ENFORCEMENT AND COMPLIANCE IN A BLOCKCHAIN(ED) WORLD

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I. INTRODUCTION

Most legal professionals have come across the term "blockchain"or "bitcoin" through client interaction, formal training or news updates. The topic has also been covered by industry publications, websites, magazines and journals which helpfully explain what a blockchain is, what it does and how it could bring revolutionary changes to business structures. Legal articles, however, are limited in scope. Most discuss the application of blockchain technology in financial services for e-commerce, reducing transaction costs and simplifying audit trails and regulatory reporting. Few publications, if any, discuss the changes blockchain technology could bring to competition enforcement and competition compliance procedures. This article looks to fill this identified gap and hopes to reach out to technology enthusiasts and competition professionals alike.

In the paragraphs that follow, I first define key terms to ensure a common understanding of relevant concepts. I then explain the potential benefits of blockchain technology in the enforcement of competition law followed by a few examples of how blockchains could be used to implement robust compliance policies.[2] A key assumption I have made in this article is that most, if not all, businesses move to a blockchain environment in the near future; similar to the uptake of accounting software or the World Wide Web today.

II. KEY TERMS

In order to unlock the potential of blockchain technology in the enforcement and compliance realms, we need a level of familiarity with the technology and the jargon used to describe its various aspects such as "distributed ledgers," "permissioned blockchains," "permissionless blockchains" and "smart contracts."

A "distributed ledger" is a ledger of transactions that exists simultaneously on multiple devices. The benefit of a distributed ledger is that no single undertaking is in control of the verification process before an entry is made onto the ledger. Similarly, no single undertaking can amend, delete or change the contents of such a ledger. If a merchant wishes to use a distributed ledger to record transactions, all devices hosting that ledger need to verify the authenticity of the transaction and agree on incorporating it into the ledger. Once incorporated, it is nearly impossible to change any details since that change will have to be made on all copies of that ledger, i.e. on all devices, at the same time. Blockchains are a type of distributed ledger.

A blockchain is generally defined as "a shared digital ledger, or a continually updated list of all transactions, where the decentralized ledger keeps a record of each transaction that occurs across a fully distributed or peer-to-peer network."[3] The term blockchain comes from the process of adding blocks of cryptographically signed data to form a perpetual and immutable chain of records.[4] Each transaction is assigned a unique set of characters called hash ID and multiple transactions are clumped together to form a digital block. Each block connects to the immediately preceding block and the immediately subsequent block creating

1 Ajinkya M Tulpule holds experience in both, competition law and technology matters. The views expressed here belong to the author alone and do not reflect the views of the FCA.

2 Arguably blockchain technology could also be used to counter bribery, fraud and money laundering, but these topics are outside the scope of this article.

3 Alan Morrison, Blockchain and smart contract automation: Blockchains defined, PwC (2016), available at: http://www.pwc.com/us/en/technology-forecast/blockchain/definition.html.

4 Oliver Wyman,Blockchain in Capital Markets: The Prize and the Journey, (2016) page 5, available at: http://www.oliverwyman.com/content/dam/oliver-wyman/global/en/2016/feb/BlockChain-In-Capital-Markets.pdf.

the chain.[5] There are multiple such blockchains, the most well-known blockchain is the bitcoin blockchain.

A key feature of blockchain technology is its verification process, which requires some form of consensus. For example, the bitcoin blockchain requires a minimum of 51 percent of all computing power on that network to verify the authenticity of each transaction before it is permitted to complete and get added to the bitcoin ledger. If a transaction fails to meet the 51 percent threshold the transaction is denied and, therefore, not added to the bitcoin ledger. The consensus mechanism for a blockchain may depend on whether the blockchain is permissioned or permissionless, among other factors.

In a permissioned blockchain, members of that blockchain network can restrict who may participate in the consensus mechanism. Members can also restrict who can create smart contracts on that blockchain for logic optimized transactions. In a permissionless blockchain, on the other hand, any member of the public can participate in the consensus mechanism and create smart contracts. Bitcoin, for example, uses a permissionless blockchain.

