

Trade in Services: A Holistic Solution to New-Found Issues in Trade Law?

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BLOCKCHAIN: REPLACING, ELIMINATING AND CREATING TRADE IN SERVICES

WEIWEI ZHANG*

Blockchain is a distributed or decentralised ledger technology that uses cryptographic algorithms to verify the creation and transfer of digitally represented assets or information over a peer-to-peer network. It eliminates the need for a central authority to keep, update and verify data. Traditionally, services provided by these central authorities constitute a significant part of the services industry. This paper argues that Distributed Ledger Technology (DLT) is changing the services industry in three ways. First, services previously provided by central authorities are now being replaced and supplied jointly by some or all participants on the distributed ledger. Second, with the elimination of central authorities, auxiliary services used to support the operation of these central authorities are being eliminated. Third, services trade may be expanded and become more inclusive by engaging previously disadvantaged or marginalised individuals. This paper further argues that the General Agreement on Trade in Services (GATS), as the first and the only multilateral trade agreement on services, is highly relevant for the development and regulation of DLT-based applications. This relevance is unpacked by: (i) identifying the services relevant in the context of DLT-based applications; and, (ii) exploring whether a WTO Member, in adopting regulations affecting DLT-based applications, needs to consider its obligations under the GATS. The paper arrives at the conclusion that the GATS can be an effective instrument in expanding trade in DLT-replaced or enabled services.

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* The author is an International Trade Advisor at Sidley Austin LLP's Geneva Office. The views expressed in this paper are personal and represent neither the views of Sidley Austin LLP nor its clients. Special thanks to Dr Gabriel Gari for his many useful comments at the UKTPO Conference "New Dimensions in International Trade", held on November 06, 2019 at the Chatham House, and to Suresh Nanwani for his input when an earlier version of the paper was presented at the Society of International Economic Law Biennial Conference in July 2018. All errors remain the author's. The author may be contacted at [wzhang\[at\]sidley.com](mailto:wzhang[at]sidley.com).

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I. INTRODUCTION

Blockchain is a distributed or decentralised ledger technology that uses cryptographic algorithms to verify the creation and transfer of digitally represented assets or information over a peer-to-peer network.¹ Even though it was initially created to run Bitcoin, the underlying idea of blockchain has inspired development of a wide range of the so-called ‘Distributed Ledger Technologies’ (DLTs) being applied in areas beyond cryptocurrencies.²

One can better understand a distributed ledger by comparing it against a centralised ledger. Many institutions today use centralised ledger systems to keep records of information, such as identity, date of birth, marriage status, and financial account. These institutions build up trust between unrelated parties by guaranteeing that information communicated is accurate and authentic, payments follow transactions, and any change to the ownership of a property is properly registered. Indeed, many services sectors exist today because of the need to have a central authority to provide services relating to verifying, keeping and updating information. An example is the financial services sector. Financial institutions keep records of an individual market participant’s asset status and manage transfer of assets between the participants. Some services sectors are also created because of an absence of a centralised ledger system, such as notary services.

A distributed ledger differs from a centralised ledger in at least two ways.³ *First*, a centralised ledger relies on one single central authority to keep all information or

¹ Julie Maupin, *Mapping the Global Legal Landscape of Blockchain and Other Distributed Ledger Technologies*, (Ctr. Int’l Governance Innovation Paper No. 149, 2017).

² Technically speaking, blockchain is one type of DLT, as DLT encompasses technologies which have different properties from the blockchain that is used for Bitcoin. For the purpose of this paper, the term ‘blockchain’ and ‘DLT’ is interchangeable, referring to any technology that allows for transactions and data to be recorded, shared and synchronised across a distributed network of different network participants. See Harish Natarajan et al., *Distributed Ledger Technology (DLT) and Blockchain: Fintech Note No. 1*, at VII (The World Bank, Working Paper No. 122075, 2017).

³ *Id.*; BANK FOR INT’L SETTLEMENTS, DISTRIBUTED LEDGER TECHNOLOGY IN PAYMENT, CLEARING AND SETTLEMENT - AN ANALYTICAL FRAMEWORK §2.2 (2017).

records on the ledger, while a distributed ledger shares the task among several selected or all network participants. *Second*, while a centralised ledger itself performs the task of updating and adding new data, a distributed ledger distributes the responsibility among self-interested network participants, who use a predefined specific cryptographic validation method to reach consensus on the current state of the ledger as well as its historical record.⁴ In short, a traditional centralised ledger system requires the presence of a central authority in charge of record keeping and updating, but a distributed ledger system does not need such a central authority. This difference is key in understanding how DLT-based applications are shaking the structure of many services sectors. To recall, many modern services exist because of the need to have a central authority. As distributed ledgers eliminate the need for central authorities, services previously provided by these central authorities would be significantly impacted. They would either be eliminated permanently or replaced by services provided through other means.

In the meantime, by eliminating the need to have a central authority in a ledger system, DLT-based applications would facilitate the participation of smaller players who do not have convenient access to services which were previously provided by centralised ledger-based service suppliers. For example, lack of access to key intermediary services such as financial services remains an impediment for many individuals and small enterprises to participate in trade.⁵ By providing an alternative solution for individuals to exchange value and pass on information, DLT-based applications facilitate the previously disadvantaged group in participating in trade in goods and services.

Furthermore, applying DLT in public sectors would improve the efficiency in regulating services sectors. Services are heavily regulated. For example, countries often impose qualification and licensing requirements to protect consumers. These requirements, although legitimate, may sometimes be burdensome for service suppliers. With a properly designed DLT-based application, all relevant information pertaining to a service supplier, including its identity, qualification, and historical transactions would be available in a synchronised and append-only manner by all, or selected participants, including consumers, suppliers or regulators. As a result, procedural requirements would be significantly reduced. In some instances, trust would be established between the supplier and consumers without the need to regulate in the first place.

