



Potential of Blockchain Technology for Trade Integration of Developing Countries

Summary

Blockchain technology (BT), famous due to its use in digital currencies, also offers new opportunities in other fields, one of which is trade integration. Developing countries especially could benefit from greater trade integration with BT, as the technology can, for example, remedy deficiencies with regard to financial system access, intellectual property protection and tax administration. BT allows virtually tamper-proof storage of transactions and other data on decentralised computer networks. In fact, it is possible to store not only data, but also entire programmes this securely: Smart contracts enable the automation of private transactions and administrative processes. This article summarises the latest research on the use of BT in trade integration by examining in more detail five key and, in some cases, linked fields of application.

The first is *trade finance*, where BT could deliver direct cost savings for exporters and importers by removing the need for credit-lending intermediaries. Second, tamper-proof storage of information on the origin and composition of goods could enhance *supply chain documentation*. This makes it possible to more reliably verify compliance with sustainability standards, particularly for globally produced goods. However, for the information in blockchains to be truthful, it must be entered correctly (it is then tamper-proof), a process that therefore requires monitoring.

Third, BT could deliver improvements in the field of *trade facilitation* by making it easier for border authorities to access information on goods and thus easing reporting requirements for exporting firms. By reducing dependence on central database operators, BT could help bring about a breakthrough with existing digital technology in the area of trade. Fourth, facilitating access to information on goods could also simplify *customs and taxation procedures* and make them less vulnerable to corruption and fraud. This goes hand in hand with cost reductions for exporters and better mobilisation of domestic resources for public budgets. Fifth, in the field of *digital trade*, BT also facilitates management of digital file rights in environments where, for institutional reasons, there is little intellectual property protection. This could help to promote digital industries in developing countries.

However, when it comes to using BT in border and customs systems in particular, it is essential to involve the relevant authorities at an early stage. At the same time, it is necessary to promote uniform technical standards for supply chain documentation in order to safeguard interoperability between the different systems across actors and national borders and thus fully leverage the cost advantages. If these guidelines are taken into account, then BT could effectively support sustainable trade integration of developing countries.

Introduction

Digitalisation creates opportunities as well as challenges for exporting and importing firms worldwide. This is especially true in developing countries, for whom international trade is a key driving force for development and in which poor analogue infrastructure can serve to ensure that digital solutions take off exceptionally quickly (leapfrogging).

When it comes to sustainable trade integration in developing countries, BT in particular offers tremendous opportunities beyond those offered by conventional digitalisation (see also Ganne, 2018 for comparison). Blockchain is a database technology, though one in which transactions and other data records are stored not by one central actor, but rather in identical form by many members of a network. Additionally, the data is chained together using cryptographic processes, making it highly tamper-proof. BT also offers great potential for automating administrative processes through the use of smart contracts. Other frequently mentioned benefits include the transparency and speed of the systems. However, conventional digital systems and centralised databases can offer these features just as effectively and, in some cases, even more so. There are various types of BT, with very different functionality and features in each case. Ohnesorge (2018) offers an overview of key types of BT and outlines their potential for promoting financial participation in developing countries.

BT affords developing countries and other stakeholders in development cooperation the opportunity to pursue several objectives at once. In this way, digital programmes for trade facilitation could help to promote sustainability standards in global supply chains and at the same time contribute to domestic revenue mobilisation (DRM) for strengthening public budgets.

Fields of application

International trade is currently heavily paper-based. Central documents such as bills of lading are generally exchanged between exporters and importers and their banks by courier and painstakingly checked by hand for correctness. Administratively processing commercial transactions in this way increases the costs for goods transport by an average of 20 per cent. Against this backdrop, digitalised administrative procedures offer great potential for accelerating processes, cutting costs, combating corruption and fraud, and preventing the loss of documents. The relevant fields of application for BT in the trade sector are briefly outlined below.

