorities should be regulated to ensure that information is not shared with other parties.

Speed: Current limitations in terms of data processing on blockchains exist, although for permissioned, Proof of Authority blockchains, this is less of a concern, as well as ongoing developments to troubleshoot this issue. However, due to the large amount of information required for taxation, authorities must keep this in mind. Technology may not yet be sufficiently developed to process with the large amounts of transactions required.

Additionally, the EU has budgeted €150 billion for digitisation, including of tax systems, expressly for more AI and cloud computing solutions.

Costs of Implementation: Modernising tax administrations has demonstrated to be of great relevance to adapt tax systems. Nevertheless, implementing a blockchain on the EU level is expensive, and may not be at the reach of all member states budgets. On the other hand, although AI and machine learning solutions are already being used by some tax administrations, moving a step further to machine learning and advanced analytics may require substantial investments by governments. Additionally, the EU has budgeted €150 billion for digitisation, including of tax systems, expressly for more AI and cloud

computing solutions.[9]

Qualified Hires and Human Resources: Hiring qualified people and providing appropriate training to current tax authorities' staff is essential for successful implementation of new solutions. However, hiring qualified professionals may be costly for governments, especially in blockchain. The interaction of newly hired data analytic personnel within the current structure of tax authorities may also be challenging.

Quantum Computers: May disrupt blockchain cryptography in the future as it has the potential to resolve the cryptographic puzzles that make the information stored in the blockchain immutable, in minutes. Although this technology is not yet fully developed, Google has recently reached a major milestone by using a quantum computer to perform a calculation that would take 30 years to solve with a super computer, in just 3 minutes.[56]

Consensus for a single platform has already been achieved for the MOSgS and OSS, and is likely easier to reach than harmonised tax rates.

Political Consensus: Consensus is always difficult at the EU level, but required for a single platform. That being said, consensus for a single platform has already been achieved for the MOSS and OSS, and is likely easier to reach than harmonised tax rates. Further, it is necessary for tax collection solutions such as smart contracts for automatic withholding tax charging and withholding tax reliefs.

However, as things currently stand, unanimity is still required for the purpose of approving EU tax related reforms. A relevant step to approve this type of EU tax wide reforms would be to use the passerelle clause to change the unanimity requirement to a qualified majority.[57]

Oracles: Oracles are the source of data to be used on the blockchain. Due to the immutable nature of blockchain, they must be highly secure and accurate. Especially if money is automatically remitted, oracles and smart contracts must be highly secure and accurate.

Smart Contracts: While highly useful for their ability to be secured to the level of binding due to the immutable nature of the blockchain, developments in the private sector (e.g. Decentralised Finance) prove that errors or oversights in code can be extremely costly. More developments into coding and auditing secure smart contracts must happen before they can be used at scale to handle funds at a large scale.

4

Conclusions & Predictions

Conclusion

Covid-19 might trigger one of the greatest economic crisis, one that has, and will, demand a substantial increase in spending from governments to ensure swift economic recovery. Taxation is the main source of revenue for states, and crucial to guarantee economic stability and recovery in times of profound economic slowdown.

But, tax systems still face several issues that reduce efficiency. On the side of taxpayers, abusive, aggressive, and fraudulent tax behaviour creates distortions in competition and erodes states' tax base, creating the opportunity for players with more economic power to further reduce what they pay. On the other hand, different compliance mechanisms, lack of harmonisation, especially in cross-border tax regulations, and a variety of exemptions increase compliance costs.

Although many improvements made these systems more resilient and increased cooperation, there is still room to improve efficiency and simplification. Increasing automation to remove businesses as intermediaries and close the distance between a taxable event and tax collection should be a primary focus.

Particularly, blockchain-based smart contracts have the potential to disrupt current tax collection methods, allowing tax to be remitted directly to states immediately upon the triggering event. To further simplify today's complex economic reality and the wealth of information, AI and machine learning will soon be essential tools for government operations.

We predict and recommend the following:

1. The EU must adopt a cloud system for information sharing in the next 5 years.

As a short term measure to ensure that the DAC directive reaches out to its full potential, EU member states should implement an efficient platform for collecting and sharing taxpayer information. This cloud system can and should be equipped with AI mechanisms to eliminate repeated info and to flag abusive practices. The platform should be available for all EU taxpayers to report information in a simple and streamlined manner.

