

Index Terms—Bitcoin Network, Mining Pools, Malthusian Trap, Incentive Mechanism

BITCOIN [1] is a decentralized peer to peer (P2P) cryptocurrency that was first proposed by Satoshi Nakamoto in 2008. Without resorting to any trusted third party, Bitcoin adapts a cryptographic proof mechanism that enables anonymous peers to complete transactions through the P2P network. Blockchain is the core mechanism of the Bitcoin system. It not only records historical transactions from Bitcoin clients, but also prevents the Bitcoin network from double spending attacks [2]. The Bitcoin network participants, who maintain and update the ongoing chain of blocks, are called miners. These miners compete in a mining race driven by an incentive mechanism [3], [4], where the one who first solves the Bitcoin cryptographic puzzle [5] has the right to collect unconfirmed transactions into a new block, append the new block to the main chain, i.e., the longest chain of blocks, and gain some BTCs [6] as a mining reward.

[illegible]

- [1] S. Nakamoto, "Bitcoin: A peer-to-peer electronic cash system," 2008.
- [2] G. O. Karame, E. Androulaki, M. Roeschlin, A. Gervais, and S. Čapkun, "Misbehavior in bitcoin: A study of double-spending and accountability," *ACM Transactions on Information and System Security (TISSEC)*, vol. 18, no. 1, p. 2, 2015.

- [3] Y. Lewenberg, Y. Bachrach, Y. Sompolsky, A. Zohar, and J. S. Rosenschein, "Bitcoin mining pools: A cooperative game theoretic analysis," in *Proceedings of the 2015 International Conference on Autonomous Agents and Multiagent Systems*. International Foundation for Autonomous Agents and Multiagent Systems, 2015, pp. 919–927.
- [4] O. Schrijvers, J. Bonneau, D. Boneh, and T. Roughgarden, "Incentive compatibility of bitcoin mining pool reward functions," in *International Conference on Financial Cryptography and Data Security*. Springer, 2016, pp. 477–498.
- [5] I. Giechaskiel, C. Cremers, and K. B. Rasmussen, "On bitcoin security in the presence of broken cryptographic primitives," in *European Symposium on Research in Computer Security*. Springer, 2016, pp. 201–222.
- [6] BTC. [Online]. Available: <https://en.bitcoin.it/wiki/Bitcoin>, Accessed on 31 January 2019.