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Blockchain and Trade: Not a Fix for Brexit, but Could Revolutionise Global Value Chains (If Governments Let It)

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INTRODUCTION

ONE OF THE MOST TONE-DEAF SUGGESTIONS in the Brexit proceedings so far came in August 2017, when the UK Brexit team released a long-awaited position paper setting out its proposal on how to manage its border with Ireland. It suggested that “technology-based solutions” – meaning blockchain, the technology behind cryptocurrencies such as Bitcoin – could be implemented to “make it easier to comply with customs procedures.”

The UK’s vague and misguided solution was quickly ridiculed by experts at home, as well as seasoned counterparts abroad. Although blockchain technology has now been around for ten years, it has not seen any meaningful implementation in global supply-chains, let alone within customs offices. Indeed, a “seamless and frictionless” border in compliance with fundamental customs procedures – itself a unicorn – cannot simply be coded into existence on its own. In reality, questions of capacity and time constraints mean that technological solutions are actually unworkable. Although Brexit’s customs predicaments cannot simply be wished away via blockchain, the use of such a technology, in general, would reduce trade costs, increase transparency, safeguard against fraud, and overall expedite trade by reducing customs clearance times. While blockchain is not a technology that could replace a border, it could cut costs and streamline procedures of an already well-managed one, to the point of making them virtually “frictionless”.

However, while the financial industry and the tech industry have shown promise in their proposals for uses of blockchain, progress has been slow, and major success stories are yet to be seen. The technology comes with certain risks, and comprehensive implementation requires significant resources and expertise. Indeed, although the commitments of global tech giants are encouraging, the lacklustre regulatory response to the advent of blockchain is stifling its growth, and preventing firms and governments alike from reaping the associated benefits. Customs regimes around the globe have done little to promote the technology, and firms have consequently been slow to adopt it. This may strike some as strange, given all of its potential benefits and the ostensible ubiquity of the word.

FIRST, WHAT EXACTLY IS BLOCKCHAIN?

ALTHOUGH THE TECHNOLOGY INVOLVED IN BLOCKCHAIN is complicated, in practice what it does is fairly simple. To visualize how it works, imagine you want to conduct a transaction with someone – exchange money for goods. When doing this in person, this is fairly easy: money and goods are exchanged physically, and a receipt is made to record the transaction. Long-distance transactions are more complicated: people transacting depend on and put their trust in an intermediary, such as a bank or a transaction system (like PayPal or Visa), to ensure that money has left one wallet and entered another. Ultimately, both participants in the transaction can record that interaction in their books, as does the intermediary through its ledger.

Blockchain – otherwise known as distributed ledger technology – works differently: when two people want to transact, that transaction and its specifications are cryptographically logged into a “block” of data. Once the members of the distributed network have verified it, is added to the blockchain, creating a permanent record of the transaction. The network itself is both the medium of transaction and the means of recording it, as the actual blockchain ‘file’ belongs to all of its members, and each owns a copy of it. The result is a permanent record where each new transaction contains information about previous transactions so that it can be consulted at any time. Additionally, its peer-to-peer system means that information can only be modified if a majority of the members of the network agree to do so, making it secure. Transactions recorded within blocks, are created, or “mined”, by dedicated individuals called “miners”, but the new information is not properly added to the blockchain until 51% of the network approves of it. In theory, this means that fraudulent changes to the blockchain would be noticed quickly, and rejected by the network. All elements of ‘trust’, which is difficult to create between parties that don’t know each other or are far apart, are thus removed from the equation. As the medium of exchange, blockchain is theoretically as secure a physically exchanging goods for currency, removing the need for settlement teams of any kind.

Furthermore, it is important to note that a blockchain can hold much more than just transaction information, and indeed can also be used to store and transact files, and be configured to execute certain tasks based on certain conditions. This is an important element of blockchain called “smart contracts”, which can be set to automatically execute tasks like transfer payments or send a document triggered by a certain date or the reception of a particular document.

