Toward a multidimensional conceptualization of decentralization in blockchain governance:

Commentary on "Two sides of the same coin? Decentralized versus proprietary blockchains and the

performance of digital currencies" by Cennamo, Marchesi, and Meyer

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Abstract: In this commentary, we argue that studies similar to Cennamo, Marchesi, and Meyer (2020) should distinguish four dimensions of control in blockchain governance, all of which could be more or less decentralized. For some of these dimensions, decentralization is likely beneficial, while for others centralization may be preferable. Cennamo et al. (2020) provide evidence that the initial design stages of blockchain systems benefit from centralization. Future research is needed to provide empirical insights for other dimensions of control in blockchain governance.

In our work on blockchain governance, we have argued that there are different dimensions of decentralization, a key concern in blockchain systems. Reviewing the blockchain literature, we found that studies have shown different aspects of control in blockchain governance to be centralized in practice. Even though blockchain networks are often referred to as decentralized, the initial system development (Beck, Mueller-Bloch, & King, 2018), subsequent system updates (Azouvi, Maller, & Meiklejohn, 2018), and transaction validation itself (Arnosti & Weinberg, 2018) all exhibit elements of centralization.

Cennamo, Marchesi, and Meyer (2020) make an important contribution to this discourse by suggesting that digital currencies enabled by their own blockchain system are more centralized, and by demonstrating the price consequences of this centralization. Distinguishing between *coins* (enabled by their own blockchain system) and *tokens* (enabled by a third party blockchain system), they argue that setting up their own coins (as opposed to tokens) allows firms to dictate how the underlying blockchain system works, which allows for a better fit with the intended purpose. Therefore, they characterize coins as more centralized than tokens. Cennamo et al. (2020) further provide empirical evidence that coins are more valuable than tokens in the long term and suggest that the difference in valuation is driven by this centralization.

As Cennamo et al. (2020) point out, it is paradoxical that centralized blockchain-based digital currencies are more valuable. This is because blockchain's promise is the maintenance of reliable shared records without a need for trusted third parties. Blockchain systems provide a solution to keep records in a decentralized and yet trustworthy fashion (Halaburda & Mueller-Bloch, 2019; Lumineau, Wang, & Schilke, 2020; Zachariadis, Hileman, & Scott, 2019). The catch is that in blockchain systems decentralized record-keeping is not an inherent technology feature, but an outcome of free individual decisions. For instance, in Bitcoin miners form mining pools,

thereby centralizing power (Arnosti & Weinberg, 2018; Alsabah & Capponi, 2020; Cong, He & Li, 2020). Therefore, in blockchain systems there is always a risk of centralization and thus emergence of intermediaries, even though blockchain systems are expected to eliminate intermediaries.

Using blockchain systems is costly, due to their immutable nature and the expensive use of consensus algorithms. Therefore, it only makes sense to use blockchain systems if there is an intention to keep records in a decentralized way. Accordingly, one would expect centralized blockchain systems to be less valuable, not more valuable, as Cennamo et al. (2020) suggest. We can reconcile this seeming contradiction, by utilizing a multi-dimensional view of control in blockchain systems (Halaburda & Mueller-Bloch, 2019). In analyses similar to Cennamo et al. (2020), we should distinguish four dimensions of control in blockchain governance, all of which can be more or less decentralized: the initial system development, subsequent system updates, transaction validation itself, and transacting. For some dimensions, decentralization is likely beneficial, while for others centralization may be preferable.

When it comes to the *initial system development* of blockchain-based digital currencies, Cennamo et al. (2020) make the important point that choosing a coin, as opposed to a token, allows for designing the infrastructure in a way that may work better for the intended purpose. This fit between technological infrastructure and application is critical in the blockchain context (Rossi, Mueller-Bloch, Thatcher, & Beck, 2019). However, once the digital currency is operating, there is no reason for users to trust it if *transaction validation* is centralized. With a multi-dimensional view of control in blockchain governance, we might find that centralization of the initial system development and decentralization of transaction validation might result in superior outcomes. This would be consistent with the empirical results of Cennamo et al. (2020), since the benefits of

centralized control during the development stage remain with coins after they start operating. Moreover, neither coins nor tokens are inherently centralized or decentralized in terms of transaction validation.

One could of course argue that centralization is also of value once the blockchain system is operating. For example, because centralized system updates would easily allow to keep the intended strategic positioning in the changing market. This is possible and also in line with the argument of Cennamo et al. (2020). However, strategic development of blockchain systems in response to changing market needs can also happen in a decentralized way. For instance, in the case of Bitcoin, several derivates exist to address different needs in the cryptocurrency market. These sprung up in a decentralized way through forks (i.e., splits) of the underlying technological infrastructure, as different stakeholders pursued diverging goals and interests (Andersen & Ingram Bogusz, 2019).

We believe that future research would benefit from distinguishing different dimensions of decentralization. Cennamo et al. (2020) make an important contribution in providing evidence that the initial design stages of blockchain systems may benefit from centralization. However, this may not be the case for other governance dimensions. Given the importance of control in blockchain governance, future research is needed to provide a more fine-grained picture of when decentralization is beneficial, and when centralization is to be preferred.

Besides the consequences of decentralization in blockchain governance, the antecedents of decentralization also deserve more attention. In particular, this is of importance in the context of permissionless and permissioned blockchain systems. Permissionless blockchain systems do not restrict who can validate transactions, while permissioned blockchain systems only allow selected agents to validate. While it is frequently argued that transaction validation in permissionless

blockchain systems is more decentralized than in permissioned ones (e.g., Liu, Wu, & Xu, 2019),

we believe that permissioned blockchain systems allow for guaranteeing a higher level of

decentralization in practice. This is because in such blockchain systems decentralization of

transaction validation is not an emergent outcome of free individual decisions, but can be enforced

through off-blockchain agreements (Bakos, Halaburda, & Mueller-Bloch, 2021).

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