"Smart contracts" are a piece of computer code capable of verifying, executing and enforcing a set of instructions.[6] The computer code reviews a pre-determined set of inputs, matches them against conditions written in the code and allows a transaction to be executed only if all necessary conditions are met. For example, a smart contract installed by a seller can check incoming purchase orders for compliance with the sales contract in the real world and release a batch of products for shipping to the customer if the purchase order matches the terms of sale agreed with that purchaser.

Blockchains can store a range of records including payment transactions, sales records, purchase history, corporate accounts, retail pricing history as well as future changes to pricing. It can also record non-transactional data such as title records, trademark and patent information, minutes of meeting, calendar entries, annual reports and travel logs to name a few.

III. COMPETITION ENFORCEMENT USING BLOCKCHAINS

The European Commission's staff working paper on best practices for the submission of economic evidence and data makes three seemingly obvious yet important points. First, "most competition or merger investigations involve (1) collecting data, (2) analyzing data, and (3) drawing inferences from data."[7] Second, "economic analysis plays a central role in competition enforcement [because] economics as a discipline provides a framework to think about… [how] each particular market operates and how competitive interactions take place."[8]

Economic analyses involve large volumes of quantitative datasets and econometric models based on these datasets are used to explain parties' actions on the market; in the case of mergers, possible future actions on the market.[9] Here, the European Commission makes its third seemingly obvious yet important point: "not all facts can be observed or measured with high accuracy and mostdatasets are incomplete or otherwise imperfect."[10] This is where blockchain technology can truly add value.

The most pertinent utility of a blockchain in competition enforcementis likely to be for the provision of large volumes of transactional and non-transactional data which has been generated contemporaneously with underlying commercial transactions

5 See https://blockchain.info/ for a live stream of transactions made using blockchain technology. The transaction list that is constantly refreshing under the header "Latest Transactions"are real-time transfers of value that are being verified and incorporated to the bitcoin ledger. You may click on any of these transactions to view its hash ID.

6 See Smart Contracts Explained, available at: http://www.blockchaintechnologies.com/blockchain-smart-contracts.

7 See Best Practices For The Submission Of Economic Evidence And Data Collection In Cases Concerning The Application Of Articles 101 And 102 TFEU And In Merger Cases, DG Competition Staff Working Paper, page 14 available at: http://ec.europa.eu/competition/antitrust/legislation/best_practices_submission_en.pdf.

8 Ibid., page 3.

9 Economic analyses are frequently used to define relevant markets, identify counterfactuals and to conduct substantive competition assessments for both behavioral and transactional matters.

10 Ibid., page 17.

and enjoys a high level of reliability. I argue that this utility can extend across merger control, cartel investigations and, at a minimum, for monitoring commitments in abuse of dominance matters.

A. Application in Merger Control

Competition lawyers are all too familiar with the varying levels of digital systems employed by undertakings for maintaining business records. The IT systems installed by an undertaking usually depends on its size, industry and of course budgetary constraints. Competition authorities, as a result, witness a varying level of complexity and sophistication in the quality of empirical economic evidence submitted by merging parties. Two recent merger decisions best demonstrate the difference between enterprise data management systems: *Olympic/Aegean Airlines*[11] and *Ryanair/Aer Lingus.*[12]

In its final decision in *Olympic/Aegean Airlines*, the European Commission highlighted the "poor quality, incomplete and/or inaccurate" nature of market data and found that this was partly because the directional data and time of purchase data was not available from at least one of the parties and also because the "ferry operators' database are not as developed as the sophisticated systems/databases used by airlines." It was, therefore, not possible for the Commission to rely on an econometric analysis containing so few observations as "such an econometric analysis would not be robust enough … for the standards of the Best practices for the submission of economic evidence."

