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PERSPECTIVE

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A perspective on three trade-offs of blockchain technology for the global strategy of the MNC

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Abstract

Research Summary: New technology plays a key role in shaping the global strategy of the MNC. We propose a perspective on how and why a novel technological development—blockchain technology—and its relevant applications affect the global strategy of the MNC. We focus on the trade-offs associated with cryptocurrencies, smart contracts, and blockchain data, and provide several real-world examples. While cryptocurrencies could lower financial costs and broaden consumers' payment options, they require new investments in cybersecurity and payment infrastructure. Smart contracts could increase trust in collaboration due to their automated, transparent, and inflexible rules, but their rigidity can harm collaboration. Finally, while blockchain data can enhance the MNC's analytics capabilities, it can also jeopardize consumer privacy.

Managerial Summary: Is blockchain technology all hype or a useful advancement for global firms? We propose that this technology has merits and drawbacks for financial transactions, collaboration, and data analytics. Cryptocurrencies have stolen the headlines and several leading organizations have already added them as payment methods. Their merits include lower transaction

fees, better security, and higher speed, but they require expensive infrastructure and carry a stigma. Smart contracts can streamline agreements between parties but lack the flexibility that global firms need when interacting with suppliers and partners. Novel blockchain data can be plugged into marketing dashboards but can also threaten consumer privacy. Overall, the jury is still out on the role of blockchain technology for global firms.

KEYWORDS

blockchain, blockchain data, cryptocurrency, MNC, smart contract

1 | INTRODUCTION

"Blockchain has the potential to add 1.76 trillion dollars to the global economy by 2030" (PwC, 2020).

Blockchain technology is widely believed to be a catalytic development with important implications for the global strategy of multinational corporations (MNCs). It is formally defined as a "cryptography-based decentralized and distributed system consisting of an ongoing list of digital records that are shared within a peer-to-peer network." (Wang et al., 2022, p. 4). In other words, blockchain technology builds upon a data file (i.e., a ledger) containing a set of transparent and immutable records securely shared among multiple parties and not controlled by a single entity (see Murray et al., 2021). On the one hand, these attractive characteristics are paving the way for breakthrough innovations in the areas of financial operations (e.g., cryptocurrencies), collaboration and governance (e.g., smart contracts), and data analytics (e.g., blockchain data). For instance, reports show that more than half of surveyed C-suites view blockchain as a top priority in such areas as finance, operations, marketing, and analytics (Deloitte., 2020). On the other hand, blockchain technology has attracted skepticism and carries a stigma. For instance, cryptocurrencies have not only been promoted as pillars of the new financial system but also stigmatized due to fraud, scams, hacks, and negative environmental impact. Similarly, while smart contracts have been associated with the benefits of automation, their roll-out might face challenges due to their complex design. Along the same lines, the growth in blockchain data represents a new frontier in firm analytics that comes with privacy-related dilemmas. Therefore, to capitalize on blockchain technology, strategic decision-makers must balance several trade-offs when considering the implementation of blockchain technology within their business models.

Accordingly, in this article, we examine three trade-offs[i] of blockchain technology for the global strategy of the MNC and illustrate these key considerations with real-life examples. More specifically, we focus on the trade-offs associated with cryptocurrencies, smart contracts, and blockchain data, and aim to present a balanced viewpoint. This complements previous research, which has not analyzed the potential trade-offs or the "dark side" of blockchain technology

(Verbeke & Hutzschenreuter, 2021). Notably, research across several fields has focused on the opportunities of blockchain technology for the financial sector (e.g., Böhme et al., 2015), the macroeconomic landscape (Cheng et al., 2019), and organizational collaboration (Lumineau et al., 2021). In international business research, studies have focused on the promises of cryptocurrency for MNCs in emerging markets (Zalan, 2018) as well as the potential of blockchain technology in international scaling (Tatarinov et al., 2023) and for governance mechanisms (Hooper & Holtbrügge, 2020). For instance, Furr et al. (2022) emphasize the opportunities offered by blockchain in relation to digital transformation. Cuervo-Cazurra et al. (2020) place blockchain in the context of supply chain management as a means for MNCs to foster trust and reliability in customer–supplier relationships, while Ojala et al. (2023) call for more research on the role of blockchain for digitally based new ventures.

The three trade-offs examined in this paper relate to the discussions around cryptocurrencies, smart contracts, and blockchain data. The first trade-off relates to the promises and costs of cryptocurrencies as a new payment system for MNCs. Cryptocurrencies might allow MNCs to decrease financial transaction costs (e.g., exchange rates, bank fees) and improve their payment systems (Ahi et al., 2022; McKinsey, 2021), ultimately leading to better product-pricing strategies and competitive positioning in foreign markets. However, they might also result in considerable outflows of resources owing to the need for investments in payment and cybersecurity infrastructure (Madan et al., 2023), staff training, and offsetting the environmental impact (Foteinis, 2018). The second trade-off relates to the role of smart contracts as a trustless form of collaboration. This setting of transparent, immutable, and automated rules (Buterin, 2014; Murray et al., 2021; Wang et al., 2022) could help reduce opportunism and information asymmetries, which should increase trust and decrease corruption in collaborations (Lumineau et al., 2023; Zou et al., 2023). However, such rules may lead to costly mistakes due to their rigidity, and face resistance from partners who are used to flexibility and relying on interpersonal trust (Tan & Salo, 2023). The third trade-off lies in the use of blockchain data. In recent years, the emphasis on data-driven decision-making for firm's foreign-market strategies has increased (Luo & Zahra, 2023). For example, MNCs increasingly rely on detailed social media and consumer data to build advertising campaigns and establish global brands. Blockchain data represents a novel avenue for MNCs' analytics efforts with the potential to provide detailed, real-time information on wallet transactions that could be tied to user identifiers (Peres et al., 2023). However, the privacy concerns related to such data are not trivial, as evident in ongoing debates around national regulation and policymaking aimed at developing effective solutions.