WHAT BLOCKCHAIN CAN DO FOR TRADE

NOW, PICTURE THE GLOBAL FRAGMENTATION of a multinational enterprise: a complex supply-chain of producers and distributors through which vast amounts of goods and wealth travel through intricate logistical channels and legal hurdles using contracts, certificates and approvals. This involves exchanges of information between numerous entities, including customs and other regulatory agencies, which comes at high costs or otherwise provide opportunities for error and fraud. Today’s customs handling requires significant man-power if standards on safety, customs valuation and rules of origin are to be upheld.

Thanks to blockchain, it is now possible to make all of these processes significantly more efficient and transparent. Using blockchain within a supply-chain would provide a firm with the infrastructure necessary to remove the need to secure each transaction or step in the supply-chain through intermediaries via registration, tracking and certification. Information on any shipment – whether it be a proof of purchase, a clearance form, a bill of lading, insurance – can be made part of a block, a transparent chain of custody, and be accessible to suppliers, transporters, buyers, regulators and auditors. Having all this information in one location would not only lower transaction costs but also decrease auditing and accounting costs as well.

From the standpoint of global logistics, the implications supply-chain management, inventory

flows and warehousing, and the associated matters of possession and provenance are of great significance, even revolutionary. Used in customs handling, exporters could upload all the documents onto a customs office blockchain and instantly prove their abidance with all the import rules – for example, qualification for preferential rates through rules of origin, sanitary and phytosanitary (SPS) rules, or compliance with embargoes (e.g. against conflict minerals). The technology could also facilitate implementation of new concepts like Mode 5 and tariff deductions for services inputs (see Cernat 2014; Antimiani & Cernat 2017), as well as border tax adjustments for carbon or corporate taxes.

Using blockchain is essentially an evolution of today's Authorized Economic Operator (AEO) system, under which the EU allows exporters with a proven track record to be granted faster customs clearance. AEO is ultimately based on trust: that major shippers (that account for large amount of customs traffic) have their documents in order. While granting AEO status to all importers would be open for abuse and defeat the purpose of having a fast lane if everyone can be on it, blockchain systems allow for expediency, while allowing for the swift authentication of all documentation.

The outlook for blockchain and trade is therefore very promising, but as the next section shows, the technology has so far only seen very narrow applications.

LITTLE USE OUTSIDE OF THE PRIVATE SECTOR

ALTHOUGH THE NUMBER OF FIRMS which have bought into blockchain is slowly increasing, supply-chains fully interlinked via blockchain are still far off. Deeper levels of integration, whereby wide-ranging processes (payments, certifications, contracts, etc.) are managed and executed via blockchain, are nowhere to be seen.

Indeed, for now the applications of the technology which we can see today are limited and mostly concern specific issues within supply-chains. For instance, chemical giant BASF has recently announced that it has begun trialling blockchain technology to track the shipment of its goods (Zhao 2017). Another example is Everledger, which has been using IBM blockchain to track the movement of diamonds from mines all the way into jewellery stores, recording the attributes, creating digital IDs for each of them and thus creating and maintain complete ownership histories for each individual diamond. IBM blockchain technology is also being used by shipping giant Maersk in collaboration with EY in a new maritime insurance platform, illustrating how the increased transparency can simplify insurance processes and decrease the workload associated with verifying and securing transactions (Burgess & Azimkanov 2017). Additionally, internet giants Microsoft and Alibaba have also recently announced that they will make efforts to develop blockchain technology for supply-chain purposes (Webb 2017), and although this looks promising, it is a recent development which won't see implementation for a few years.

In addition to these large corporate entities, the number of start-ups looking for ways to innovate in this field is slowly growing too – not surprising, given the experimental culture of cryptocurrency in general. Consider Provenance, which hopes to create a blockchain platform which could be used to verify the authenticity of goods. Modium, another start-up, created a platform with which to ensure that products are shipped under the criteria specified in contracts with the help of sensors that collect data on speed and environmental conditions, and uses smart contracts to validate that transactions meet the standards set by customers. Similar innovations are being ushered by VeChain, which uses chips to secure products against counterfeiting.