⁴ DLTs may differ in terms of who can access and use copies of the data on the ledger and who maintains the integrity of the ledger; *See* Part II.1.b.

⁵ *See Financial Inclusion: Overview*, THE WORLD BANK, <https://www.worldbank.org/en/topic/financialinclusion/overview> (last visited Apr. 30, 2020).

As businesses in services sectors are tapping the potential of DLTs, stakeholders must also assess the suitability of current rules pertaining to these sectors. The General Agreement on Trade in Services (GATS), which entered into force in 1995 as the first and only multilateral agreement governing international trade in services, is one of such rules. It was created in the wake of the “growing importance of trade in services for the growth and development of the world economy”, aimed at “the expansion of such trade”.⁶ The GATS applies to all “measures by Members affecting trade in services”.⁷ Thus, services sectors using DLT-based applications are, by definition, covered by the GATS. So far, there is little research on how the application of DLTs is relevant to WTO Members’ obligations under the GATS. This paper tries to fill this gap.

Part II introduces the underlying rationale of blockchain and DLT-based applications (Part II.1), and the basic principles of the GATS (Part II.2). Based on these observations, Part III explores the relevance of the GATS to the DLT-based applications in two steps: Part III.1 identifies the services at issue and discuss how DLT-based applications may affect the provision of these services; Part III.2 proceeds to analyse why WTO Members’ specific commitments on Market Access and National Treatment are relevant if they want to adopt measures affecting DLT-based applications. The paper concludes, in Part IV, by stating that the GATS can be an effective instrument for advancing liberalisation in services replaced or created by DLT-based applications.

II. BLOCKCHAIN AND GATS IN A NUTSHELL

A. *Blockchain-Based Applications: Variations*

Blockchain data structure is an ordered, back-linked list of blocks of transactions, as initially proposed by Satoshi Nakamoto in his paper “Bitcoin: A Peer-To-Peer Electronic Cash System”.⁸ It can be stored as a flat file, or in a simple database. For example, Bitcoin Core stores the blockchain metadata using a LevelDB database.⁹ In the Bitcoin network, new transactions are recorded and transmitted to the network in a new data block. The new block, containing encrypted data, is then shared across the entire network. All network participants together determine the block’s validity according to a pre-defined algorithmic validation method or a consensus mechanism. After validation, the new block is linked to the existing

⁶ General Agreement on Trade in Services, pmbl., Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1B, 1869 U.N.T.S. 183, 33 I.L.M. 1167 (1994) [hereinafter GATS].

⁷ See *id.* at art. I:1.

⁸ ANDREAS M. ANTONOPOULOS, *MASTERING BITCOIN: PROGRAMMING THE OPEN BLOCKCHAIN* 195 (2nd ed., 2017).

⁹ *Id.*; LevelDB stores keys and values in arbitrary byte arrays, and data is sorted by key.

chain of blocks in an append-only manner.¹⁰ Through this mechanism, each change to the ledger is replicated across the entire network and each network member maintains a full, identical copy of the entire ledger at any point in time.

Each block on the blockchain structure is identified by a hash, generated using an SHA256 cryptographic hash algorithm on the header of the block.¹¹ Each block also references a previous block, known as the parent block, through the “previous block hash” field in the block header. The sequence of hashes linking each block to its parent creates a chain going back all the way to the first block ever created, known as the genesis block.¹² Thus, the blockchain structure can precisely trace back historical transaction records. This idea inspired the development of various types of DLTs.

1. Variations in Design Elements

Since the introduction of blockchain, businesses have been exploring ways to utilise one or several features of the technology beyond cryptocurrencies. These DLT-based applications vary based on their functionality, nature of services, design, technology, and processes. The key technical design elements for variations are: (i) what information is to be kept on the ledger; and (ii) how the ledger is to be updated. The payment and settlement industry deploys DLT to record ownership or balance of digital assets (or digital representation of physical assets). In the case of a ‘smart contract’, DLT is used to retain the terms of an actual contract or ‘automated contract tools’.¹³ In terms of updating, as mentioned before, the responsibility to update information in a DLT is shared by multiple network participants. DLTs use a number of protocols for communication between nodes and facilitating consensus on the current state of the ledger and its historical record.¹⁴ Depending on the specific rule applied in each specific DLT-based application, changes to the ledger will eventually be reflected in all the copies of the network within a certain time span.

2. Variations in Permission Rules

Blockchain-based applications also vary in the role each network participant can play, including who can modify or update the protocol and source codes, who can grant access and assign permissions for other entities to perform certain roles, and

¹⁰ Harish Natarajan et al., *supra* note 2, at 2.

¹¹ ANTONOPOULOS, *supra* note 8, at 27.

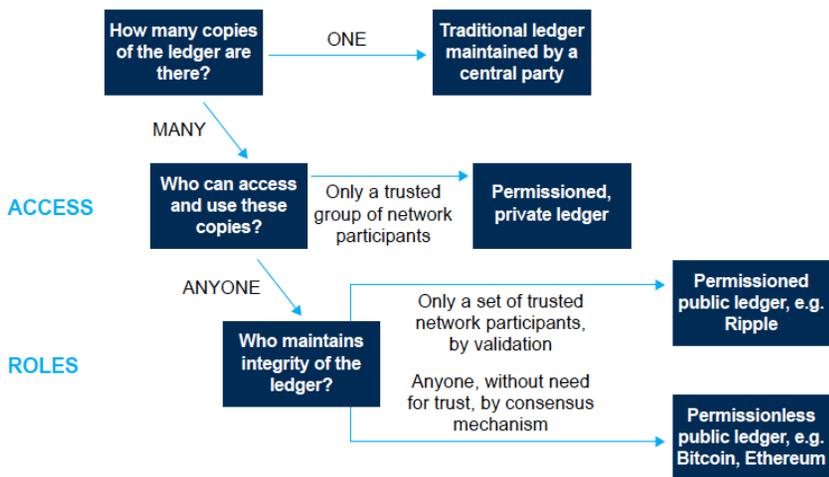
¹² *Id.* at 195.