2. AI will become an essential tool for governments to adapt tax systems to the world of the digital economy.

Advanced data analytics will allow governments to make better use of data from several sources, and to use predictive modeling to prevent fraud or other infractions. Such solutions will be discussed in the context of the European Commission's Fair and Simple Taxation Package, which necessitates a conference on data analytics and digital solutions as well as a pilot project on "Better Quality and Use of Data".[21] With the DAC6 increasing the quantity of data that tax administrations must store, exchange, and filter through, AI is a necessary intervention.

3. Harmonisation of EU tax regulations could be partially realised with technology.

Although harmonisation of tax policies is a difficult topic of agreement within the EU, technology may boost negotiations by simplifying tax systems and coordinated approaches between member states. In the short term, this may sidestep the issue of true harmonisation of tax policy by simplifying filing and application of different tax regulations.This will drive innovation in the single market.

4. Blockchain smart contracts could disrupt current tax collection in the EU.

Smart contracts can help achieve action A8 of the Fair and Simple Taxation Package - the impact assessment of digital solutions to levy taxes at source to facilitate payment collection.[21] Hopefully, the application of smart contracts will be considered by states as a relevant option for automated tax collection, and continued innovation in this field will make it a viable option in the next 5-10 years. Already, 73% of respondents to a WEF study expected to see taxes collected on a blockchain by 2025, and we hope to see that expectation realised with even greater automation.[35]

Although the path for tax digitalisation is not straightforward, hopefully, governments will continue to look at blockchain and AI as tools to improve tax systems. These systems are needed sooner, rather than later, and governments must bear in mind that implementing such technologies could greatly increase tax revenues and tackle tax fraud and evasion.

The costs of implementation and other challenges are of course very relevant and cannot be ignored. However, if performed via coordinated approaches and with thorough planning, the digitalisation of tax administrations will enhance tax collection and improve competition within the EU.

About dGen

After Gen X, characterised by big societal shifts, Gen Y, better known as millennials, and the digital native Gen Z, the decentralised generation will grow up in a future shaped by different dynamics and technological developments. AI, blockchain technology, and IoT will individually bring disruption to many industries, but it's at the crossroads where we expect our whole socio-economic fabric to change.

dGen is a not-for-profit think tank based in Berlin, Germany. We focus on how blockchain technology can contribute to a decentralized future in Europe and what this might mean for people, society, private entities, and the public sector over the coming decades.

Emerging technology focused on decentralising society will shape the next part of the twenty-first century; The dGen will grow up with opportunities for borders to fade and traditional networks to dissipate. Meanwhile, most blockchain developments are still in the early stages; focusing on building solid products and exploring regulatory requirements to create a fertile yet safe environment for companies and investors. The industry is focused on solving the big topics right now, while we encounter a lot of great ideas in the blockchain community about adoption. It's time for those ideas to find a purpose and for the real decision-makers in the world to learn what decentralisation will mean for them.

We're working with a team of researchers exploring how decentralisation will shape our future. Our insight reports focus on specific topics and industries to drive ideas for adoption in Europe. If you're researching how decentralisation is shaping our future, and would like to get involved, please get in touch at dgen.org. dGen is part of Beyond, a venture studio exploring a new world. For more information, go to beyond.ventures.

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Tomás has a bachelor's degree in law from the University of Lisbon, and an LLM in international taxation from Tilburg University. He has also recently concluded an advanced course in diplomacy at the Portuguese Catholic University. He has worked, as a fundraiser in Australia and spent 6 months in Asia, where he has studied in Macau in the context of an exchange program. He is currently an international tax consultant at Deloitte Portugal. Tomás has a strong interest in policymaking issues, especially in the improvement of international tax systems via digital transformation.

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Contributors

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Before founding dGen, Jake was originally a partner at Signal Ventures, investing in blockchain tech. In late 2017 he founded hype partners to help build and nurture ecosystems for blockchain projects and has worked with many top 100 projects. With these combined experiences he is able to distinguish legitimacy, necessity, and nonsense in this space. Jake is one of the founding partners of Beyond, a venture studio exploring a new world.

