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THE CRYPTO ECOSYSTEM: PROSPECTS AND CHALLENGES FOR REGULATORS

The interest of market operators, authorities and academics for crypto assets has become apparent in 2009, when the bitcoin blockchain was implemented. The novelty of a form of money operating through a privately owned, decentralized, trustless and technology-based mechanism has spurred a theoretical debate, often motivated by ideological elements, but bitcoin has not represented an issue of concern for central banks and regulators, due to its negligible impact of the payments and financial markets[1]. As the speculative nature of bitcoin exchanges has become clear, due to its extreme price volatility, central banks, standard setting bodies (SSB)[2] and regulators have repeatedly warned about the risks that investors would have incurred in betting on an instrument devoid of any guarantee or safeguard.

In the last decade the crypto ecosystem has steadily developed, but its expansion has become noticeable only since 2020, when several factors incentivized the generation and diffusion of an impressive number of crypto assets: the progressive adoption of the blockchain technology, of the original, public and fully decentralized kind ("permissionless"), but also of the private, centrally governed and managed nature ("permissioned"); the increasing demand for cheaper and faster payments solutions; the pandemic, stimulating further digitalization of payments and financial activities. The prolonged period of (very) low interest rates played a role, too, leading to a search for yields from the side of less risk averse actors keen to exploit price volatility of any form of asset.

Thus, after the "native" cryptos like bitcoin, a second wave of these assets developed in the form of stablecoins, which embedded mechanisms aiming to stabilize their value, thereby lowering

[1] Unique and certified quantitative information on the diffusion of bitcoin, generally of cryptos, is not available. Survey-based data are recorded by several research centers around the world, which agree that, at the moment of maximum expansion of the sector (end 2021), in terms of stocks all cryptos amounted to approximately 1% of the global financial assets. Bitcoin accounted for one third of crypto assets, the largest parts being represented by stablecoins. Since in 2022 the crypto assets market capitalization collapsed to 1,000 billion from a maximum of 3,000 billion in November 2021, it is almost certain that the above market shares have shrunk as well.
[2] The most relevant SSBs dealing with the topic are the FSB (Financial Stability Board), the BIS Basel Committee on Banking Supervision (BCBS), the BIS Committee on Payments and Market Infrastructures (CPMI), and the International Organization of Securities Commissions (IOSCO).

price volatility and making them more attractive for payment purposes[3]. The more recent stage of development in the crypto ecosystem is that of the "decentralized finance" (DeFi), where trades can be automatically executed and settled through algorithms (smart contracts) on Distributed Ledger Technology (DLT) platforms.

Nowadays there are about 22,600 crypto assets, with very different nature and functions such as payments, investment or exercise of governance or property rights. Such huge variety is the basic reason why a commonly recognized classification of cryptos is challenging and still missing. A general purpose definition and a related taxonomy can be drawn from the European "Markets in Crypto-Assets Regulation" (MiCAR), in the process of being published and which will become applicable in 2024[4]. MiCAR defines cryptos as:

"a digital representation of a value or of a right that is able to be transferred and stored electronically using DLT or similar technology".

Digital values and rights associated to a crypto are incorporated in and represented by tokens, which the Regulation distinguishes in e-money token (EMT), asset referenced tokens (ART) and other crypto assets (including bitcoin and other "native" cryptos, but also tokens representing property or voting rights). From a risk perspective, the EMT and the ART are often assimilated to "backed" stablecoins, while the wide, residual typology encompasses all the "unbacked" assets.

There is a number of substantive, intertwined elements inherently defining the components of this ecosystem:

- the technological footprint, centered on the DLT paradigm and cryptography. This technology enables all crypto players to interact in a substantially different mode than in traditional finance (TradFi). Technology allows distributed governance, algorithms and validation mechanisms based on anonymous consensus;
- the variety of entities and infrastructures typologies involved: crypto issuers, crypto-related service providers (which include wallet providers, trading platforms and exchanges) and 3rd party IT outsourcers. Exchanges can be of a centralized (CEX) or decentralized (DEX) kind, depending on whether a central order book is envisaged and

[3] On the intrinsic cryptos price volatility see IMF (2021).
[4] Proposal for a Regulation of the European Parliament and of the Council on Markets in Crypto-assets (2022), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020PC0593 .