Trade finance

By their very nature, the processes of trading and shipping physical goods involve long periods of time between shipment by the seller and receipt by the buyer. This carries major risks for importers who pay cash in advance and for exporters who ship on open account (far in advance of payment). Letters of credit are one financial service that can be used to resolve this issue, whereby a bank acts as

intermediary, taking on this risk to guarantee the payment. The costs of and lack of access to trade finance can thus present major obstacles to exports and imports. This is especially true for trade in developing countries, where access to financial resources is usually more restricted and particularly so for small and medium-sized exporters.

BT can facilitate access to trade finance, thereby reducing costs associated with export and import. Smart contracts offer the greatest potential for revolutionising trade finance. They can automate actions such as payments from an escrow account when triggered by specific events, such as the arrival of a container in the destination port. This makes it possible to automate financial products such as letters of credit, eliminating the need for intermediary services. However, in the short term, it would appear more likely for banks to use smart contracts to partially automate their intermediary services.

BT can also make a key contribution to assessing the credit rating of companies. If a company's trade finance transaction history is stored on a tamper-proof blockchain, then it is easier and more cost-effective for that company to provide evidence of its creditworthiness to potential lenders.

Supply chain documentation

In international trade nowadays, it is typical for the production chain for many goods to involve different manufacturers in several countries, rather than for one single company to produce and then export a finished product. This makes it difficult for consumers and other supply chain actors to monitor the origin of goods and their components. In developing countries especially, lack of trust between trade partners (or quality control costs), particularly at cross-border level, can hinder trade integration. The problem is exacerbated by the fragmentation of supply chains, while the uncertainty as to origin can also pose issues for plain raw materials such as diamonds. This further hampers certification processes that use sustainability standards.

In principle, there are two alternative options for fully and consistently documenting the supply chain of a given product: (i) an actor (within or outside of the supply chain) stores the data on a central platform, or (ii) the data is stored by many actors on a decentralised platform. Option (i) has not yet caught on, despite the necessary technology having been in place for decades and public pressure mounting over many years. One reason for this is that companies generally choose not to work with competitors' platforms for cost reasons or to avoid becoming dependent on them. Option (ii) circumvents these problems, facilitating peer-to-peer cooperation without the need for an additional intermediary. BT lays the technical foundations for this by enabling the network members to agree on the same data and store it in a tamper-proof manner. Blockchain systems can also be set up in such a way as to allow the respective actors to be identified and held responsible for any misconduct. Against this backdrop, numerous firms are opting for BT in order to document

their or their customers' supply chains more transparently and reliably in future. However, BT cannot replace mechanisms for ensuring the correct entry of information. This requires proactive cooperation between the actors in the supply chain, regardless of whether or not they use a decentralised platform (Nærland et al., 2017).

Trade facilitation

BT-based processes could also cut trade costs directly and indirectly by enabling end-to-end documentation of the trade route of a given good. While electronic bills of lading and letters of credit have been available for a number of years, they have barely taken off to date. BT could be viewed in this context as an enabler for the dissemination of digital technology, as, analogous to the presentation in the "Supply chain documentation" section, decentralised storage of data removes certain barriers to digitalisation, such as dependence on one central actor. Trade facilitation programmes in developing countries often revolve around the establishment of Single Windows for export in which all the required export formalities are compiled. Ideally, these Single Windows will be compatible with the information required for import to the destination country. If origin and content documentation is already stored on a blockchain, this makes it easier for border authorities to access and thus reduces the necessary reporting efforts for exporting firms. However, this requires interoperability between the IT systems of the customs authorities and the blockchain systems.

Customs and taxes

An integrated BT solution involving exporters and administrations could not only cut trade costs, but also strengthen DRM at the same time. Being relatively easy to manage, customs and VAT account for much of the public revenue of developing countries, and yet they are especially vulnerable to evasion by exporting companies. Paper-based documentation processes make this kind of corrupt practice even easier. If BT were used to document the origin of goods, customs authorities could collect duties on a partially or fully automated basis. In addition to cutting costs, this would also help to curb corruption, as automation can prevent customs officials treating identical processes differently to their own personal advantage. Furthermore, because BT is tamper-proof, it hinders forms of corruption and fraud involving the subsequent alteration of documented product characteristics. Additionally, in the long term, a wholesale migration to BT-based customs systems could facilitate the enforcement of rules of origin by allowing customs authorities to access inalterable information on the origin of goods. In turn, effective enforcement of rules of origin could deliver benefits for least-developed countries which, for example, enjoy preferential market access through the EU's Everything But Arms initiative.