In this decision, the Commission also set out three pre-conditions that must be met before complex inferences can be drawn from a sophisticated empirical analysis:

- all necessary data must be available to implement the chosen empirical methodology and the available data must be of adequate quality

- empirical analysis necessarily involves the use of historical data and for the data to be usable in merger cases it needs to be a good indicator of the likely impact on future competition, and

- there should be sufficient variability in the data to identify references for comparison.

After repeated submissions from the parties, the Commission distinguished its decision in *Ryanair/Aer Lingus* by explaining that the "data [in *Ryanair/Aer Lingus*] was complete, accurate, and adequate for the methodologies for which it was used."[13]

However, even in *Ryanair/Aer Lingus* the Commission admitted that it had to cope with a specific problem concerning the gathering of relevant evidence. The Commission commented that although "the transaction is likely to have an effect on more than 14 million passengers travelling with the Merging Parties' airlines, these are largely individual customers that could not be contacted by the Commission by way of the classic investigative techniques (questionnaires, telephone interviews) in a meaningful way."[14] Also, footnote 95 in the decision explains that the Commission's price correlation analysis was limited to only 17 routes because it did not have sufficient data for the remaining routes.

Blockchain technology is unlikely to replace all traditional sources of market data for the better part of the next decade. However, assuming a majority of undertakings eventually transition onto blockchain platforms, it will better populate the target dataset and speed up data collection to result in a more informed, robust and accurate competition assessment. Further, the speed and granularity of data collection will be matched by its reliability. Transaction data held on blockchains is created contemporaneously with the associated commercial transaction in real time and, therefore, provides a much clearer picture of the conditions of the market that exists at a specific point in time. Also, reliability of blockchain data could be further improved

11 Case No COMP/M.5830 – *Olympic/Aegean Airlines* (2011).

12 Case No COMP/M.4439 – *Ryanair/Aer Lingus* (2007).

13 Ibid.

14 Ibid.

through the use of checkpoints on blockchain networks, which will allow business systems to recognize all transactions up to the checkpoint as being valid and irreversible. If any member of that network tries to fork the blockchain prior to the checkpoint, the system will not permit it.

With respect to the specific cases discussed above, if the relevant undertakings were using blockchain technology, the Commission would have had access to the necessary pricing data for all routes and ports as well as sales data from airlines, travel agents and even consumers to gain a more comprehensive understanding of competitive dynamics. Further, since blockchains can store more than just pricing data the Commission could have viewed legal agreements in the real world that underlie each transaction in the blockchain world. This would provide an unprecedented level of insight and granularity into every undertaking's commercial transactionsfor a specific timeframe. The level of granularity and reliability promised by blockchains is likely to find favor with economists and lawyers conducting quantitative analyses such as price correlation analysis, past shocks analysis and demand estimation.

It is important to note at this point that blockchain data does not necessarily mean a different result; but it does mean a more informed result.

B. Application in Cartel Investigations

When competition authorities wish to detect cartels and investigate potential infringements, they experience information asymmetry. This is because cartels are by their very nature secretive and most competition authorities do not have access to an undertaking's contracts, arrangements or financial and transactional history. Since the information held on a permissionless blockchain falls in the public domain and can be viewed by anyone, I expect most undertakings to gravitate towards permissioned blockchains for maintaining business records. As a result, unless all undertakings across all sectors grant all competition authorities ongoing access to their blockchain network, it is unlikely to be of much assistance for cartel detection.

However, an area where blockchains can impact cartel enforcement is in the submission of leniency applications and concomitant formal investigations. In most cases, applicants for lenient treatment under competition laws need to provide vast amounts of information on the alleged cartel to convince the authority that an anti-competitive arrangement exists, identify the cartel members with a level of certainty and provide all available evidence on the functioning of the cartel. Using blockchain technology, leniency applicants will be able to provide access to a live data stream on all relevant transactions falling within the alleged cartel arrangement. A "live data stream" as opposed to past transaction data is analogous to watching a football game live on TV as opposed to a stack of photographs of the gameafter it has ended. Such live streaming can greatly increase a competition authority's visibility over an alleged cartel arrangement allowing it to reach certain conclusions before initiating a formal investigation and committing additional resources.