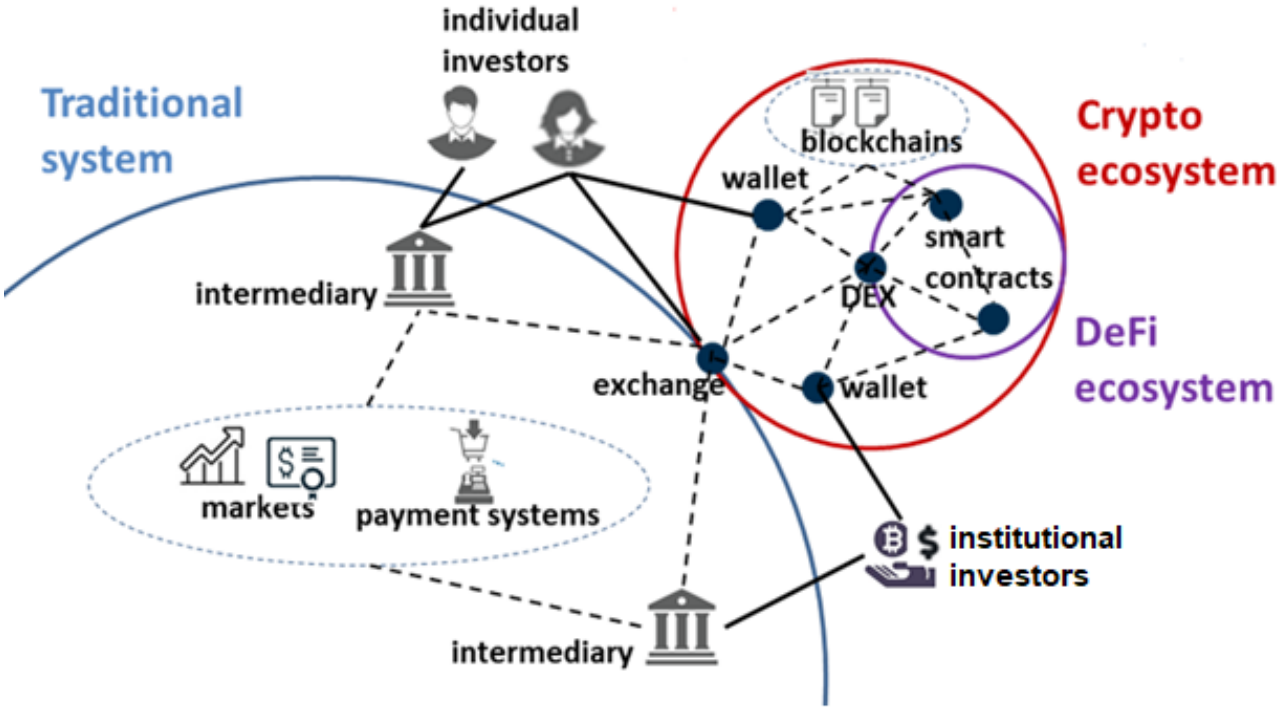
managed by an identifiable entity, where a price is determined and made public to the market, or the price is fixed by algorithms;

- the intrinsic borderless nature, due to the technologically and functionally distributed nature of the new instruments;
- the strong and growing interconnectedness, both within the crypto domain and between crypto assets and players and the TradFi system. Exchanges play a crucial role in this regard, allowing purchase and sell of cryptos against fiat currency (or another crypto asset) and being open to traditional, supervised intermediaries as well as to individual and institutional investors. Moreover, intermediaries and investors can directly acquire cryptos in a non-custodial wallet form (also referred to as "unhosted wallet"), which allows peer-to-peer transfers between DLT addresses.

All the above components are a matter of attention for regulators, but interconnectedness can be considered of utmost relevance, for the reasons visible in the stylized figure depicting the TradFi, Crypto and DeFi perimeters and their intersection points[5, 6].

The multiple risk transmission channels inherent in the functioning of crypto markets have deep, potential implications under two main risk typologies, regarding financial stability on one side, macroeconomic and monetary policy control on the other.

[5] On the cryptos and DeFi characteristics and risks see, among others, Aramonte *et al.* (2021), Aquilina *et al.* (2023) and FSB (2023).
[6] See OECD (2022a).