¹³ BANK FOR INT’L SETTLEMENTS, *supra* note 3, at 3.

¹⁴ *Id.* at 4.

who can have access to the network.¹⁵ The following chart, introduced in a World Bank report on DLT, summarises different institutional designs of distributed ledgers.¹⁶ As the chart shows, a distributed ledger has more than one copy of the ledger, as opposed to a traditional centralised ledger, which has only one copy maintained by a central authority. Distributed ledgers can be further classified into permissioned, private ledgers, on which only a trusted group of network participants can have access and use the ledger copy; as opposed to public ledgers, on which anyone can access and use ledger copies. Public ledgers can be further classified into permissioned ledgers, on which only a set of trusted network participants can maintain the integrity of the ledger; as opposed to permission-less ledgers, in which anyone can play a role in maintaining the integrity of the ledger.

Figure 1: Distributed Ledger Taxonomy¹⁷



To summarise, DLT eliminates the need to have a central authority to keep, update and verify information on the ledger. Such task is shared among network participants in a synchronised manner. Nevertheless, applications based on DLTs may vary in design elements and permission rules. These differences matter, especially for regulators.

¹⁵ *Id.* at 7.

¹⁶ Harish Natarajan et al., *supra* note 2, at 13.

¹⁷ *Id.*

B. *The General Agreement on Trade in Services (GATS)*

Recognizing the importance of services trade in economic growth and development, the Contracting Parties to the General Agreement on Tariffs and Trade (GATT), in the Uruguay Round of trade negotiations from 1986 to 1994, conceived the first ever multilateral trade agreement governing trade in services — the GATS. The GATS sets out a framework of principles and rules to expand trade in services through progressive liberalisation.¹⁸

1. An Innovative Approach in Governing International Trade

Trade in services, by its nature, is different from trade in goods. *First*, services are intangible, invisible, and perishable, and usually require simultaneous production and consumption. That means, unlike goods that can be shipped, the provision of services, in many cases, requires the presence of service suppliers. Thus, the GATT model, covering only one mode of supply, cross-border trade in goods, cannot satisfy the need for regulating trade in services. *Second*, a tangible border exists in the case of trade in goods. As a result, countries can collect tariffs at the border, and can use tariffs as a means of protection for its domestic production. Such border does not exist in the case of trade in services, however. The only way for a country to protect its domestic services industries is to impose regulations on the product (services) or product providers (service suppliers). Thus, the approach under the GATT to negotiate tariffs to liberalise trade cannot be transplanted to services trade liberalisation. *Third*, many services industries are highly regulated, due to certain market failures (such as information asymmetry). This feature makes it a daunting task for trade negotiators to identify barriers to services trade. Therefore, liberalisation of trade in services must follow a different approach from that of trade in goods.

Indeed, the GATS is designed in a distinct manner, compared to its counterpart for trade in goods. *First*, it covers four modes of supply. In addition to the traditional mode of cross-border trade (mode 1 – to supply services from the territory of one Member into the territory of any other Member), it covers three additional modes of supply, including: consumption abroad (mode 2 – to supply services in the territory of one Member to the service consumer of any other Member), commercial presence (mode 3 – to supply services by a service supplier of one Member, through commercial presence in the territory of any other Member), and presence of natural persons (mode 4 – to supply services by a service supplier of one Member, through presence of natural persons of a Member

¹⁸ GATS, *supra* note 6.

in the territory of any other Member).¹⁹ *Second*, it covers measures affecting both services and service suppliers.²⁰

2. Ambitious, But...

The GATS is ambitious in terms of its scope of coverage and application. It covers all measures “affecting trade in services”.²¹ As clarified by the Appellate Body in *EC — Bananas*, there is no *a priori* exclusion of any measure from the scope of coverage of the GATS.²² The GATS further defines ‘measures’ as to include those taken by “central, regional or local governments and authorities”, and “non-governmental bodies in the exercise of powers delegated by” these authorities.²³ The very limited exclusion applies to “services supplied in the exercise of governmental authority”.²⁴ There is also no *a priori* exclusion to any services.²⁵ The only exemption from the scope of application relates to “measures affecting air traffic rights and services directly related to the exercise of these rights”.²⁶

The broad scope of coverage of the GATS is, however, balanced by conditional obligations. WTO Members only liberalise services sectors or subsectors in which they have made specific commitments. In committed sectors or subsectors, they cannot maintain limitations on Market Access²⁷ and must offer National Treatment to foreign services and service suppliers,²⁸ unless they have engraved the limitations in their commitments according to the relevant provisions.

¹⁹ *See id.* at art. I:2.

²⁰ *See, e.g., id.* at art. II:1, XVI, XVII.

²¹ GATS, *supra* note 6, at art. I:1.

²² Panel Report, *European Communities — Regime for the Importation, Sale and Distribution of Bananas*, ¶ 109, WTO Doc. WT/DS27/R/ECU (adopted Sept. 25, 1997) [hereinafter PR, *EC — Bananas*], held that “... no measures are excluded *a priori* from the scope of the GATS as defined by its provisions. The scope of the GATS encompasses any measure of a Member to the extent it affects the supply of a service regardless of whether such measure directly governs the supply of a service or whether it regulates other matters but nevertheless affects trade in services”, which was upheld in Appellate Body Report, *European Communities — Regime for the Importation, Sale and Distribution of Bananas*, ¶ 109, WTO Doc. WT/DS27/AB/R (adopted Nov. 26, 2008) [hereinafter ABR, *EC — Bananas*].