VAT fraud is a particularly big issue in the EU. However, it also affects other groups of states in which goods can be traded VAT-free between cooperating countries (as is

planned in the East African Community). Fraudsters take advantage of the VAT exemption for cross-border business and benefit from the fact that it is difficult to detect fraud if the transactions are recorded in the databases of several different countries. This could be prevented by employing a central tax database for all states within one group. However, this would not (yet) appear to be feasible in the EU, as the individual member states insist on saving their tax data nationally. BT offers nations the alternative option of using a decentralised database with a consensus mechanism involving each member state in order to detect such cases of fraud in real time and thus put a stop to them. Smart contracts could also be used within a BT-based system to automate the VAT payment and refund processes and thereby further minimise the potential for fraud. The Gulf Cooperation Council (GCC) could become a pioneer in this field, given that its member states are planning the coordinated launch of a value-added tax in 2019. It is presumed that the introduction of this system will enable the authorities to store the VAT data on a blockchain.

Digital trade

While e-commerce still does not play a major role in developing countries, it offers tremendous potential. It is estimated that e-commerce in Africa rose from USD 8 billion in 2013 to USD 50 billion in 2018. BT-based payment systems which function in a similar way to bitcoin could facilitate cross-border e-commerce without currency exchange if they find general acceptance as a means of payment. However, this is still some way off. But e-commerce is not limited solely to the electronic sale and purchase of physical goods. Rather, it increasingly offers the opportunity for simple transmission of digital files, something which further facilitates cross-border trade. BT provides particularly great potential in this area, as it offers an effective and innovative form of copy protection for digital files. When it comes to cryptocurrencies such as bitcoin, for instance, BT prevents a currency unit being issued multiple times. This principle is transferable to rights management and makes it possible to effectively limit the scope of use for digital goods. For example, in the domain of 3D printing, BT could ensure that a particular blueprint can only be printed once by one customer. In developing countries especially, automated rights management could play a major role, as state institutions are often not able to effectively protect intellectual property.

Nonetheless, when developing and regulating automated rights management systems, it is necessary to take account of the fact that, in least developed countries especially, excessive protection of intellectual property can counteract other development goals. One example would be for medical equipment blueprints in the public health sector.

Conclusion and challenges

BT will bring about fundamental changes in international trade. It could help to integrate developing countries more

effectively in global trade, as BT can promote global value chains and reduce trade costs, which pose a major obstacle to small and medium-sized enterprises (SMEs). It could prove especially effective in weak institutional environments, as the security it offers can replace some institutional tasks and significantly improve administrative processes.

In order for BT to promote sustainable development in this area, account should be taken of the following during the early phase of implementation:

- While BT can store supply chain information and make it transparent, it cannot guarantee the accuracy of the original information. Consequently, processes for monitoring the analogue-digital interface using (i) independent certification organisations or (ii) internet of things (IoT) solutions (such as radio frequency identification (RFID) chips for monitoring storage temperature) will remain important.
- In order to fully leverage the possibilities of BT, it is also necessary for national authorities to adapt their systems to the technology and for them to be involved in the development process.
- In international trade especially, which often involves many different corporate and administrative actors, there is a need to promote uniform technical standards to allow the potential of BT to be completely unlocked. Against this backdrop, efforts of international organisations such as the International Organization for Standardization (ISO) and the International Chamber of Commerce (ICC) to promote the interoperability of different BT systems (Ganne, 2018) are very welcome.
- International cooperation could help to overcome regulatory challenges such as the legal handling of smart contracts and to resolve the tension between the tamper-proof protection afforded by blockchains and the right to be “forgotten”.

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Published with financial support from the Federal Ministry for Economic Cooperation and Development (BMZ)



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DOI: 10.23661/bp4.2019