DEX=Decentralised Exchange

Transfer of value within the respective ecosystems

Access points for institutional and retail investors

In terms of financial stability, increasing adoption of these instruments may make the boundaries between TradFi and DeFi more permeable, with increasing risks of spillovers to banks and other supervised operators, ultimately to the real economy[7]. Banks disintermediation outcomes are key in such analysis. But vulnerabilities may emerge also in the "non-bank financial intermediation" (NBFI) sector, due to both direct investment in cryptos and crypto-related structured products, and to financing of entities operating in this world. As the "crypto winter" episodes of 2022 have shown, liquidity stress or default events occur in this sector primarily due to excessive leveraged positions or Ponzi-like structures built up using cryptos as collateral to buy other cryptos[8]. And crypto operators generally face severe deficiencies in risk management, risk fencing of business

[7] See FSB (2023).
[8] See among others Harvey (2022) and Cecchetti and Schoenholtz (2022).

lines and handling of customer funds[9]. Therefore, spillover effects to TradFi are most challenging to intercept and to contrast.

This picture is further complicated by other elements: i) there is a lack of certain and reliable quantitative information on cryptos; i) where the sector is outside the regulatory perimeter, there is a lack of designated resolution authorities, no provision for lender of last resort asset purchase facilities and no industry-fenced insurance schemes; ii) there is an issue of market concentration, as few dominant players ("crypto-conglomerates") are emerging, operating in multiple markets and providing vertically integrated services (e.g. issuance of cryptos, custody and investments). Their failure would heavily impact the interlinked players and beyond; and they could be obviously akin to anti-competitive practices; iii) cyber attacks are more difficult to timely recognize and counter in such unregulated and opaque environment, and iv) there is yet a problem of lacking consumer protection and Anti Money Laundering (AML) and Counter Terrorist Financing (CFT) measures.

From a macroeconomic perspective, a broad-based adoption of cryptos could have implications for monetary control, at an extreme monetary sovereignty, and capital flow management[10]. The risk of banks disintermediation is a crucial element in this perspective, too. Operating outside the banking sector, crypto trades could alter the monetary policy transmission effectiveness, traditionally relying on a stable money market multiplier. Additionally, the new channels for capital flow between countries via crypto assets would ask for revising the existing capital flow management and external policies. Finally, the decentralized nature of the new instruments and markets challenges tracking, with negative implications for tax and fiscal policy[11].

Of course, as recently reiterated by the current Indian G20 Presidency[12], there can be benefits offered by cryptos and distributed platforms, which would be of common interest to harness. After all, there are reasons why these instruments can be demanded, not necessarily related to illicit purposes. Cryptos can entail efficiency gains, e.g. insofar decentralized technologies lead to shorten some financial value chains in payments execution or funds raising. Moreover, as a new

[9] See FSB (2022).
[10] For the macroeconomic risks of digitalization of money see Brunnermaier *et al.* (2021).
[11] On this issue see OECD (2022b).
[12] See the G20 panel discussion on "Policy Perspectives: Debating the Road to Policy Consensus on Crypto Assets" (2023).

medium of exchange cryptos can prove useful in a context of strong, endemic monetary instability. An effective regulation should not waste these favorable potentials.

Yet, at present authorities view the above mentioned risks as outweighing benefits. What kind of approach is being defined by regulators and SSBs in the current stage of development of the crypto ecosystem? Given the information gaps and complexities involved, single jurisdictions have adopted a variety of measures, ranging from prohibition, to restriction, to explicit support. But the borderless nature of crypto assets necessitates a global approach, rather than a purely country-specific one. The general principle "same activity, same risk, same regulation"[13] is being made more flexible, and authorities tend to use, on a case by case basis, the option of banning specific cryptos, ring-fencing cryptos from TradFi and the real economy, and regulate the sector in a manner akin to TradFi[14].

However, as emphasized *inter alia* by the BIS, an essential element of any regulation is enforceability. That leads to a line of approach under discussion at this stage, which points to define the perimeter of crypto assets, markets and operators that can be effectively regulated and supervised, as distinguished from those that can be left outside such perimeter, being addressee of recommendations and other soft law measures; this goes together with envisaging limits to the financial exposures of TradFi intermediaries to crypto ones[15].