²³ GATS, *supra* note 6, at art. I:3(a).

²⁴ *Id.* at art. I:3(b) & (c).

²⁵ *Id.* at art. I:3(b).

²⁶ *Id.* at annex on Air Transport Services.

²⁷ *Id.* at art. XVI, prohibits quantitative limitations on the number of service suppliers, total value of service transactions or assets, service operations or outputs and natural persons; as well as limitations on types of legal entity, or on the participation of foreign capital in terms of maximum percentage limit on foreign shareholding or the total value of individual or aggregate foreign investment.

²⁸ *Id.* at art. XVII.

However, obligations such as Most Favored Nation treatment (MFN) apply to all services, irrespective of whether a specific commitment has been made.²⁹

The broad scope of coverage is further balanced by ample policy space offered by the GATS. The right to regulate is explicitly acknowledged in the preamble of the GATS. More specifically, GATS permits WTO Members to apply measures relating to qualification requirements and procedures, even in sectors or subsectors where specific commitments are made, provided that they “do not constitute unnecessary barriers to trade in services”.³⁰ GATS also permits WTO Members to take measures to safeguard national security³¹ and to pursue policy objectives such as public morals and health.³²

To summarise, the broad scope and coverage of the GATS implies that, potentially, a broad scope of government measures may fall under the scrutiny of the agreement. Nevertheless, as WTO Members have made their commitments under the GATS on an *à la carte* basis, whether any specific measure violates a Member’s obligation under the GATS must be assessed case by case.

III. DLT-BASED APPLICATIONS: ELIMINATING AND CREATING SERVICES

As introduced above, DLT eliminates the need to have a central authority to keep, update or record information for a group of unrelated individuals or entities. Before, such central authority was needed because these unrelated individuals or entities can only trust each other to conduct business if a middleman exists to ensure the authenticity of the information provided, or to guarantee the transfer of assets or information. Indeed, many services are created to respond to the need for a middleman.³³ The elimination of the central authority from a transaction chain means the elimination of the central authority as a service supplier. In the meantime, the elimination of the central authority may create new opportunities for the network participants to provide services to other people in the network.

To recall, no services are excluded *a priori* from the GATS. Thus, any measure affecting DLT-based applications may fall under the ambit of the GATS. This part

²⁹ See, e.g., *id.* at art. II, III:1, VI:2, IX, VIII:1, & XV:2. However, for MFN treatment, WTO Members have a once-off chance to exempt a MFN-inconsistent measure according to the Annex on art. II Exemptions.

³⁰ *Id.* at art. VI:4.

³¹ *Id.* at art. XIV *bis*.

³² *Id.* at art. XIV.

³³ Thus, it is of no surprise that financial services is the sector most affected by the development of blockchain-based applications.

first discerns the services at issue and how the provisions of these services are affected by DLT-based applications. It proceeds to discuss WTO Members' obligations under the GATS about the services affected by DLT-based applications.

A. Discerning the Services at Issue

To recall, to examine a WTO Member's obligation under the GATS, it is necessary to read the GATS together with that Member's schedule of specific commitments. A significant part of its obligations under the GATS only applies to the service sectors or subsectors in which it has made commitments. Indeed, each WTO Member's schedule of specific commitments is annexed to the GATS and forms an integral part thereof.³⁴ The GATS does not specify how services are defined and how to classify services for the purpose of scheduling. Nevertheless, during the negotiations, the then GATT Secretariat advised the Contracting Parties to form a schedule based on the GATT Secretariat note, named "Services Sectoral Classification List" (also known by its document name "W120").³⁵ The Secretariat document W120 identifies twelve services sectors and some 160-odd subsectors.³⁶ Each sector or subsector identified, refers to a corresponding Central Product Classification (CPC) number so that the Contracting Parties could consult the explanatory note of the then CPC Provisional version to understand the exact scope of the sector or subsector concerned. Most WTO Members made their commitments with reference to W120. For this reason, this paper uses W120 and the corresponding CPC number to identify the services at issue.

There are broadly three ways in which DLT is applied.³⁷ The following discussion is based on these applications.

1. Currency and Currency Transfer

The first used case of DLT-based application is currency and the associated transfer mechanism, of which, the most well-known is Bitcoin. In this case, the DLT-based application eliminates the need for a central bank to issue currency and

³⁴ GATS, *supra* note 6, at art. XX:3.

³⁵ See General Agreement on Tariffs and Trade, Multilateral Trade Negotiations, ¶16, WTO Doc. MTN.GNS/W/120 (July 10, 1991). Nevertheless, Members are free to use their own classification. In that case, Members are advised to "give a sufficiently detailed definition to avoid any ambiguity as to the scope of the commitment".

³⁶ *Id.*

³⁷ EURO BANKING ASSOCIATION (EBA), CRYPTOTECHNOLOGIES, A MAJOR IT INNOVATION AND CATALYST FOR CHANGE: 4 CATEGORIES, 4 APPLICATIONS AND 4 SCENARIOS AN EXPLORATION FOR TRANSACTION BANKING AND PAYMENTS PROFESSIONALS (May 11, 2015).

for commercial banks to keep record of consumers' account information and perform transfer of money among market participants. The services originally provided by the central bank and commercial banks concern the whole category of services of monetary intermediaries (CPC 8111), including central bank currency issue services (CPC 81114), acceptance of deposits and other repayable funds from the public, all payment and money transmission services, provision and transfer of financial information, etc.³⁸ In the scenario of a DLT-based application, the need for these services remains, yet the traditional service suppliers are replaced by some or all participants on the distributed ledger. In other words, some key services remain, yet suppliers are replaced.