We provide concrete, real-life examples for each of the three trade-offs, and then discuss an exciting and pressing research agenda for global strategy scholars. We aim to help researchers address the relevant gaps in the literature and explore novel, interdisciplinary ideas at the intersection of related fields, such as finance, organizations, and marketing. First, we point to intriguing questions on how cryptocurrencies can simultaneously enable and constrain the MNC's performance. For example, studies at the intersection of global strategy and marketing could focus on consumers' willingness to adopt cryptocurrencies and whether MNCs should target specific consumer groups, such as Gen-Z, due to their openness to alternative payment options.

The second research opportunity lies in how MNCs could benefit from the transparency provided by smart contracts for collaboration. As smart contracts could replace interpersonal trust, future studies could reveal which parties (e.g., partners, suppliers, governments) and tasks (e.g., contracts, transactions) are best suited for smart contracts for collaboration in certain

contexts (e.g., organizational, cultural). At the same time, given the inherent rigidity of smart contracts, studies could investigate ways to effectively design them to balance automation and flexibility.

The third avenue for future research relates to blockchain data and its role in the new era of analytics. For example, scholars might work to answer key questions about how blockchain data can be integrated with the MNC's existing portfolio of analytical resources, and when such integration and related investments could pay off. Studies should also assess the impact of such data on consumer privacy. For example, studies could explore how MNCs can navigate the differences in privacy preferences among consumers across countries to arrive at an optimal strategy for reaping the benefits of blockchain data.

2 | TRADEOFFS OF BLOCKCHAIN TECHNOLOGY FOR THE MNC's GLOBAL STRATEGY

As with other technological developments,[ii] blockchain technology and its applications entail trade-offs for the MNC (Buckley, 2022; Furr et al., 2022; Larsen et al., 2023; Verbeke & Hutzschenreuter, 2021). In this section, we discuss three such trade-offs that have implications for the MNC's global strategy[iii] and illustrate them with real-life examples. We summarize our perspective in Figure 1.

2.1 | Trade-off 1: Cryptocurrencies—The future of payment or a risky investment?

As MNCs serve multiple countries and markets, they and their customers must rely on different payment systems for products and services. This means dealing with numerous financial intermediaries, currencies, and regulations. For instance, MNCs might need to sell a product to customers in a foreign currency or make a wide range of alternative payment solutions available for consumers in emerging markets. Inevitably, such challenges imply that both MNCs and their customers could face high banking fees, uncertainty regarding currency exchange rates, prolonged clearing and settlement times, and technical issues with payment interfaces (Ahi et al., 2022; Contractor, 2022; McKinsey, 2021). MNCs might not be able to offset these costs by raising product prices due to the presence of multiple local competitors (Contractor, 2022). In addition, MNCs that do not provide an appropriate payment solution might achieve suboptimal coverage, thereby jeopardizing their competitive advantage. From a consumer standpoint, not having access to appropriate payment solutions decreases their welfare (Chatterjee & Rose, 2012; Huang & Savary, 2023). Not surprisingly, reducing financial costs in emerging markets has become not only a strategic priority of MNCs but also a mandate set by the G20 council (Financial Stability Board, 2021). In this regard, we argue that cryptocurrencies—cryptographic currencies built on a blockchain—could be one way to lower the costs of financial transactions across markets. However, the use of cryptocurrencies requires financial investments from MNCs in order to, for instance, build a payment and cybersecurity infrastructure, train staff, and deal with sustainability issues. Therefore, the first trade-off for the MNC is weighing the opportunities and costs of using cryptocurrencies as a payment system.

With respect to the promise of cryptocurrencies, previous research shows that adopting new forms of payment (e.g., PayPal) tends to lead to positive consumer responses across markets