These developments indicate that some multinational businesses that are at the forefront of blockchain innovation are deploying it internally within their organisations, in search for greater efficiency to improve their competitive advantage. Authentication with third parties, let alone government agencies, are still decades ahead. From the standpoint of global trade, while the

applications of blockchain mentioned above have a wide range of implications, their limited scope nonetheless implies that the integration of blockchain will be very gradual. Indeed, as of yet, the kind of technology required for blockchain to bring a more comprehensive level of interconnectivity – such as the one entailed by a customs border or within a full supply-chain – is still nowhere to be seen.

And as we shall see, the reason blockchain is still in its infancy despite all its promise largely concerns the lack of regulatory oversight, the opportunities for fraud, network issues, and the implications of unwanted transparency.

LACK OF REGULATORY OVERSIGHT

ALTHOUGH REGULATORY ISSUES must always be dealt with cautiously when it comes to technology, the current lack of regulatory oversight for blockchain means that its legal environment is filled with uncertainty. The lack of an authority or standard that firms can refer to in the event that they want to experiment with blockchain naturally means they are less willing to take risks. Indeed, although the European Central Bank (ECB) began writing about blockchain in 2012, this was in the context of cryptocurrency mostly, and the same is true for the Bank of England (Ali 2014) and the US Federal Reserve in 2014 (Badev & Chen 2014). On blockchain specifically, the first major papers by these three central banks all only came out last year (see Barrdear & Kumhof 2016; European Central Bank 2016; Mills et al. 2016).

Lack of research on blockchain means that regulators are far from developing any form of standards which would make the technology safer. This issue is twofold – on the one hand, lack of adoption means that the technology does not have the current scale to warrant the creation of a standard-setting authority. On the other hand, the lack of such a safeguard is likely making potential adopters even more hesitant to adopt a technology which they can hardly be blamed for viewing as risky. In this way, regulatory oversight is key to promoting blockchain's legitimacy, and regulators are for the most part either being too slow to take action, or taking actions that are likely slowing down the rate of innovation. This is the case in China, which appears to want to promote blockchain (cf. Casey 2017), but recently banned Initial Coin Offerings (ICOs), an application of the technology, and proposed a ban on the use of cryptocurrency in general. These types of mixed signals make innovators reticent to innovate, out of fear of having their efforts shut down. Overall, the current regulatory environment around blockchain is not conducive to innovation.

Conversely, it can be argued that regulatory oversight may muddle the waters and raise barriers to innovation. Although this is a justified concern, having the ability to refer to sets of guidelines and eventually to standards would mean that businesses would feel more secure about experimenting with blockchain and would be encouraged to apply the technology more comprehensively. Additionally, having an authority that businesses (especially SMEs) can refer to when experimenting with blockchain would be an ideal way of increasing trust in the technology, and would discourage uses of the technology that may be dangerous.

OPPORTUNITIES FOR FRAUD

ALTHOUGH MANY HAVE CLAIMED THAT blockchain increases the security of networks, the technology nonetheless has severe drawbacks which mean that significant opportunities for fraud remain. Specifically, the fact that any change made to the blockchain must be approved by 51% of the network does not in itself prevent damages to the network. Not only is this benchmark not infallible, as a recent split – or “hard fork” – in the Bitcoin blockchain illustrates (see Hertig 2017), trusting that the network will always be aligned, either by protocol design or via contract, is not enough to prevent problems.

Indeed, “51%” actually does not refer to part of some majoritarian democracy algorithm, but instead refers to the computing power required to make changes to the network. This means that any individual with powerful enough hardware would be able to execute what is called a “51% attack”, and execute transactions, steal valuable information, and disrupt a supply-chain. Smaller networks are particularly vulnerable, especially considering that certain groups of miners, or “mining pools”, have already been able to harness over 51% of Bitcoin’s network power (see Eyal & Gun Sireer 2013), which is the largest blockchain network to date. Double spending is possible with as little as 33% of total hashing power. Worse even, in the field of customs handling, harnessing any amount of network power would not be necessary, since all that would be required to deliver lasting damage would be one authentication from the right authority to allow fraudulent or illegal goods to cross the border.