By way of example, the OFT's investigation into retail tobacco sales would have looked very different if it had access to transactional data from all relevant undertakings on their respective blockchains. The information asymmetry between OFT and participants of the alleged cartel became very clear at the appellate stage where the OFT's evidence was limited to an expert report from Professor Greg Shaffer, some key correspondence, corporate leniency statements and a witness statement from Fiona Bayley, a Sainsbury's tobacco buyer during the relevant time period. ITL's evidence bank, on the other hand, included 12 witness statements, expert reports from a number of consultancies and, more importantly, empirical analysis based on 36 million price data points. The empirical evidence in this case helped prove that there were lower price increases during the period of the alleged infringement than afterwards. Arguably, if the OFT could access all relevant transactional data on tobacco prices before, during and after the relevant time period as part of the leniency application, it may have amended its theory of harm before issuing a statement of objections; it may have also decided to close its investigation and not issue a statement of objections altogether. This would have led to some resource savings on both sides.

The link between the evidentiary standard applicable to a competition authority and its proposed theory of harm is best explained in *Tetra Laval*. In this case, the Court of Justice held that "[where] the claims of cause and effect are dimly discernible,

uncertain and difficult to establish…the quality of the evidence…is particularly important."[15] The Court's approach has developed since *Tetra Laval* and it is now well accepted that the strength of evidence required to show the existence of an infringement should be directly proportional to the complexity of the proposed theory of harm. Therefore, once blockchain technology is adopted by a majority of businesses, we can expect competition authorities to propose increasingly complex theories of harm and defense counsel and accompanying economists will need to gear up to raise robust defenses.

C. Application in Monitoring Commitments

Accepting commitments is one of several ways a competition authority may conclude a formal investigation into abuses of dominance. Commitments are voluntarily offered by parties and become legally binding once accepted by the competition authority. Although commitment decisions do not make a finding of infringement, parties run the risk of incurring enforcement actions and financial penalties if they fail to comply with these commitments. So far, there has only been one instance at the EU level where a breach of commitments was discovered and penalized.

In 2013, the Commission penalized Microsoft EUR €561 million for failure to comply with its commitment to offer a "choice screen" allowing consumers "to choose in an informed and unbiased manner which web browser(s) they wanted to install."[16] The penalty imposed on Microsoft was based on gravity of the infringement, duration of the infringement, deterrent effect as well as cooperation offered by Microsoft.

Smart contracts based on blockchain technology could have avoided the infringement from occurring in the first place. For instance, a smart contract could be designed so that software releases only take place if they are also compliant with binding commitments to competition authorities. This would have required Microsoft's in-house team to ensure that the relevant commitments are coded into the company's smart contract for future operating system releases. Moreover, smart contracts are highly customizable and could be designed to only review sales made to EU consumers.Therefore, if Microsoft offers a variation of the choice screen commitment in multiple jurisdictions, they could be quickly and easily "localized" so that relevant jurisdictional requirements are met. Finally, the distributed ledger system of the blockchain would mean Microsoft would have a record of every transaction compliant with EU commitments (and similar commitments made in other jurisdictions) where this information could easily be shared with the Commission by granting them access to "MS-Blockchain." The automation of certain compliance functions would not only result in significant cost savings, but also in lower penalties through increased transparency and cooperation. Interestingly, using blockchains can also lead to resource savings at the Commission allowing it to focus its attention on other pressing matters.