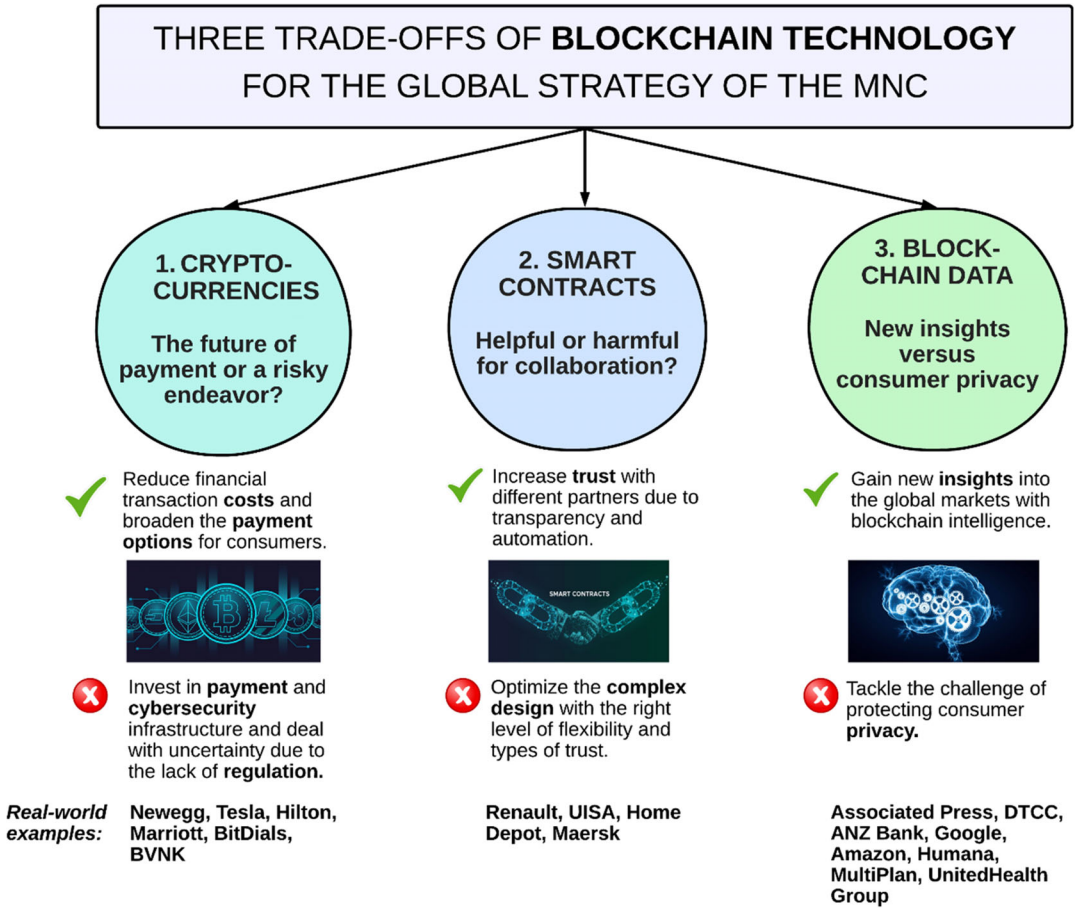

FIGURE 1 Trade-offs of blockchain technology for multinational corporations' (MNCs) global strategies.

(Kumar et al., 2021). MNCs often operate in emerging markets, where banking systems might be outdated or unavailable due to a lack of financial inclusion (World Economic Forum, 2021). In fact, according to a recent World Bank report, 1.7 billion consumers are still unbanked (World Bank, 2022). As such, consumers in emerging markets are often open to adopting new forms of payment (Morgeson et al., 2015). For example, a mobile wallet, Mwallet, has attracted more new customers in emerging markets (Kumar et al., 2021) than PayPal, which has high penetration rates in developed countries (6sense, 2024). Hence, the use of cryptocurrencies as a payment system could allow MNCs to simultaneously capture both tech-savvy and unbanked consumers. A key advantage of cryptocurrencies relative to other forms of payments is their borderless nature, as a transaction does not require a conversion to a particular national currency (e.g., USD). In addition, cryptocurrencies use their own blockchain protocols to execute transactions, making them virtually available 24/7 and independent of financial intermediaries, which reduces the time needed to verify and settle payments (Catalini & Gans, 2020). Hence, they do not typically carry banking commissions or exchange fees. Indeed, Deloitte reports that payments in cryptocurrencies can reduce fees with an average velocity of money of 4–6 s (Deloitte, 2016).

Furthermore, the largest cryptocurrency, Bitcoin (Nakamoto, 2008), is based on decentralized blockchain technology, which theoretically increases protection against malicious usage. This is because transactions on decentralized blockchains are based on a consensus mechanism, meaning that multiple parties have to agree to execute a transaction. Not surprisingly, more than 30,000 businesses and merchants worldwide accept Bitcoin (Coinmap, 2024; Cointelegraph, 2022). Payments in Bitcoin can be implemented through the Lightning Network, which is a cryptographically secured protocol for proof of Bitcoin holdings (Guasoni et al., 2023). Other available solutions include the Ethereum network (Buterin, 2014). The Everest on Ethereum protocol incorporates a payment solution, a multicurrency wallet, and a biometric identity system (Morkunas et al., 2019).

However, the adoption of cryptocurrencies for payments entails a few challenges. First, doing so requires substantial investments in infrastructure and staff training. Given that MNCs have already built advanced layers of cybersecurity protection (Cuervo-Cazurra, 2016; Madan et al., 2023), integrating an entirely new payment system might be costly. The costs might be further exacerbated by the current lack of personnel who are well versed in blockchain technology and cryptocurrencies. In response, MNCs might need to invest in personnel training and educational programs. The building of proper capabilities is crucial, as traditional banking rules and regulations do not typically cover blockchain transactions. For instance, any mistakenly executed transaction on blockchain cannot be reversed. Hence, any minor mistake or fraudulent transaction can have costly consequences. An alternative would be to outsource the payment system to external service providers, which could simplify the process. However, this would hamper the MNC's competitive position in the long term due to a lack of internal capabilities.

Second, clear regulatory frameworks for cryptocurrencies are lacking. For instance, the leading cryptocurrencies are not legal tender in most countries (with a few exceptions, such as El Salvador). In addition, regulation is likely to differ across jurisdictions, which could mean that cryptocurrencies might be banned in some countries and only partially allowed in others (e.g., markets in crypto assets [MiCA]; European Council, 2023). Although the winds on crypto regulation are shifting in some parts of the world (e.g., the EU; European Parliament, 2024), MNCs still need to factor in the risk of changing regulatory frameworks (see, e.g., Leiblein et al., 2022).

Third, cryptocurrencies are associated with a negative environmental footprint. Several studies suggest that the carbon footprint of cryptocurrency mining and the validation process is still high (Foteinis, 2018). For example, some argue that the mining process behind the Bitcoin network could result in a global temperature rise of 2°C by 2050 (Mora et al., 2018). These issues are not limited to Bitcoin. For instance, Ethereum's high energy consumption and transaction fees have also attracted heavy criticism. Although the jury is still out on the long-term impact of cryptocurrencies on MNCs' environmental impact, MNCs will face increasing pressure to reduce their overall carbon footprints in line with the United Nations' Sustainable Development Goals. Therefore, they will need to find ways to counterbalance this potential additional source of carbon emission, which could jeopardize their long-term sustainability goals.