In the meantime, as central authorities disappear, all the auxiliary services used to support these central authorities disappear. These include, for example, settlement and clearing services provided by third-party suppliers to the banks. These are the services eliminated by the introduction of DLT-based applications.

Yet, as these DLT-based applications facilitate exchange of assets of economic entities, DLT-based application users may find it easier to exchange new and more services. Services can be created as a result of this blockchain application.

2. Record Keeping (Asset Registry)

Asset registries use DLT-based applications to register assets. Ownership of an existing asset, e.g. stocks, vehicles, buildings, once registered on such application, are immutable and verifiable. Traditionally, these registering services are either provided by governments (e.g. in the case of buildings, land, etc.) or by the entity itself (or third parties) to facilitate management (e.g. stocks). The services at issue here are bookkeeping services (CPC 86220) or auxiliary services provided by the authority traditionally issuing proofs of asset (e.g. services related to provision of services related to the insurance of securities). In DLT-based settings, the need for these services remains, but the suppliers are changed, from conventional centralised service suppliers to participants on the distributed ledger.

In absence of a centralised record keeping authority, notary services kick in to provide verification services. If all the information needs to be notarised today are stored by DLT, there would be no need for notary services. Thus, services relating to legal documentation and certification services (CPC 86130) would be eliminated.

3. Smart Contracts

³⁸ To note, for financial services, GATS Annex on Financial Services provides for an alternative classification. This paper uses classification in that Annex.

In this case, programs are written on a blockchain and automatically executed by nodes on the network.³⁹ Thus, it is by nature an application added on top of a DLT-based application. A famous example is Ethereum and smart contracts created by using the Ethereum platform. The services at issue relates to a whole category of services provided to implement contracts, including validating trade transactions, preventing duplicated transactions, recording transactions in the event of disputes over contract settlements or deliverables, acting as agents on behalf of associates or members. Some examples include contract administration services (CPC 86713), services relating to freight transport agent services (CPC 74800) etc. In this scenario, conventional service suppliers are replaced by smart contracts.

Smart contracts can greatly facilitate the implementation of contracts and therefore has a big potential in promoting any services that can benefit from more efficient execution.

4. Asset Centric Technologies

This type of DLT-based application focuses on the exchange of digital representations of existing assets, e.g. currencies, metals, stock, bonds in combination with a shared ledger. Their applications include foreign exchange and remittances, real-time payments, documentary trade and asset serving. A salient feature of this application is that only trusted partners can participate. Thus, it is not an open ledger. In this case, traditional institutions that keep records of these assets remain and become nodes in the DLT-based application. The DLT-based application aims to make transactions among themselves easier, by removing the need for a trusted third party to provide these backdoor services. Services being replaced may relate to services provided by trusted third parties commonly employed as custodians, payment providers, poolers of risk and in insurance setting. Similarly, this type of application may benefit the consumers of the network participants, thus promoting trade in both goods and services.

B. *Applying GATS to Services and Service Suppliers Impacted by DLT*

As discussed above, DLT-based applications may replace services traditionally provided by central authorities; eliminate services created to remedy the absence of central authorities or to support the operation of the central authorities; and facilitate trade in services among DLT-based application users. This part assesses how, in each of these circumstances, WTO Members' obligations under the GATS matter. Specifically, it explores whether a WTO Member, in adopting regulations

³⁹ Harish Natarajan et al., *supra* note 2, at 29.

affecting DLT-based applications, needs to consider their obligations under the GATS.

1. Services Being Replaced: Commitments on Market Access Matter!

As discussed in the previous part, DLT-based applications would replace services traditionally provided by central authorities. In this case, the substantive services (e.g. bookkeeping services, issuance of currency) stay, but the suppliers who provide these services have been replaced.

In a DLT-based system, the services originally provided by central authorities are now jointly provided by some or all ledger participants (depending on the permission rules for each application). In other words, some or all service consumers may also act as service suppliers. Thus, the provision of such services is internalised by service consumers. In this instance, can governments adopt measures affecting DLT or DLT-based applications that may impede the replacement of services previously provided by central authorities?

The threshold question is whether the measures at issue “affect trade in services” within the meaning of Article I:1 of the GATS.⁴⁰ In particular, there must be affirmative answers to two questions: (i) whether there is ‘trade in services’ in the sense of Article I:2; and, (ii) whether the measure in issue ‘affects’ such trade in services within the meaning of Article I.1.⁴¹

One may argue that when services are internalised, there would be no service suppliers at all—even less so the existence of ‘trade in services’. Thus, the measure cannot “affect trade in services” so as to fall under the ambit of GATS. This argument would be similar to that put forward by the European Union in *EC — Bananas*. The European Union argued in that dispute that ‘vertically-integrated companies’ are not service suppliers, because the services are internalised by the company. This argument was dismissed by the Panel and the Appellate Body.⁴² The essence of their reasoning is that the nature and structure of the business does not matter. In other words, service suppliers exist so long as services exist, even if they supply the services to themselves. Following this logic, to the extent that the nodes on the distributed ledger provide the services traditionally provided by the central authorities, they remain the service suppliers of the services concerned. Therefore, the threshold question concerning the application of the GATS to

⁴⁰Appellate Body Report, *Canada — Certain Measures Affecting the Automotive Industry*, ¶ 152, WTO Doc. WT/DS139/R (adopted Feb.11, 2000) [hereinafter *Canada – Autos*].

⁴¹*Id.* ¶ 155.

⁴²ABR, *EC – Bananas*, *supra* note 22, ¶ 227.

government measures affecting this type of DLT applications may not be difficult to pass.