Nick Dijkstra

One of the founders of dGen and with a rich background in tech, Nick knows how to build organisations from scratch and can transform ideas to great tech products. As a former Product Manager at LiveIntent and Director of Customer Success at Avari he shipped software to a user base over 15% of the US population and has organised 200+ events in Berlin. As the COO at hype partners he is currently helping top-tier blockchain firms strategise their market approach. Nick is one of the founding partners of Beyond, a venture studio exploring a new world.

Maggie Clarendon

Maggie is a writer, researcher, and editor. Trained in literature, critical theory, and gender studies, they are now exploring the ways that technology is changing the landscape of human interaction.

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Francisco has a degree in Business and Law, and is currently working for dGen to communicate its vision for blockchain adoption to an audience of thought leaders in tech companies, corporates, and the public sector as a researcher and marketer.

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References

1.   Reinhart, Carmen & Reinhart, V. (2020, September) The Pandemic Depression. *Foreign Affairs*. Retrieved from: https://www.foreignaffairs.com/articles/united-states/2020-08-06/coronavirus-depression-global-economy

2.   Covid-19: the EU plan for the economic recovery. (2020, May 18) *European Parliament.* Retrieved from: https://www.europarl.europa.eu/news/en/headlines/economy/20200513STO79012/covid-19-the-eu-plan-for-the-economic-recovery

3.   (2012, Oct 26) Articles 321 & 322, Consolidated Version of the Treaty on the Functioning of the European Union. *Official Journal of the European Union*, pp. 141-142. Retrieved from: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:12012E/TXT:en:PDF

4.   Wahrig, Laura. (2011, Apr 26) Tax revenue in the European Union. *Eurostat.* Retrieved from: https://edz.bib.uni-mannheim.de/edz/pdf/statinf/11/KS-SF-11-026-EN.PDF

5.   Nerudova, Danuša. (2004, Jun 29) Tax Competition and Tax Harmonization in the European Union. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, Vol. 52, No. 6, pp. 135-144. Retrieved from: https://acta.mendelu.cz/52/6/0135/

6.   Action 6: Prevention of tax treaty abuse. (2018) *BEPS.* OECD. Retrieved from: https://www.oecd.org/tax/beps/bepsactions/action6/

7.   (2020, Sep) DAC 6: EU tax disclosure rules. *Norton Rose Fulbright.* Retrieved from: https://www.nortonrosefulbright.com/de-de/wissen/publications/0bd7dc5e/dac-6-new-eu-tax-disclosure-rules

8.   Bailleul-Mirabaud, Annabelle & Pasquier, C. (2020, Sep 22) DAC 7: Online platforms, key players-to-be in the European tax transparency framework? *Lexology.* Retrieved from: https://www.lexology.com/library/detail.aspx?g=65070309-6498-4311-b575-5f1f17f38cae

9.   Lomas, Natasha. (2020, Sep 16) Europe will go it alone on digital tax reform in 2021 in if it must, says EU president, as bloc directs €150BN in COVID-19 relieve toward cloud, AI and broadband. *Techcrunch.* Retrieved from: https://techcrunch.com/2020/09/16/europe-will-go-it-alone-on-digital-

tax-reform-in-2021-if-it-must-says-eu-president-as-bloc-directs-e150bn-in-covid-19-relief-toward-cloud-ai-and-broadband/?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAKW715U7UMzL6mm3r8MExkyW5Rx_uwp2rxMFLiPAFe0S7S4tZvPbi_7nAzjMHAd866XuFt73psb1OY9lhULAiXSqMMrl0oNYdHsB_lU5iUY24ytAvoGEazytASDC1QudbyycCZ5OCUnSBWnFwX96hTkw7iGSEjp30Xb1AsZBj5oz

10.   Tinholt, Dinand, van der Linden, N., Schenkelaars, S. Ehrismann, M., de Vries, V., Cattaneo, G., …., & Marchio, G. (2016) eGovernment Benchmark 2016: A turning point for eGovernment development in Europe? *European Commision*. Retrieved from: https://ec.europa.eu/digital-single-market/en/news/eu-egovernment-report-2016-

11.   The Fiscalis 2020 Programme. (2020) *European Commision*. Retrieved from: https://ec.europa.eu/taxation_customs/fiscalis-programme_en#:~:text=Fiscalis%202020%20is%20an%20EU,national%20officials%20from%20across%20Europe.