Of course, a parallel strategy should aim to improve those TradFi services where cryptos could more successfully compete. Making retail payment systems more efficient, namely promoting the adoption of fast solutions, or issuing CBCDs by central banks. At present cryptos play overall a negligible role in payment systems and financial markets, but with a volatile and potentially very high growth rate. However, this does not alleviate the need for internationally homogeneous standards and regulations. The European MiCAR is the first, organic and comprehensive set of rules in this market sector. But in a rapidly changing competitive and technological environment, regulatory gaps and asymmetries leave the financial landscape exposed to the risks of regulatory arbitrage, illicit uses, weak or missing protection of individuals resorting to cryptos.

[13] On regulation and supervision on cryptos see among others Auer (2022) and Aquilina *et al.* (2023).
[14] See Banca d'Italia (2022).
[15] See BCBS (2022).

The contributions of this special issue delve in depth into all these topics, focussing on the two broad risk typologies outlined above. The authors give different emphasis to single issues and come to somehow different suggestions, but unanimously agree that time is ripe for coordinated regulatory initiatives at the global level in this field.

The first two papers presented hereinafter deal with financial stability issues. After describing the trends in both backed and unbacked crypto assets, Ardizzi, Bevilacqua, Cerrato and Di Iorio draw lessons from the recent series of default events in these markets. The Russia-Ukraine war has shown how investors are not only motivated by speculative intentions, but often consider cryptos as legitimate alternatives to regulated financial services or even as a reserve of value in difficult times. Yet, the two most relevant episodes (the Terra-Luna collapse and the FTX bankruptcy) witnessed the intrinsic fragility of the largely unregulated crypto-markets, with possible spill-over to traditional finance. Authorities are aware of and alert to such risks under several viewpoints (TradFi resilience, payment systems reliability, financial stability, customer protection, etc.), while committing to not neglect the potential benefits of distributed ledger technologies (DLT) in terms of increased efficiency, financial inclusion and transparency of financial services.

Against this background, the paper builds a conceptual framework along two dimensions, i.e. decentralization of i) technological infrastructures and ii) governance of applications relying thereon. Different set-ups come with different challenges for authorities. TradFi actors may rely on new infrastructures with centralized governance to "rewire" existing activities, as is the case with bank-led private permissioned DLT infrastructures processing tokenized assets. This comes with lesser implications compared to the case of new entrants or incumbents relying on decentralized infrastructures to offer innovative services, or the case of decentralized set-ups based on DeFi protocols with no clearly identifiable responsible entities.

Whether and, more importantly, how to regulate the issuance of crypto-assets and the related provision of services are complex issues, and there is no one-size-fits-all answer, as exemplified by the debate among global standard setters and the spectrum of choices made by legislators in different jurisdictions, while the borderless nature of digital assets makes international cooperation ever more crucial.

The paper by Abate, Branzoli and Gallo documents the complex structure of crypto-asset ecosystems and their significant vulnerabilities, highlighting how these issues amplified the turmoil observed in 2022 in these markets.
The analysis shows that the episodes of stress followed patterns similar to those observed in the traditional financial system: after investors lost confidence in the stability of a building block of the market, either a stablecoin or a large trading platform in the case of crypto-assets, panic and inability of the stressed intermediaries to maintain obligations with clients led to a widespread crisis. Direct exposures of crypto-asset service providers to these entities, coupled with relevant leverage, transmitted and amplified the stress to the broader crypto-asset ecosystem. Against this background, it is essential to avoid the risk of harmful fragmentation arising from different regulatory approaches, given the global nature of these markets.

To this end, the paper argues that there are inherent challenges in regulating some parts of the crypto-asset ecosystems, such as algorithmic stablecoins, permissionless DLTs and decentralized governance structures. In light of these challenges, the authors suggest that authorities should set a clear perimeter for financial regulation and develop common rules to address financial stability risks following the "same activity, same risk, same regulation" principle. Authorities should aim to limit interconnections between the parts of the crypto ecosystem that are not covered by regulation and the TradFi, addressing financial stability risks for the latter and supporting identification of good practices for the management of risks by entities involved or operating in areas not directly covered by financial regulation. Such regulatory perimeter should be regularly reviewed and potentially changed by authorities if there are material novelties in the functioning of crypto-asset markets.

The other papers tackle the monetary implications of the adoption of crypto assets under theoretical, institutional and operational viewpoints.