UNWANTED TRANSPARENCY

A MORE NUANCED ISSUE PREVENTING the wider adoption of blockchain regards the transparency that it would bring to supply-chains. Global supply-chains can entail practices which may carry significant reputational implications. For this reason, the fact that blockchain may make certain information more available – to auditors, the public, or even other parts of the supply-chain – is not attractive to all businesses. In this way, transparency is a double-edged sword which increases efficiency, while at the same time increase scrutiny of manufacturing practices. For instance, supply-chains involving hundreds or thousands of inputs may include some from countries with unattractive labour practices, or products tested on animals. Additionally, such transparency could have other dangerous competitive effects: imagine if consumers were to find out that a high-end fashion brand makes its apparel in the same factory as a fast fashion brand, and with the same materials.

Indeed, this raises the question of how far firms will be willing to integrate blockchain in the future. Food industry giants such as Unilever, Walmart and Nestle, have recently committed to using blockchain to trace food contamination (Browne 2017), which is sensible because such a problem directly hurts margins. Nevertheless – is the entire industry willing to fully integrate blockchain if it means consumer groups would be able to trace back the entire production chain to verify producer claims, such as country of origin, fair trade or climate-friendly? Although the technology is also a means of improving corporate social responsibility, it may not be the first order of business if it entails radical reforms of the existing supply-chains. For now, at least, it seems that firms are only going to be willing to use blockchain to improve efficiency.

NETWORK ISSUES

SOME OF THE AFOREMENTIONED FLAWS are likely to be transitory and constitute the types of hurdles that are common in the development of any new technology, and which are ironed out over time. However, network issues are more pervasive: not only is the talent associated with blockchain scarce and expensive, but the technology essentially requires a great number of entities to participate to be viable. Correspondingly, this also means that a large enough number of players must not only adopt the technology but also learn to use it. As Bateman & Cottrill point out (2017), full integration of blockchain within a supply-chain therefore means that those making use of less tech-savvy producers will need a means of recording their associated data for transmission within a blockchain. For instance, ensuring food quality would potentially entail getting small-scale farmers to record data on when a fruit was picked, how a cow was fed, when a load of meat was frozen, etc.

In this regard, human error, like malice, can also hardly be ignored. In the same way the input of erroneous data within a blockchain may not necessarily be spotted (especially when relying on a great number of trading partners for data), errors of a blockchain’s protocol can have disastrous consequences for all the members of the network relying on it. Indeed, the fear of human error

is likely deterring many, especially when one considers how a simple glitch in the protocols of Ethereum, Bitcoin's main rival, enabled a hacker to steal the equivalent of \$55m (The Economist 2016). On that note, it is also worth noting that Bitcoin's bad reputation as a pyramid scheme, an asset undergoing a bubble, or a tool used by criminals to launder money has not helped blockchain's reputation.

ANOTHER BREXIT RED HERRING

THE IMPLICATIONS OF THE CURRENT STATE of implementation of blockchain within global trade have clear implications for the UK's post-Brexit customs predicament.

The first and most obvious implication is that the technology required for a blockchain customs border, whether between Ireland and Northern Ireland or between the UK and the EU, simply does not exist yet. In the next five years, as success stories begin to emerge within the global economy, governments will start seriously considering the use of blockchain for customs purposes, but this likely means that even partial usage is years away. In fact, there's a good chance that the UK will have had time to leave the EU, realise its mistake, and re-join it before blockchain sees any significant implementation within customs borders.