Another potential benefit is in the transfer and licensing of standard essential patents. Patent rights can be saved on a permissionless blockchain ledger that will allow members of the public to view certain details, for example, the current owner of the patent, its transfer history and that any potential restrictions attached to it. A properly created smart contract for patent transfers can ensure that any potential restrictions attached to the patent are transferred to the purchaser. The smart contract can also be set to automatically remove these conditions once they expire in line with the Commission's decision. In 2007 IPCom acquired various patents in mobile telephony from Robert Bosch GmbH ("Bosch"), which included the patent for GSM and WCDMA standards. Bosch held essential patents in GSM and WCDMA standards given its role in developing these standards as a member of the European Telecommunications Standards Institute and had committed to granting irrevocable licenses on FRAND (fair, reasonable and non-discriminatory) terms and conditions. In 2009, more than two years after the patents were acquired by IPCom, the Commission engaged IPCom in discussions to ensure it honored Bosch's FRAND commitments. In a blockchain environment these commitments could be hardcoded into the relevant smart contract so that competition authorities and sectoral regulators do not need to spend resources ensuring they are passed on to the purchase with every transfer.

The above examples show that data on a blockchain can bring about a real change in the way competition law is enforced. As with current technologies, enforcement in a blockchain(ed) world is only as good as the data management systems adopted by undertakings.

15 *Commission of the European Communities v. Tetra Laval BV,* Case C-12/03 P (2005) at para 44.

16 Case AT.39530 - *Microsoft* – Tying (2013).

IV. COMPETITION COMPLIANCE USING BLOCKCHAINS

Infringements of competition law can have serious consequences; ranging from monetary penalties of up to 10 percent of worldwide turnover, imprisonment of individuals, disqualification of directors and damage to reputation. In the UK and EU there is also an increased focus on follow-on private actions, which in some cases has led to significant award for damages.[17] Finally, agreements with infringing provisions may be declared wholly or partially invalid and unenforceable.

A robust compliance program not only helps avoid infringements from occurring, but also to reduce penalties if they do occur. To this end, blockchain technologies have the potential to provide an additional layer of compliance for undertakings. This could be achieved in a number of ways.

- **Pricing control**: Businesses are increasingly cross-border with their customer base in a number of jurisdictions. A direct result of this expansion is the associated management and control of offshore offices and staff. In these circumstances, undertakings may utilize a range of pricing models for their products depending on local demand patterns, distribution costs, market conditions in each region, etc. Indifferent towards the pricing policy an undertaking may select, placing sale contracts on a permissioned blockchain will help the central compliance function ensure that prices in a particular region do not fall below the average variable cost for that region (where the undertaking is likely to be dominant) or that product features comply with binding commitments (if any have been agreed with local competition authorities). The increased visibility over remote offices will also allow the compliance function to detect anomalous pricing patterns that are not linked to cost structures, corporate policy or prevailing local market conditions and raise queries early.
- **Trade associations**: Information exchanges through trade associations have long plagued market participants as a potential hotbed for competition enforcement. This is because members of the trade association often sit on governing committees and have access to sensitive data belonging to competitors. A permissioned blockchain, however, could be used to avoid inadvertent infringements by limiting the dissemination of information while a smart contract collates data from all undertakings and generates aggregate, anonymized industry trends. Full access to the smart contract could be limited to the trade association's external counsel, advisors or specific individuals within specific members. This will also help ringfence sensitive data to IT personnel or compliance managers within specific members while being immune to the risk of rotating board or committee memberships seen in most trade associations.

- **Smart employment contracts**: There has been some industry discussion around increasing the effectiveness of in-house compliance programs by requiring all employees to undergo competition training and tying the payout of performance based bonuses only if training is completed. Commenting on the effectiveness of these measures is outside the scope of this article; however, if such a system were implemented on a blockchain, it could be done using a "smart employment contract" that will only release bonus payments if the system detects that training modules have been completed to a satisfactory level, perhaps the bonus payment could be made in a cryptocurrency such as bitcoin?

The above list is not exhaustive and there will be a range of other benefits and applications for blockchain technology as the technology itself develops over the next decade. Further, the importance of specialized legal advice cannot be understated as it remains a key requirement to ensure that blockchain networks and smart contracts satisfy the relevant competition concerns and are regularly modified to align with developing case law.

17 *Sainsbury's Supermarkets Ltd v. MasterCard Incorporated and Others*, Case 1241/5/7/15 (T), Competition Appeal Tribunal (2016).


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