To illustrate the trade-offs associated with cryptocurrencies as a payment system for MNCs, we focus on several real-world applications. Consider Newegg, a large online electronics shop that has accepted cryptocurrency payments since 2014 (Newegg, 2024a). Originally, Newegg allowed payments for its merchandise in Bitcoin, which required customers to create their own Bitcoin wallet and then transfer the required amount of Bitcoin to Newegg's wallet. This

allowed, for example, foreign customers to pay in Bitcoin (vs. USD). Recently, Newegg expanded the range of accepted cryptocurrencies to 12 (e.g., Shiba INU, Ethereum, and Dogecoin) by partnering with Bitpay (Newegg, 2024b). By outsourcing the handling of crypto payments to Bitpay, Newegg circumvented the need to invest in a payment and cybersecurity infrastructure while still catering to consumers in 20 countries around the globe. A similar route has been taken by numerous world-leading hotel chains, such as Hilton and Marriott, which collaborate with a travel agent, Travala.com, that allows payments in cryptocurrencies (Gao et al., 2024) and even offer discounts for this form of payment.

In contrast, Tesla—a leader in cryptocurrency adoption—has invested in its own capabilities for crypto payments. Tesla first accepted Bitcoin as payment for its cars by running its own Bitcoin node (Thomson, 2021), although the company has since acknowledged the environmental issues associated with Bitcoin transactions and retracted that decision. Instead, Tesla has built its own DOGE-only payment system. While this move allegedly required the company to invest in large amounts of both equipment and talent (CoinMarketCap, 2024), it attracted new demand for Tesla's vehicles from crypto enthusiasts.

Another example comes from the "crypto-born" companies. For example, BitDials—an innovative luxury-goods merchant—accepts only cryptocurrencies using the payment interfaces built on OpenNode and Color Crypto. This allows BitDials to ensure easy setup and provide support for the payment interface. Importantly, in addition to the usual cryptocurrencies, such as Bitcoin and Ethereum, BitDials accepts stablecoins, such as USDT (BitDials, 2024). A stablecoin is a form of cryptocurrency that is pegged 1:1 to an existing currency, such as the USD or EUR. Stablecoins been argued to be one of the most promising large-scale applications of blockchains (Biais et al., 2023). Therefore, they could be an attractive option for MNCs as a form of cryptocurrency payment and multiple providers already offer outsourcing possibilities. For instance, BVNK, a payment-infrastructure provider operating in seven European countries as well as the US and South Africa, offers B2B firms a payment interface in stablecoins (Harmse, 2024). One advantage of stablecoins is that they are not as volatile as Bitcoin and Ethereum, as their underlying value varies with the value of the national currency. In addition, they do not attract environmental critique to the same extent. A key drawback is the likelihood of regulation. Unlike Bitcoin and Ethereum, which have faced only potential threats from national regulatory agencies, stablecoins have encountered concrete regulatory issues in recent years (Blankenship et al., 2022). Hence, MNCs need to consider these risks when adding different types of cryptocurrencies to their payment systems.

2.2 | Trade-off 2: Smart contracts—Helpful or harmful for collaboration?

Effective collaboration with foreign partners, suppliers, and governments is an important element of an MNC's global strategy (Lumineau et al., 2021; Luo, 2001; Obadia & Robson, 2021). Collaboration hinges on the expectation that the parties will be transparent with each other (Luo, 2001), fulfill their contractual obligations, and not engage in opportunistic behavior (Cuypers et al., 2021). However, these expectations can be violated due to information asymmetries (Akerlof, 1970) and a lack of contract enforceability, which are particularly relevant in an international context. Information asymmetries are common in firms' collaborations, as the information structure for business partners can vary across borders (see, e.g., Singh, 2007). In addition, firms often face challenges when dealing with contractual and relational

agreements across markets. For instance, different legislation, rule changes, and opportunistic behavior imply that firms must continuously monitor, update, and redesign contracts, which can lead to inefficiencies.

Smart contracts could help to streamline collaboration. A smart contract is a pre-programmed computer code registered on a blockchain that contains transparent instructions for executing operations, transactions, or agreed terms when certain conditions are met (Buterin, 2014; Murray et al., 2021; Wang et al., 2022). Hence, they could make transactions and agreements transparent, automated, and binding. Indeed, recent research finds that smart contracts can help firms mitigate the constraints and inefficiencies arising from contractual incompleteness (Biais et al., 2023; Chen et al., 2023). However, while smart contracts could, in theory, simplify collaboration and improve trust among parties, MNCs collaborate with a wide range of parties that might not accept these contracts or remain skeptical of their use. Therefore, the second trade-off we propose lies in the promises and perils of smart contracts for collaboration.