Secondly, even if the technology did exist, the UK government does not have the expertise required to implement it. Indeed, not only is the staff needed to develop blockchain solutions not easy to come by, but if it leaves the Customs Union, the UK faces a staffing problem regardless of whether it finds a technological solution or not. Indeed, customs borders would see an immense inflow of goods that would need to be processed under new trade arrangements (see Wallace 2017). A blockchain customs border would, therefore, mean hiring an expensive staff to design and implement a system that has never seen prior application, and which would require proper testing – especially given the risks associated with the technology.

Third and finally, the UK's situation is essentially too severe even to begin experimenting with such a project, both in regard to time constraints and the current technological characteristics of the UK's customs border. Even if the deadline of March 2019 is pushed back through a transition period, the UK would be forced to find the quickest "off the shelf" solution, as the uncertainty posed by the threat of a customs border that is not adequately managed is already sending waves through the economy. This rings especially true given that the UK customs systems have been going through an upgrade that started in 2013, and which is due to be completed in January 2019. The new system – which won't have gone through its entire planned testing period by March 2019 – will only be able to process a total of 150 million customs declarations, whereas leaving the Customs Union will raise the total of declarations that need to be processed to 200 million (see Owen et al. 2017 and Houlder 2017). On top of this, there are no contingency plans for the potential failure of the new system. In other words, no form of technological solution could prevent disaster. A fundamental change of strategy is required, as leaving the Customs Union seems hardly feasible at present.

POLICY RECOMMENDATIONS BEYOND BREXIT

THE SCOPE OF BLOCKCHAIN'S APPLICATIONS is wide, but it will unfortunately not fix Brexit. Although some have claimed that blockchain has finally reached its deployment phase, the issues mentioned above illustrate that much more needs to be done before blockchain sees universal adoption by businesses and exporters – until which it will have no meaningful impact on customs.

Chiefly, a more committed governmental response would be a great help. Although governments are unlikely to be able to adopt the technology to manage customs offices before it has been widely implemented within supply-chains, that does not mean that they are helpless. As previously

mentioned, if regulators spearheaded blockchain research, specifically into how the flaws of the technology can be alleviated, this would be a significant step towards legitimising the technology, making it safer, and creating the type of regulatory environment that allows innovators to thrive. Helping innovators reduce the risks associated with blockchain would also be an ideal way of determining the uses of blockchain that can be deemed safe, and lead to guidelines on its usage. These steps would usher a gradual implementation within certain processes which would eventually lead to a larger community of blockchain experts, and more widespread and comprehensive usage.

Indeed, a significant amount of direct business support and subsidies is needed before the global economy sees widespread adoption of blockchain. This is especially true for SMEs that want to experiment with the technology but don't have access to contracts with internet giants. Likewise, blockchain will need to see applications within supply-chains that extend far beyond the EU before the technology can be considered viable for use on the Northern Irish or even the UK border.

Furthermore, EU legislation in general could be used to aid blockchain innovators in all Member States. For instance, the EU could mandate that Member States are not allowed to demand any form of restrictive permit or license to use blockchain, as was the case recently in the US state of Nevada (Chow & Larsen 2017). Similarly, setting clear legal limits for the use of the technology would help innovators focus their efforts; banning certain uses of blockchain, such as fraudulent practices in ICOs, would not be as detrimental to innovation overall if regulators also clearly stipulated the uses that are permitted – and correspondingly, those practices which should be encouraged. Use of blockchain in promoting transparency could even be a part of corporate social responsibility policy; a recent European Commission contest entitled “Blockchains for Social Good” already points to developments in this regard (European Commission 2017).

When regulators commit globally to promoting blockchain, it will eventually be used for much more than just the Northern Irish border: customs offices all over the world will use it to monitor their borders effectively and to smooth out trade with partner nations. The issue is, of course, that the current timeline for Brexit will see the UK leave the EU in March 2019, and that the timeframe for both the development and implementation of the required technology is therefore much too short, and the resources needed for such a project are much too great. Blockchain-powered trade, very much like Brexit, is something that depends on cooperation with all trading partners, and can't be wished into existence.

But unlike Brexit, the promises of blockchain are concrete and worth striving for.

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