12.   The Relevance House. (2019, Nov 12) A Growing Interest in Blokchain Use by Tax Authorities. *Medium*. Retrieved from: https://medium.com/the-relevance-house/a-growing-interest-in-blockchain-use-by-tax-authorities-e105e308897d

13.   Murphy, Richard. (2019, Jan) The European Tax Gap. *Socialists and Democrats Group in the European Parliament*. Retrieved from: https://www.socialistsanddemocrats.eu/sites/default/files/2019-01/the_european_tax_gap_en_190123.pdf

14.   Highlights: Tax Policy Reforms 2020: The role of tax systems in responding to COVID-19. (2020) *OECD*. Retrieved from: http://www.oecd.org/tax/tax-policy/highlights-tax-policy-reforms.pdf

15.   Removing cross-border tax obstacles for EU citizens. (2010) *European Commision.* Retrieved from: https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/gen_info/tax_policy/com%282010%29769_en.pdf

16.   (1998, May 19) Harmful tax Competition: An Emerging Global Issue. OECD. Retrieved from: https://doi.org/10.1787/9789264162945-en

17.   (2019, Sep 24) Dutch tax deal with Starbucks was legit, and not state-aid: European court. *NL#Times*. Retrieved from:

https://nltimes.nl/2019/09/24/dutch-tax-deal-starbucks-legit-state-aid-european-court#:~:text=In%202015%20the%20European%20Commission,from%20the%20American%20coffee%20chain.

18.   Harmful tax competition. (n.d.) *European Commission.* Retrieved from: https://ec.europa.eu/taxation_customs/business/company-tax/harmful-tax-competition_en

19.   Inclusive Framework on Base Erosion and Profit Shifting. (2019) *OECD*. Retrieved from: http://www.oecd.org/tax/beps/

20.   Dourado, Ana Paula. (2015, Jan 1) Aggressive Tax Planning in EU Law and in the Light of BEPS: The EC Recommendation on Aggressive tax Planning and BEPS Action 2 and 6. *University of Lisbon - Institute for Economic, Financial and Fiscal*. Retrieved from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3370307

21.   Package for fair and simple taxation. (2020) *European Commission*. Retrieved from: https://ec.europa.eu/taxation_customs/general-information-taxation/eu-tax-policy-strategy/package-fair-and-simple-taxation_en

22.   Action 13: Country-by-Country Reporting. (2020, Aug) BEPS. *OECD*. Retrieved from: https://www.oecd.org/tax/beps/beps-actions/action13/

23.   (2019, Mar 26) Directive on Administrative Cooperation (DAC), Evaluation. *European Commission*. Retrieved from: https://ec.europa.eu/taxation_customs/sites/taxation/files/presentation_dac_evaluation_v3.pdf

24.   Poláček, Richard. (2007) Study on Impediments to Mobility in the EU Live Performer Sector and on Possible Solutions. *Mobile.Home*. Retrieved from: https://on-the-move.org/files/news_files/Pearle_report.pdf

25.   Anti-Tax Avoidance Package. (2016, Jan) *European Commission*. Retrieved from: https://ec.europa.eu/taxation_customs/business/company-tax/anti-tax-avoidance-package_en

26.   (2020, Feb) EU Anti-Tax Avoidance Directive: Implementation of controlled foreign company rules. *Deloitte*. Retrieved from: https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Tax/dttl-tax-eu-anti-tax-avoidance-directive-implementation-of-controlled-foreign-company-rules.pdf

27.   Common Consolidated Corporate Tax Base (CCCTB). (n.d.) *European Commision*. Retrieved from: https://ec.europa.eu/taxation_customs/business/company-tax/common-consolidated-corporate-tax-base-ccctb_en#:~:text=The%20Common%20Consolidated%20Corporate%20Tax%20Base%20(CCCTB)%20is%20a%20single,than%20many%20different%20national%20rulebooks.