Trust has traditionally been viewed as the foundation of inter-organizational relationships and collaboration in global strategy (Lumineau et al., 2023; Zou et al., 2023). However, due to their key properties, smart contracts offer an alternative to trust for collaborative agreements (e.g., Contractor, 2022; Cuypers et al., 2021). Specifically, smart contracts can be transparent (i.e., visible to everyone at any time), virtually unmodifiable (i.e., tamper-resistant), and automatically enforceable (Wang et al., 2022, p. 10). Hence, establishing contractual rules in advance removes the possibility of altering them and, thus, reduces the possibilities for opportunistic behavior (Williamson, 1985; Zou et al., 2023). For example, recent research finds that smart contracts can enable the efficient tracking of defective products, thereby reducing the risk involved in the manufacturer purchasing from multiple suppliers and enhancing the manufacturer's welfare (Iyengar et al., 2023). Smart contracts can also improve trust by tackling corruption[iv] (Buckley et al., 2017; Hasan et al., 2020), which is defined as "the abuse of entrusted power for private gain" (Cuervo-Cazurra, 2016, p. 36) and includes, for example, bribes, favors, and informal promises (OECD, 2021a). Reasons for corruption include the low transparency in contractual agreements, the centralization of decision-making, and the absence of a paper trail or accountability (Cuervo-Cazurra, 2016). Smart contracts can help reduce such risks by creating a transparent account of transactions and operations coupled with decentralized documentation (Davis et al., 2022; Hasan et al., 2020). For instance, public procurement can be plagued with "behind-the-scenes" agreements, which can lead to a lack of competitiveness and has been flagged by the OECD as a key thematic area for responsible business conduct (OECD, 2021b). By designing the public-procurement process with a smart contract, parties can be protected by a verifiable paper trail and transaction traceability (e.g., offers, payments, and settlement of local suppliers' accounts).

The perils of smart contracts for collaboration could stem from their design. First, if set up incorrectly, smart contracts can create more problems than solutions because of their irreversible rules (Catalini, 2017). Errors in smart contracts can be irrevocable, which may be costly. For example, in October 2021, a smart contract on a decentralized finance protocol mistakenly awarded thousands of users more than USD 90 million of cryptocurrency. Owners had no choice but to ask and even beg users to return the money (Sigalos, 2021). Such irreversible rules can be particularly challenging for MNCs, which often operate in turbulent and dynamic environments (Aguinis & Gabriel, 2022) that require flexibility and adaptability. For instance, local partners might not be able to ship certain goods regardless of the presence of a smart contracts due to disruptions like changing weather, economic conditions, or political conditions (Kumar

et al., 2021). A recent example of such a shock was the Covid-19 pandemic, which destabilized global supply chains. Moreover, smart contracts might trigger a resolution in the case of a failure in goods delivery, which can also create issues among partners. The careful design of a contractual agreement could solve this issue, but extra effort and attention would need to be paid to each detail in the algorithm.

Second, smart contracts can give rise to novel opportunistic behavior due to the introduction of flaws in the initial code itself, which can lead to biases in contractual agreements from the start (Lumineau et al., 2021). This could place more emphasis on bargaining power in the initial agreements between parties (given that agreements cannot be changed later on), leading to lengthier negotiations.

Third, replacing interpersonal trust might not be achievable or even desirable in all collaborations (Tan & Salo, 2023). Trust-related expectations are culture-specific (Zou et al., 2023) and, in emerging markets, trust and flexibility are key pillars of the informal economy (Nason & Bothello, 2023). For example, many economic activities might rely on negotiating contractual obligations, which requires flexibility from all parties. Any other approach might heighten the distrust in MNCs operating in foreign markets (e.g., due to the liability of foreignness).

Several real-world examples illustrate the trade-offs of smart contracts for MNCs. Consider a typical collaborative agreement between a firm and a supplier. From the firm's standpoint, the product information provided by the supplier (e.g., certifications) must be thoroughly verified due to regulatory compliance. Such an agreement can be simplified with a smart contract. For instance, Renault partnered with IBM and suppliers to create a solution called XCEED, which was based on a set of smart contracts. This solution allowed the car manufacturer to track the regulatory features and characteristics of the materials for each car part (Du et al., 2023; Renault Group, 2021). To help manage the complex regulatory landscape across countries, XCEED enhanced Renault's supply chain transparency by providing a clear account of the origins and characteristics of its car components, which could also have a positive impact on consumers and regulators. Another example of complete product traceability was rolled out by UISA, a large biorefinery in Brazil, which implemented a blockchain-based solution powered by Sensedia (Sensedia, 2024). Owing to external scrutiny of the global sugar cane industry, UISA invested in modernizing its processes with suppliers. As of 2024, its innovative platform was powered by smart contracts, which allowed for easy access to information on a product's origin through QR codes and tokenized carbon credits. These examples illustrate the potential for smart contracts to create supply chain transparency, which is a major issue for MNCs (Cui et al., 2024; McGrath et al., 2021).

In addition to improving transparency, smart contracts can automate agreements and make them binding between the retailer and supplier. This has helped companies like Home Depot manage their supply chains. The retailer, which had previously faced numerous disputes with its suppliers, developed a blockchain initiative in collaboration with IBM (IBM, 2024). Typically, retailers prefer to pay for goods after the supplier has delivered them (Jamal et al., 2000), while suppliers would prefer the payment to be contractually binding and executable at the time of the order (Chen & Lee, 2017). The solution developed by IBM for Home Depot introduced a trustless approach for the shipment and delivery of goods. Smart contracts were set up so that a currency or asset could only be transferred to a local partner when predefined conditions were triggered (e.g., a good was shipped). This solution enabled Home Depot to monitor order status in real time and automatically settle its payments with suppliers, thereby reducing bottlenecks and trust issues.

While such cases underscore the opportunities of smart contracts, another example points to their challenges. TradeLens attempted to create a blockchain for the logistics industry, promoted by IBM and Maersk. However, the initiative failed due to a lack of full global collaboration in the industry, which may imply that replacing trust in the supply chain is not a straightforward task (Cecere, 2022). In the TradeLens case, some middlemen feared being replaced by blockchain technology, while others were concerned that the platform would favor some actors at the expense of others. Thus, the drawbacks of the irreversibility of agreements and the lack of flexibility outweighed the benefits of smart contracts for Maersk. We propose that a new, promising wave of smart contracts with a mixed contractual system including trust-based and trustless rules could lead to further adoption of smart contracts for collaboration (see, e.g., Lumineau et al., 2023).