The next step of analysis is whether the WTO Member concerned has made specific commitments concerning Market Access and National Treatment in the relevant services sector or subsector. Very often, the first challenge battle is whether the services at issue fall under the sectors or subsectors that the WTO Member has committed to. This may not be an easy task.⁴³ On the one hand, as services become ever complicated, it may be difficult to identify what elements constitute the service that the DLT-based applications have replaced or created.⁴⁴ On the other hand, it is challenging to interpret the scope of the sectors or subsectors classified by the Central Product Classification (CPC) Provisional. To recall, most WTO Members based their commitments on the CPC Provisional version, which was adopted in 1989. Since then the CPC system itself has been revised several times.⁴⁵ Governments may tend to argue that because the negotiators of the GATS could not have envisaged some services existing today, WTO Members should not be assumed to have taken obligations with regard to these services.⁴⁶ However, this line of argument has been consistently dismissed by the Appellate Body in *US — Gambling* and *China — Audiovisual Products*.⁴⁷

⁴³See, e.g., Appellate Body Report, *United States — Measures Affecting the Cross-Border Supply of Gambling and Betting Services*, WTO Doc. WT/DS285/26 (adopted Apr. 20, 2005) [hereinafter ABR, *US — Gambling*]; Panel Body Report, *China — Certain Measures Affecting Electronic Payment Services*, WTO Doc. WT/DS413/10 (adopted Aug. 31, 2012) [hereinafter PR, *China — Electronic Payment Services*].

⁴⁴For example, in *China — Electronic Payment Services*, parties went to great lengths to discuss what the services at issue are. See PR, *China — Electronic Payment Services*, *supra* note 43, Section VII.C, ¶¶ 7.11 – 7.62.

⁴⁵U.N. DEP'T OF ECON. & SOC. AFFAIRS, PROVISIONAL CENTRAL PRODUCT CLASSIFICATION, U.N. Doc. ST/ESA/STAT/SER.M/77 (1989); U.N. DEP'T OF ECON. & SOC. AFFAIRS, PROVISIONAL CENTRAL PRODUCT CLASSIFICATION, U.N. Doc. ST/ESA/STAT/SER.M/77/ VER.1.0 (1997); U.N. DEP'T OF ECON. & SOC. AFFAIRS, PROVISIONAL CENTRAL PRODUCT CLASSIFICATION, U.N. Doc. ST/ESA/STAT/SER.M/77/ VER 1.1, U.N. Sales No. E.03.XVII.3 (2002); U.N. DEP'T OF ECON. & SOC. AFFAIRS, PROVISIONAL CENTRAL PRODUCT CLASSIFICATION, U.N. Doc. ST/ESA/STAT/SER.M/77/ VER 2.0 (2008); U.N. DEP'T OF ECON. & SOC. AFFAIRS, PROVISIONAL CENTRAL PRODUCT CLASSIFICATION, U.N. Doc. ST/ESA/STAT/SER.M/77/ VER 2.1 (2015).

⁴⁶In, Panel Report, *United States — Measures Affecting the Cross-Border Supply of Gambling and Betting Services*, ¶ 6.39, WTO Doc. WT/DS285/R (adopted Apr. 20, 2005) [hereinafter PR, *US — Gambling*], the United States made an argument that gambling is a *sui generis* activity. In *China — Publications and Audiovisual Products*, the United States argued that “the principle of technological neutrality is consistent [...] with the concept that the GATS is sufficiently dynamic so that Members need not renegotiate the Agreement or their commitments in the face of ever-changing technology.” In response, China argued that “its Services Schedule

Assuming that the WTO Member has made commitments in the relevant service sector or subsector, the final step is to assess the scope of the commitments and whether the measure at issue has constituted a prohibited limitation. For example, a full commitment on Market Access in a service sector or subsector means that the government cannot impose measures that are tantamount to a prohibition of the provision of such services by nodes in a DLT-based application.

A WTO Member's commitments on National Treatment may be less relevant in this circumstance. This is because domestic consumers themselves are now service suppliers. Arguably, any measure affecting the supply of such services through a distributed ledger will necessarily affect domestic service suppliers and consumers in the same way as foreign ones.⁴⁸

One caution here is that services supplied in the exercise of governmental authority are carved out from the scope of application of the GATS.⁴⁹ "Services supplied in the exercise of governmental authority" are defined as any service which is supplied "neither on a commercial basis, nor in competition with one or more service suppliers".⁵⁰ For financial services, as provided by the Annex on

has to be interpreted in light of the circumstances of its conclusion. At the time of negotiations on China's accession to the WTO, network music services did not, according to China, constitute an established business operating within a legal framework." See Panel Report, *China — Measures Affecting Trading Rights and Distribution Services for Certain Publications and Audiovisual Entertainment Products*, ¶¶ 7.1160, 7.1164, WTO Doc. WT/DS363/19 (adopted Dec. 21, 2009) [hereinafter PR, *China — Publications and Audiovisual Products*].

⁴⁷ In *US — Gambling*, the Appellate Body considered that interpreting a Member's Schedule of Commitments "involves identifying the *common intention* of Members", rather than the intention of *one* Member. See ABR, *US — Gambling*, *supra* note 43, ¶ 159. In *China — Publications and Audiovisual Products*, the Appellate Body considers that "interpreting the terms of GATS specific commitments based on the notion that the ordinary meaning to be attributed to those terms can only be the meaning that they had at the time the Schedule was concluded would undermine the predictability, security, and clarity of GATS specific commitments, which are undertaken through successive rounds of negotiations." See Appellate Body Report, *China — Measures Affecting Trading Rights and Distribution Services for Certain Publications and Audiovisual Entertainment Products*, ¶ 397, WTO Doc. WT/DS363/19 (adopted Jan. 19, 2010) [hereinafter ABR, *China — Publications and Audiovisual Products*].