28.   (2019, Sep 12) Commission Staff Working Document Evaluation of the Council Directive 2011/16/EU on administrative cooperation in the field of taxation and repealing Directive 77/799/EEC. *European Commision*. Retrieved from: https://ec.europa.eu/taxation_customs/sites/taxation/files/2019_staff_working_document_evaluation_on_dac.pdf#page75

29.   Buske, Olaf, Scott, C., Kerrigan, A., Vancamp, F., Narmon, M., …., & Wegge, D. (2018, Nov 20) Study on tax compliance costs for SMEs. *European Commission*. Retrieved from: https://op.europa.eu/en/publication-detail/-/publication/0ed32649-fe8e-11e8-a96d-01aa75ed71a1

30.   Lamensch, Marie, PhD. (2018, Oct) VAT fraud: Economic impact, challenges and policy issues. *European Parliament.* Retrieved from: https://www.europarl.europa.eu/cmsdata/156408/VAT%20Fraud%20Study%20publication.pdf

31.   Afonso, Whitney. (2015, Jun 24) The Challenge of Transparency in Taxation. *Mercatus*. Retrieved from: https://www.mercatus.org/publications/government-spending/challenge-transparency-taxation

32.   Conway, Luke. (2020, Nov 17) Blockchain Explained. *Investopedia*. Retrieved from: https://www.investopedia.com/terms/b/blockchain.asp

33.   Topics: Blockchain. (n.d.) *OECD*. Retrieved from: http://www.oecd.org/going-digital/topics/blockchain/

34.   Blockchain Technologies. (n.d.) Shaping Europe's digital future. *European Commission*. Retrieved from: https://ec.europa.eu/digital-single-market/en/blockchain-technologies

35.   (2015, Sep) Deep Shift: Technology Tipping points and Societal Impact. *World Economic Forum*. Retrieved from: http://www3.weforum.org/docs/WEF_GAC15_Technological_Tipping_Points_report_2015.pdf

36.   Regan, David. (2017) Tax administration in the age of

blockchain. *Disruptive Business Models: Challenges and Opportunities for Tax Administrations*, pp. 38-40. Iota. Retrieved from: https://www.iota-tax.org/sites/default/files/publications/public_files/disruptive-business-models.pdf

37.   (2019, Mar) Platforms in the Collection of VAT/GST on Online Sales. OECD. Retrieved from: http://www.oecd.org/tax/consumption/the-role-of-digital-platforms-in-the-collection-of-vat-gst-on-online-sales.pdf

38.   Brennan, Pascal, Kilmartin, A., Nolan, J., & Walsh, C. (n.d.) VAT errors and how to correct them. *Deloitte*. Retrieved from: https://www2.deloitte.com/ie/en/pages/tax/articles/vat-errors-and-how-to-correct-them.html

39.   Modernising VAT for cross-border e-commerce. (n.d.) Taxation and Customs Union. *European Commission*. Retrieved from: https://ec.europa.eu/taxation_customs/business/vat/modernising-vat-cross-border-ecommerce_en

40.   European Commission proposes far-reaching reform of the EU VAT system. (2017, Oct 4) European Commission. Retrieved from: https://ec.europa.eu/commission/presscorner/detail/en/IP_17_3443

41.   Merkx, Madeleine, Ph.D. (2019) VAT and Blockchain: Challenges and Opportunities Ahead. *EC Tax Review*, *28*(2), 83–89. Retrieved from: http://hdl.handle.net/1765/115403

42.   Merkx, Madeleine, Ph.D. (2019, Dec 6) Blockchain and VAT: the impact of blockchain on VAT legislation. *Erasmus University Rotterdam*. Retrieved from: https://ec.europa.eu/taxation_customs/sites/taxation/files/03-vat-conference-dec-2019.pdf

43.   (2019, Dec 11) Portuguese tax authorities extend automatic VAT calculation to more payers in 2020. Essential Business. Retrieved from: https://www.essential-business.pt/2019/12/11/portuguese-tax-authorities-extend-automatic-vat-calculation-to-more-payers-in-2020/

44.   Portugal - Income Tax (2020, Jan 31) *KPMG*. Retrieved from: https://home.kpmg/xx/en/home/insights/2011/12/portugal-income-tax.html

45.   (2016, Dec) How blockchain technology could improve the tax system. PwC. Retrieved from: https://www.pwc.co.uk/issues/futuretax/assets/documents/how-blockchain-could-improve-the-tax-system.pdf

46. Taxation of securities income received by individuals. (n.d.) Tax and Customs Union. *European Commission.* Retrieved from: https://ec.europa.eu/taxation_customs/individuals/personal-taxation/taxation-securities-income-received-individuals_en

47. (2019, May 14) Tax Collection Using Blockchain. CIOReview. Retrieved from: https://www.cioreview.com/news/tax-collection-using-blockchain-nid-28752-cid-176.html#:~:text=Blockchain-based%20taxation%20system%20delivers,keep%20track%20of%20tax%20payments.&text=With%20blockchain%2C%20governments%20can%20also,revenue%20based%20on%20tax%20laws.