2.3 | Blockchain data—New insights versus consumer privacy

The data revolution has provided unprecedented insights into global markets (Luo & Zahra, 2023). MNCs have novel access to data on consumer habits from social media, supplier metrics from real-time shipping data, and details on local partners from satellite data. Along these lines, blockchain data (also referred to as "on-chain" data) represent a new frontier in data analytics. Blockchain data is generated when users interact with blockchains (e.g., when making cryptocurrency payments or using smart contracts). Such data is permanently and irrevocably stored on blockchains, and can be accessed with a blockchain-explorer application. Importantly, blockchain data contains only a few identifiers, such as transaction type, numerical identifier, and wallet number, making it highly anonymous. In contrast, detailed consumer data is key for effective marketing and customer analytics. Therefore, we argue that the third trade-off for the MNC lies in balancing the benefits of blockchain data, which require access to consumer identity information, with the costs of reduced consumer privacy.

The benefits of blockchain data can be unlocked through blockchain intelligence—the collection and analysis of blockchain data. First, blockchain data can be used to analyze aggregate-level patterns in anonymous consumer data from multiple markets or it can be combined with data from other sources. A second, a more sophisticated way to deploy blockchain intelligence is to design mechanisms for consumers to reveal at least some of their identity and information. For instance, when interacting with a firm's blockchain-based application, consumers could be asked to complete Know Your Customer (KYC) questionnaires. Alternatively, they could be asked to share some of their blockchain data directly with the firm. Analyses of this data can unlock new insights into global markets, especially for locations with "wall-off" policies for open data (Nambisan & Luo, 2021). Those insights can increase the firm's competitive advantage (Luo, 2022). This is a major improvement for MNCs, as data availability in emerging markets has traditionally prevented them from harnessing consistent consumer insights across countries (Toppan, 2024). Blockchain intelligence offers an unprecedented way of collecting similar metrics across consumers in multiple countries. This can help MNCs optimize marketing strategies catering to the habits and behaviors of consumers (e.g., cultural and demographic differences) in a specific target market (Datta et al., 2022; Mintz et al., 2021). Alternatively, MNCs could strive to deliver a globally standardized loyalty program that satisfies the needs of the "global consumer" (i.e., tapping into similar tastes across locations).

The challenges of blockchain data relate to privacy. An important characteristic of blockchain technology is anonymity or, at least, pseudonymity, which precludes the collection

of detailed information on consumers. Protecting consumer privacy is a key concern for regulators and governments (Benito et al., 2022). Blockchain data records do not contain exact information on individuals. Instead, it includes wallet numbers or Ethereum name service (ENS) identities (e.g., nicknames or unverifiable names). Unless consumers decide to reveal their identity by using their real names in ENS identities or completing KYCs when interacting with blockchain applications, their privacy is protected (Bleier et al., 2020; Cui et al., 2021; Mathews & Tucker, 2023). Consumers might not choose to reveal their information to MNCs. Recent scandals involving data hacks among prominent internet companies have made the public aware of their data rights and risks (Komnenic, 2024). For example, a Pew Research report shows that most US consumers are concerned with their activities being monitored and tracked online (Auxier et al., 2019). Blockchain data can present similar issues because the moment consumers reveal their identities through a KYC on an exchange, to the blockchain application, or even to the firm itself, their past wallet transactions immediately become traceable, heavily jeopardizing consumer privacy (Perrin, 2020). In addition, if the entity (e.g., an exchange) suffers a data breach, all such consumer records could become public.

Hence, an important aspect of blockchain data is the design of the data sharing agreement between consumers and MNCs. For instance, consumers might be offered the opportunity to choose what to do with their data and which information to share. Several solutions already exist, such as s self-sovereign identities (SSI), which can grant consumers complete control over their identity and data, and allow them to share that information with anyone. Interestingly, recent reports show that, if given a choice, some consumers might be willing to share some of their data (Swant, 2019). However, even if an agreement with consumers can be customized for each data piece (DMA UK, 2022), the correct privacy design might vary by country due to country-specific regulations. For instance, data privacy is treated differently under Europe's General Data Protection Regulation (GDPR) and the UK's legislation. This implies that firms must adapt their collection of blockchain data to the legislation in each jurisdiction (e.g., the EU and the UK).

A few real-world examples illustrate the trade-offs of blockchain data for the MNC. Companies such as the Associated Press (AP), DTCC, ANZ Bank, Google, and Amazon have delved into the blockchain data space by partnering with Chainlink (Chainlink Ecosystem, 2024). Chainlink is a decentralized oracle network that securely connects smart contracts with off-chain data and services. For instance, it provides insights into inflation across countries and sectors by leveraging real-time, blockchain data on consumer prices in supermarkets (https://truflation.com). AP used Chainlink to share its economics, sports, and race-call datasets, which are available to a wide audience worldwide (The Associated Press, 2021). This allows AP to break new ground and attract new customers by delivering data "on-chain" to interested parties. Similarly, DTTC and Anz Bank have used Chainlink to deploy financial data directly on the blockchain, thereby providing institutions with easy access to real-time, secure financial information (Prosperi, 2023; Sinclair, 2023). One potential issue for these firms could be an overreliance on Chainlink's ability to deliver data in the future, as there is no guarantee that the company will exist in the long term.

