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Validation of Crypto- Asset On-Chain Transactions

Relevance, Risks, and Challenges for Official Statistics

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Trends and mechanisms in crypto validation

- Crypto-assets are digital assets and payment systems that are verified and recorded on a blockchain.
- Two main validation methods
 - Mining (Proof-of-Work - PoW) and staking (Proof-of-Stake - PoS)
- Shift in consensus mechanisms
 - Ethereum's transition in September 2022
 - Advantages of PoS (energy & scalability)
- Technological innovations
 - Liquid staking
 - Layer-2 solutions (like Arbitrum and ZKSync)
 - Re-staking technologies (e.g. EigenLayer)
- New business models
 - Mining / staking pools
 - Validation-as-a-service



Quantifying crypto validation output by country

- Growing phenomenon and environmental concerns
 - Generation of significant output
 - Energy Consumption (PoW)
 - Shift Towards Sustainability (PoS & Green Energy)
- Regulatory and data gaps
 - Lack of regulation
 - Information shortcomings (off-chain data scarcity, pseudonymous on-chain data)
- Statistical challenges
 - Economic output recording
 - Geographic attribution



First estimates of crypto validation output by country

- The initial effort (based on rough estimates) to create macroeconomic statistics using the available data.
- Various Indicators and data sources are showcased in the Annex.
- Aim: to foster a thorough discussion about the data limitations and other areas for improvement or further development.
- More hands-on work with blockchain data by statisticians/authorities might be helpful.
- Methodologies for on-chain country attributions by statisticians/authorities.
- Potential benefits of new initiatives could improve data quality.

Selected country distribution of BTC mining balances, block rewards and fees



Source: Crunchbase, Chainalysis, Cambridge Centre for Alternative Finance, and authors' calculations.

Notes: Mining costs, fixed at 66% of rewards, are deducted in the chart. Country-specific balances and rewards are derived from Chainalysis data, segmented by average geographical shares from Crunchbase and CCAF. Fees are also country-segmented based on Chainalysis's cross-country data. The estimates encompass all countries, although the chart presents only a select few for the sake of clarity.



Future of crypto validation statistics

- Initiatives to address data gaps
 - NACE Ver. 2.1
 - Other statistical initiatives
- Regulatory frameworks
 - The role of MICAR and information on the environmental impact of crypto validation
 - Enhanced reporting requirements (standards)
- Methodological innovations
 - Geographic attribution methods
 - Blockchain data utilisation
- Improving data quality and accessibility



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Conclusions

- Relevance of crypto validation
 - Growing financial significance
 - Economic contributions
 - Ongoing technological and business innovation
- Challenges
 - Regulatory and data gaps
 - Only rough estimates of crypto validation output by country is possible
- Future directions
 - Leveraging on initiatives contributing to increased data availability
 - Catching up with technological changes
 - Engagement & collaboration



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Thank you for your attention



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