⁴⁸ However, situation would be different if there are domestic conventional service suppliers supplying the same services in the market, and the measure disproportionately favours domestic suppliers of the same service. In this scenario, as elaborated in Part III.2.c below, the issue of 'like service suppliers' kick in. The question would be whether DLT has made service suppliers unlike.

⁴⁹ GATS, *supra* note 6, at art. I:3(b).

⁵⁰ *Id.* at art. I:3(c).

Financial services, this constitutes “activities conducted by a central bank or monetary authority or by any other public entity in pursuit of monetary or exchange rate policies”.⁵¹ This means measures affecting services provided by central banks such as currency issue service are not covered by the GATS.

2. Services Being Eliminated: Commitments Not Relevant

Blockchain eliminates the need for a central authority. By eliminating the central authority, it eliminates the need for services provided to that central authority (traditionally conducted either by that authority or trusted third parties) to enable their performance. Since these services are no longer needed, the existence or absence of specific commitments under GATS in these services sectors or subsectors becomes irrelevant.

3. Services Being Enabled: Technology Neutrality and Likeness of Marginalised Service Suppliers Are at Issue

By using DLT-based applications, transactions among ledger participants are facilitated. DLT-based application participants can either use the application to deliver services or enforce transactions (e.g. in the case of ‘smart contract’). Depending on the configuration of the application, there are at least two ways in which a WTO Member’s commitments may matter. The first is to consider the DLT-based application as a means of delivery for the substantive services being supplied. The term ‘means of delivery’ was first used by the Panel in its report in *US — Gambling*.⁵² It refers to various technological means (mail, telephone, internet, etc.) by which a service can be supplied cross-border or remotely. When the DLT-based application users are not located in the same jurisdiction, such transaction would be categorised as trade in services in the sense of mode 1, cross-border supply, covered by GATS. Previously, panels and the Appellate Body had no problem in finding that services delivered via internet, a means of delivery not prevalent at the time when WTO was created, is covered by mode 1 under the GATS.⁵³ Applying the same logic to the DLT-based application, if a WTO

⁵¹*Id.* at Annex on Financial Services, art. 1(b)(i).

⁵² PR, *US — Gambling*, *supra* note 46, ¶ 6.33.

⁵³ In *US — Gambling*, the Panel confirmed by making full commitments under mode 1, a Member cannot restrict any means of delivery within mode 1, including services provided via internet, *see Id.* ¶¶ 6.280–6.287. This decision was not appealed. *See ABR, US — Gambling*, *supra* note 43, ¶ 220. In making this conclusion, the Panel, at ¶ 6.285, referred to a Progress Report on a “Work Programme on Electronic Commerce”, prepared by the Council for Trade in Services for the General Council, which states: “[i]t was also the general view that the GATS is technologically neutral in the sense that it does not contain any provisions that distinguish between the different technological means through which a service may be supplied.” The principle enshrined in this statement is branded as

Member undertakes full commitment in any of the mode of supply (mode 1 and mode 3 being the most relevant) of the relevant service, the provision of that service via a DLT-based application shall not be impeded.

The second way is to apply an evolutionary interpretation to the service sectors scheduled in a Member's specific commitments. The definition of 'supply of a service' under GATS offers some room for such interpretation, as it refers to the 'production, distribution, marketing, sale and *delivery* of a service'.⁵⁴ In *China — Audiovisual Products*, both the Panel and the Appellate Body found that a sector, China subscribed in its schedule, "distribution of sound recording" extends to the distribution of sound recordings in non-physical form, notably through electronic means.⁵⁵ Following the same logic, commitments on a particular service sector or subsector may be interpreted as to grant the right for service suppliers to deliver the services via new technology such as DLT-based applications.

Another legal question in assessing WTO Member's obligations under the GATS is whether services provided via DLT-based applications and service suppliers on these distributed ledgers are like services and service suppliers in the conventional form of supply. A salient feature of DLT is to make it possible for previously marginalised or disadvantaged individuals to participate in the trust-based world economy. Nevertheless, regulatory authorities may suddenly be exposed to many new service suppliers, of whom they have very few information. The Appellate Body in *Argentina — Financial Services* confirmed that the 'likeness' of services and service suppliers under Articles II:1 and XVII:1 of the GATS is concerned with the competitive relationship of services and service suppliers, similar to the rationale in interpreting likeness under the GATT.⁵⁶ Nevertheless, the Appellate Body highlighted that the likeness under the GATS relates not only to the services being supplied, but also to service suppliers.⁵⁷ Thus, likeness of services and service suppliers must be assessed together in a holistic manner. That implies that even if the services provided via conventional means and services provided via DLT are like, consideration of service suppliers may render 'service and service suppliers' as a whole not like. Even though the Appellate Body has not yet provided guidance

'technology neutrality'. Nevertheless, as noted in that Report, this view that technology neutrality was not unanimous since "[s]ome delegations expressed a view that these issues were complex and needed further examination". See Council for Trade in Services, *Work Programme on Electronic Commerce Progress*, ¶ 4, WTO Doc. S/L/74 (July 27, 1999).

⁵⁴ GATS, *supra* note 6, at art. XXVIII (b) (emphasis added).

⁵⁵ See PR, *China — Publications and Audiovisual Products*, *supra* note 46, ¶ 4.12.

⁵⁶ See Appellate Body Report, *Argentina — Measures Relating to Trade in Goods and Services*, ¶ 6.25, WTO Doc. WT/DS453/12 (adopted May 9, 2016) [hereinafter *Argentina — Financial Services*].

⁵⁷ *Id.* ¶¶ 6.28, 6.29.

on the relevance and weight of specific criteria for determining whether service suppliers and the services provided are 'like',⁵⁸ their emphasis on the term 'service suppliers' opens the door for WTO Members to have some regulatory space under the 'likeness' assessment.