Another example is Synaptic Health Alliance, a blockchain-fueled venture involving Humana, MultiPlan, and UnitedHealth Group (Lewis, 2023). A key issue in healthcare is maintaining a detailed data directory of physicians and care providers, which costs the industry USD 2.1 billion annually (CAHQ, 2017). Synaptic builds on Kaleido's blockchain platform[v] to synchronize data from patients and providers directly on the distributed ledger, which lowers data maintenance costs, improves coordination among providers, and reduces patient

complaints. Patients are rewarded when they provide correct and up-to-date records, which improves the overall data quality. While this solution can be used in other areas of healthcare, such as hospital staffing and personal health monitoring, the key challenge is ensuring data privacy, which is critical in this industry. Such sensitive data has high value and, hence, is often sought by third parties, which can use it in a variety of ways that are not always in the best interests of patients (Muoio, 2024). Healthcare data is also prone to cyberattacks (Spence, 2019). In addition, while blockchain provides extra layers of security, any data leak could have dramatic consequences for individuals. To tackle these issues, firms might need to invest resources and work with leading legal and technological companies in the space, such as companies that tackle the design of privacy rights for scientific research (e.g., OpenMined), data management (e.g., Anjuna, Duality Technologies) (Fauvre-Willis, 2021), and the monetization of advertising (e.g., Publiq) (Bleier et al., 2020).

Finally, blockchain data can be used to generate new consumer insights. For example, such data can help improve advertising campaigns by fetching information on real-time interests from consumers and providing a better understanding of their ad preferences (Peres et al., 2023; Stallone et al., 2024). A typical issue for online advertisers is a lack of attribution and attention metrics due to data unavailability, statistical noise, and imprecise measures (Johnson, 2023). One blockchain-based solution called AdEx addressed some of these issues by serving as a fully transparent platform connecting advertisers with publishers and facilitating the trading of advertising space (Stallone et al., 2024). In more technical terms, AdEx displayed real-time data and identified invalid traffic, fraud, and bots that could lead to incorrect measures of ad attribution. The system stored consumers' browser cookies and did not require a specialized app or browser, as participating publishers provided all relevant code to consumers' browsers. However, while AdEx aimed to improve consumer privacy, whether and to what extent user data will be shared in the future remains unclear (Mathews & Tucker, 2023).

3 | RESEARCH AGENDA

Our proposed research agenda stems from the three trade-offs discussed in the previous section. We list six potential research questions in Table 1.

The first research question concerns how adopting cryptocurrencies for payments can enable and constrain MNCs' performance. The topic of cryptocurrencies opens exciting opportunities for research on strategic decision-making related to both MNC-internal processes, such as performance, and external aspects, such as consumers. The lower financial costs of transactions in cryptocurrencies should enable better MNC performance in foreign markets. However, the need for investments in infrastructure, cybersecurity protection, and legal frameworks could offset such positive consequences. Thus, investigations of this trade-off could lead to additional research opportunities at the intersection of efficiency and corporate strategy (Asmussen & Foss, 2022). For example, drawing on previous strategic management research on firm innovation (Cano-Kollmann et al., 2016; Fabrizio & Thomas, 2012), researchers can collect detailed firm-level data (e.g., transaction fees, revenues, and costs) on global publicly traded firms. If secondary data is unavailable, such research could use qualitative designs with case studies (see, e.g., Du et al., 2023) to assess the cost efficiency of cryptocurrencies for a selected set of firms. Another approach could be to use a quasi-experimental design involving crypto adoption and non-adoption between similar firms to see which strategy leads to better outcomes. Overall, analyses of whether and under which conditions adding payments in cryptocurrencies affects

TABLE 1 Research agenda.

Three trade-offs of blockchain technology for the MNC	Potential research questions
Trade-off 1: Cryptocurrencies—The Future of Payment or a Risky Endeavor? • Cryptocurrencies could reduce financial transaction costs (e.g., through lower fees and quicker settlement times) and broaden payment options for different consumer groups. • Cryptocurrencies require substantial investments to cope with cybersecurity issues, the lack of regulation, and sustainability issues.	1. How and under what conditions do cryptocurrencies enable (e.g., more payment options) and constrain (e.g., costs of investing in new infrastructure, potential reputational damage) MNC performance? 2. Should multinational corporations (MNCs) differentiate themselves by allowing payments in cryptocurrencies in order to address and leverage customer preferences (e.g., Gen-Z)? If so, how should they do so?
Trade-off 2: Smart Contracts—Helpful or Harmful for Collaboration? • Smart contracts may increase trust in collaborations between parties due to their transparent, automated nature. • Smart contracts can be challenging to design due to their inflexibility, and the need for compromise between trust-based and trustless mechanisms.	3. How should MNCs design smart contracts to increase the effectiveness of collaboration among parties across countries? 4. How should MNCs utilize smart contracts to deal with the different tensions stemming from external parties (e.g., corporate partners, suppliers, governments) and streamline strategically relevant tasks (e.g., contracts, transactions)?
Trade-off 3: Blockchain Data—New Insights versus Consumer Privacy • Blockchain data may be a new frontier for insights into the global markets. • Consumer privacy needs to be safeguarded.	5. How do blockchain data relate to MNCs' existing data capabilities and resources and, thereby, allow for new insights into global markets? 6. What are the tensions between designing privacy rights to protect consumers and the mechanisms to offer strategic insights for the MNC? How can those tensions be addressed?

MNCs' performance could provide new insights into the role of new technologies in global strategy. Examinations of their performance implications should also consider negative externalities, such as potential regulatory and reputational challenges.