48. Double taxation. (2020, Jun 22) European Union. Retrieved from: https://europa.eu/youreurope/citizens/work/taxes/double-taxation/index_en.htm

49. Download Power BI tools and apps. (n.d.) *Microsoft.* Retrieved from: https://powerbi.microsoft.com/en-us/downloads/

50. Council Directive (EU) 2018/822 of 25 May 2018 amending Directive 2011/16/EU as regards mandatory automatic exchange of information in the field of taxation in relation to reportable cross-border arrangements. (2018, May 6) *Official Journal of the European Union.* Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L0822

51. (2019, Apr 17) How AI looks to upend the tax functions' 80/20 rule. *EY.* Retrieved from: https://www.ey.com/en_gl/tax/how-ai-looks-to-upend-the-tax-function-s-80-20-rule

52. Ghoul, Ibrahim. (2019) Taxation for the Future of the GCC: As Oil Wealth Declines, Governments Need to Broaden Their Revenue Base. *Oliver Wyman.* Retrieved from: https://www.oliverwyman.com/content/dam/oliver-wyman/ME/publications/taxation-for-the-future-of-the-gcc.pdf

53. (2019, Oct) Artificial Intelligence - Entering the world of tax. *Deloitte.* Retrieved from: https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Tax/dttl-tax-artificial-intelligence-in-tax.pdf

54. (2016) Advanced Analytics for Better tax Administration: Putting Data to Work. *OECD.* Retrieved from: https://dx.doi.org/10.1787/9789264256453-en

55.   Baisalbayeva, Kuralay, van der Enden, E., Tenan, R., & Flores, R. (2018). The Data Intelligent Tax Administration: Meeting the challenges of big Tax Data and Analytics. *PwC*. Retrieved from: https://www.pwc.nl/nl/assets/documents/the-data-intelligent-tax-administration-whitepaper.pdf

56.   Pollock, Darryn. (2019, Sep 24) Google's Quantum Computing Breakthrough Brings Blockchain Resistance Into the Spotlight Again. *Forbes*. Retrieved from: https://www.forbes.com/sites/darrynpollock/2019/09/24/googles-quantum-computing-breakthrough-brings-blockchain-resistance-into-the-spotlight-again/?sh=3b20afa34504

57.   Flexibility in EU decision-making: passerelle clauses, brake clauses and accelerator clauses. (2016, Jul 25) *EUR-Lex*. Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=legissum%3Aai0019

58.   Proposal for a Regulation of the European Parliament and of the Council Establishing the 'Fiscalis' Programme for Cooperation in the Field of Taxation. (2018, Jun 8) *European Commission*. Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1529053629679&uri=CELEX:52018PC0443

59.   (2019). China's Shenzhen district uses blockchain for $1 billion of tax invoices. *Ledger Insights*. Retrieved from: https://www.ledgerinsights.com/china-shenzhen-blockchain-tax-invoices/

60.   Das, Samburaj. (2017, Jun 29) Japan Will Test Government Tenders On a Blockchain this Year. *CCN*. Retrieved from: https://www.ccn.com/japan-will-test-government-tenders-blockchain-year/#:~:text=The%20government%20of%20Japan%20will,government%20tenders%20this%20fiscal%20year.&text=In%20a%20separate%20project%2C%20the,ledger%20powered%20by%20a%20blockchain.

61.   Alkhodre, Ahmad, Syed, T., Jan, S., & Alsaawy, Y. (2019, May) A Blockchain-based Value Added Tax (VAT) System: Saudi Arabia Use-Case. International Journal of Advanced Computer Science Applications, Vol. 10, No. 5, pp. 708-716. Retrieved from: https://www.researchgate.net/deref/http%3A%2F%2Fdx.doi.org%2F10.14569%2FIJACSA.2019.0100588

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