4. Services Provided by the Ledger: As Part of the Service or an Input?

The analysis above explains why WTO Members should consider their specific commitments under the GATS when adopting measures affecting services and service suppliers enabled by DLT-based applications. A question remains as to whether a WTO Member can impose limitations on the distributed ledger itself—the infrastructure through which the block chain participants supply services. The value of the distributed ledger is the shared control over the data and the protocols governing the data. Thus, the services provided by the ledger, in its essence, are data storage and processing services. In this way, it resembles the services provided by online platforms. Scholars have written a lot on the WTO compliance of government measures affecting internet and database-enabled digital.⁵⁹ These discussions remain relevant in the context of trade enabled by DLT-based applications.

To assess whether measures affecting data storage, processing, and sharing may violate Members' commitments under GATS, one must assess, first, whether the data-related services form an integral part of the substantive services being enabled and delivered. As discussed in the previous part, the definition of the service sector or sub-sector may itself include services delivered via innovative means of delivery, including DLT. In this case, what matters is the specific commitments made for the substantive services enabled by the DLT-based application.

In the cases where services are replaced by the DLT-based applications, data services provided by the ledger can be considered as an input. Full commitments on the services being replaced do not automatically grant access to input services. As advised by the Scheduling Guidelines issued by the WTO Secretariat, a commitment made in Market Access and National Treatment commitments apply only to the sectors or sub-sectors inscribed in the schedule and do not imply a

⁵⁸ *Id.* ¶ 6.33.

⁵⁹ See, e.g., Nivedita Sen, *Understanding the Role of the WTO in International Data Flows: Taking the Liberalization or the Regulatory Autonomy Path?*, 21(2) J. INT'L ECON. L. 323-348 (2018); Antony Taubman, *TRIPS Encounters The Internet: An Analogue Treaty In A Digital Age, Or The First Trade 2.0 Agreement?*, in TRADE GOVERNANCE IN THE DIGITAL AGE 315-319 (Mira Burri & Thomas Cottier eds., 2012); SACHA WUNSCH-VINCENT, *THE WTO, THE INTERNET AND TRADE IN DIGITAL PRODUCTS: EC-US PERSPECTIVES* 52-53 (1st ed., 2006).

right for the supplier of a committed service to supply uncommitted services which are inputs to the committed service.⁶⁰ Thus, in the absence of a commitment on the data-related services, WTO Members enjoy policy space to impose measures affecting data storage and sharing on distributed ledgers. However, this freedom is not without limitation. Following the logic put forwarded by the Appellate Body in *US — Gambling*, in case a commitment is made for the substantive services replaced by the DLT-based application, the measures affecting ledger-related services cannot be tantamount to a total prohibition on the use of blockchain-based applications to deliver the replaced services, as it constitutes a zero quota for the supply of the committed services being replaced by the DLT-based application.⁶¹

An extra layer of regulatory concern for DLT, however, lies in the manner in which it shares information across the entire ledger. Especially, an open DLT-based application shares all data including sensitive data and data already restricted by regulation with all participants in whichever jurisdiction the servers are held. In this instance, Article XIV (c)(ii) of the GATS may provide the government with necessary space to regulate.

5. Summary

To summarise, depending on the way the DLT-based application may replace, eliminate, or create services, the commitments that WTO Members have made on these services under the GATS may matter in different degrees. It is also worth noting that even if a WTO Member has not made any commitment for the services being replaced or enabled, WTO Members still need to comply with some general obligations under the GATS such as MFN and transparency.⁶² Having said that, as mentioned above, the GATS offers ample policy space through its provisions on domestic regulation and exceptions. GATS-inconsistent measures may still be justified in accordance with these provisions.

IV. CONCLUSION

DLT is rapidly changing the way in which businesses are conducted. A salient feature of DLT-based applications is the removal of the need to have a central authority to keep, update, and verify data. Traditionally, services provided by central authorities constitute a significant part of the services industries, as they

⁶⁰ Council for Trade in Services, *Guidelines for the Scheduling of Specific Commitments under the General Agreement on Trade in Services*, WTO Doc. S/L/92, ¶ 25 (Mar. 26, 2001), https://www.wto.org/english/tratop_e/serv_e/guide1_e.htm.

⁶¹ ABR, *US — Gambling*, *supra* note 43, ¶¶ 223-238.

⁶² *See, supra* Part II.B.

build trust among unrelated individuals or entities to facilitate transactions between them. With the advent of DLT, services previously provided by central authorities are now being replaced and provided jointly by some or all the participants on a distributed ledger; services used to support the operation of central authorities are being eliminated. In the meantime, DLT-based applications offer an easier way for previously disadvantaged or marginalised individuals to participate in trade. By engaging these participants, DLT-based applications expand trade, including trade in services.

GATS, as the first and the only multilateral trade agreement on services, is highly relevant for the development and regulation of DLT-based applications. Its broad scope of coverage and application means any measure affecting trade in services relevant to DLT-based applications (as identified in Part III.1) falls under the ambit of GATS. If a WTO Member has made specific commitments in the relevant service sector or sub-sector, such commitments may limit the Member's ability to adopt measures relating to the DLT-based application. The discussions in Part III.2 of this paper show that the GATS has a lot to offer in (i) keeping under check domestic regulations relating to services which are either being replaced or enabled by DLT-based applications; and (ii) in realizing the potential of DLT to expand trade by curbing barriers to such trade. In addition, WTO Members can also use platforms provided by GATS to follow the development of DLT-based applications and share regulatory experiences, e.g. through the transparency mechanism provided by Article III and following the negotiation mandate under Article VI:4.