The second research question revolves around the idea that blockchain technology can shift the locus of innovation and value creation from MNC-internal processes to global consumers (Autio et al., 2021). Future research could assess the feasibility of payments in cryptocurrencies for different consumer groups and study the implications of such a payment system for consumers' attitudes towards firms across markets. To extend the focus of global strategy to emerging markets (Cuervo-Cazurra, 2012), new research could build on previous studies showing that payment adoption and its effects on a range of consumer metrics (e.g., willingness to pay for a product) vary across developed countries and emerging markets (Morgeson et al., 2015). This heterogeneity in consumer response may stem from several factors. Although cryptocurrency payments do not require access to banking services, consumers in emerging markets might not have the necessary skills or access to technology (e.g., smartphones) to execute such transactions. In addition, the willingness to pay for goods and services in cryptocurrencies might vary dramatically across countries and demographics. For instance, Gen Z, a key cryptocurrency audience (Gogol, 2024; Nasdaq, 2023), has exhibited shopping behavior patterns that are surprisingly similar across countries but different from those of other generations within

individual countries (Statista, 2024). Hence, studying the essential boundary conditions of cryptocurrency adoption and its impact on consumer metrics could be a fruitful research avenue. The boundary conditions could include country-level variables (e.g., emerging markets vs. developed countries), firm-level variables (e.g., services vs. goods), consumer-level variables (e.g., demographics, lifestyle), and product-level variables (e.g., hedonic vs. utilitarian, digital vs. physical).

The third and fourth research questions revolve around the implications of different designs of smart contracts for effective global collaboration. Ideally, smart contracts should be able to reduce uncertainty and information asymmetries in collaborations as well as maintain flexibility. From a strategic perspective, MNCs should aim to reconcile these two objectives by integrating some principles of smart contracts into their current collaborative agreements. Hence, future studies can examine whether smart contracts could be more versatile in terms of offering a hybrid design so that they are automated and irreversible for some principles, and flexible for others. One potentially interesting issue relates to recent artificial intelligence (AI) advancements. The new AI-coded smart contracts could overcome inflexibility issues due to their ability to adapt, learn, and make decisions (Deebak & Fadi, 2021; Manimuthu et al., 2022). However, such cutting-edge designs may require a large amount of computing power, making them expensive. Hence, a cost–benefit analysis would help enhance our understanding of the theoretical drivers of collaboration by integrating transaction-cost economics and the resource-based view (Benito et al., 2022). Such an analysis could use either analytical modeling (e.g., game theory) or simulation studies with participants. For instance, researchers could adopt an experimental design in which decision-makers are presented with smart-contract designs that vary in transparency, automation, irreversibility, and flexibility, and then asked to assess trust in collaborations with partners. Follow-up survey-based studies could be conducted to investigate the boundaries of trust among parties and their implications for effective collaboration (e.g., achieving a particular goal or agreement). Finally, studies could explore the strategic incentives for each party to use smart contracts in collaborations. For instance, for some suppliers, a smart contract could reduce legal and administrative (e.g., paper trail) costs. In contrast, given local traditions and cultures, smart contracts will not make sense for other suppliers due to inherent automation or inflexibility. Hence, theoretical studies could establish a framework to guide strategic decision-making on the fit between smart contracts and parties in a given context.

The last two research questions deal with key concerns with blockchain data. As argued above, blockchain data represents a new frontier for extracting insights from the global market. However, a place for blockchain data needs to be found within firms' overall analytics in which they have already invested millions of dollars (e.g., cloud computing, AI, and deep learning). Therefore, blockchain data needs to be integrated with the existing portfolio of analytical tools, such as CRM, data-management platforms, and social media marketing (McKinsey, 2021). Given that the return on investments in blockchain data has yet to be demonstrated, future studies should also assess where and when blockchain data can be effective as well as when it can be too costly to be deployed. For example, future research could use case studies to show how blockchain data can be integrated within a firm and where such an initiative might fail. In addition, as blockchain data is inherently pseudonymous, consumer privacy protection could be at the forefront of the policymaking agenda (Benito et al., 2022). As consumers are increasingly concerned about their data being hacked or leaked from various databases, an investigation of whether data breaches significantly affect firms that store and analyze blockchain data is essential.

4 | CONCLUSIONS

In this perspective article, we argue that blockchain technology has important implications for MNCs' global strategies. However, as with any new technology, this technology and its applications inevitably entail trade-offs. First, cryptocurrencies allow MNCs to decrease financial transaction costs and enhance the security of their payment systems. However, their implementation may entail new costs for infrastructure, staff training, and offsetting the environmental impact. Second, smart contracts can serve as trustless solutions for collaboration owing to their ability to set transparent, immutable, and automated rules, but they also create hindrances due to their rigidity. Third, while blockchain represents a novel avenue for MNCs' analytics, it also gives rise to consumer privacy concerns. We illustrate these dilemmas using multiple real-life examples and then generate a detailed research agenda. We hope the trade-offs presented in this paper spark debates as well as new theoretical and empirical studies in global strategy research.

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ENDNOTES

[i] We focus on the most promising, feasible, and less-researched aspects of blockchain technology for MNCs and do not strive to cover all potential trade-offs.

[ii] New technologies play a key role in shaping MNCs' global strategies. For example, digitalization, digital transformation, and the use of AI are changing the way in which MNCs enter foreign markets, cooperate with partners, and interact with institutions (e.g., Benito et al., 2022).

[iii] Global strategy incorporates "global" elements that are conceptualized as "cross-border activities of economic agents" (Tallman & Pedersen, 2015, p. 273), and "strategic" decisions that create interdependencies with other firm activities, actors, and time (Leiblein et al., 2022). In a recent overview, Birkinshaw (2022) tabulated the strategic landscape of MNCs, which have been examined in several streams of research focused on competitive advantage; corporate organization; market-entry choices; the extent of vertical and horizontal differentiation; and cooperation and collaboration with partners, organizations, and governments.

[iv] Notably, smart contracts might not eliminate corruption in private relationships (see Davis et al., 2022), as bribes can often be made in cash and favors can be agreed upon verbally.

[v] https://www.kaleido.io/.

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