Mastromatteo and Rossi focus on the macroeconomic and geopolitical implications of the CBDC in an international context. CBDCs do not fall in the conventional definitions of cryptos, due to their different legal status and economic function, but both the domains share an operational essential feature, being issued and exchanged through a DLT infrastructure.

CBDCs would positively affect the functioning of retail payment systems in terms of safety, accessibility, efficiency and ultimately trust. A digital central bank liability would be in the best

position to satisfy the needs of a modern cashless society, and could be distributed and exchanged through private, supervised intermediaries. The authors argue that such an instrument would also impact monetary policy implementation, to the extent that it substitutes cash and bank deposits. The degree of crowding-out effects of short-term bank liabilities would depend on choices regarding the CBDC model design, *in primis* whether an interest rates is applied to it and at what level, but also on the daily volatility of agents' demand for the digital public money, in particular in periods of financial stress. These elements would call for an adaptation of the monetary policy operational framework.

In the present experimental phase of the CBDC in more advanced economies there is not yet a clear view on its possible impact on monetary policy implementation and on its effects on the economy as a whole (e.g. in cases of banks disintermediation outcomes). Other implications of CBDCs could be of geopolitical nature, insofar competition among national reserve currencies becomes relevant. In this perspective the authors emphasize the role that the Chinese CBDC could play in inducing a deep change in the international dollar-based trading system.

Bini Smaghi discusses critically the digital euro project. Its alleged benefits are uncertain both when referred to the payments system (push to digitalization and efficiency, reduction of agents' reliance on private digital form of money, less overall riskiness), and when assumed to smooth the monetary policy transmission or alleviate geopolitically critical dependence on foreign digital currencies.

According to the author, the reduction trend in the use of cash and the related increase in electronic, private payment instruments have not caused any market failures, since the system has not become less efficient or secure. After all, choices of payments instruments are driven by agents' preferences, and it is unclear that these preferences would change significantly in favor of a public form of digital money. In addition, in the ECB project the planned ceiling on low levels to individual CBDC endowments would *per se* limit any hypothetical benefit, both at the micro and macro level.

Furthermore, it has to be considered that CBDCs entail costs and risks. With reference to monetary policy implementation, the author points to the risks of money multiplier instability, due to shifts from banks deposits to CBDC and vice versa in individual preferences. In addition, banks disintermediation could come at the expense of banks stability, in case they are forced to

fire sales and to resort to central bank refinancing against collateral. Finally, it is unclear that the ECB would keep full control on some essential features of the CBDC, such as remuneration or anonymity: in an open monetary environment, they cannot be fixed independently on other central banks decisions, with risks of weakening the independence of a single central bank.

Bini Smaghi concludes that central banks should rather engage in reinforcing and refining their regulatory and supervisory action on digital currencies issued by non-regulated entities. In this perspective, designing a consistent regulation on tech giants is at the present a major challenge.

Monetary issues linked to properly defined cryptos are discussed by Garzón Espinosa, Cruz Hidalgo, Medialdea García and Sánchez Mato, Pittaluga and Beltrametti, and Savona.

The Spanish authors investigate under what conditions cryptos could replace the State currencies in their three functions. They examine several traits of a possible crypto currency monetary paradigm in the decentralized set up of the blockchain in light of the most relevant monetary theoretical approaches. Two topics are delved in particular: competition among different versions of private and State money on one side, institutions and safeguards facilitating the functioning of a "Monetary Production System" in a capitalistic economy on the other side.
The authors argue that cryptos cannot be successful either as medium of exchange or as a reference in the magnitude of prices, or as a reserve asset, due to well-known drawbacks and risks of the ecosystem: the dominant, speculative component, with inherent unpredictable price volatility and risks of bubbles; concentration of issuance at few, unknown elites of miners and investors; risks of money laundering or other illicit uses; markets integrity and security problems due to cyber hacking, with associated, uncontrolled risks of thefts; high energy costs and pollution effects. In addition, a deeper factor to be considered is the lack of the institutional factors enabling the functioning of a modern monetary economy: in essence, a central, public guarantee like that provided central banks (including the lender of last resort function), nurturing trust in an uncertain world and containing monetary and financial stability risks.

The paper by Beltrametti and Pittaluga focuses on stablecoins, framing the analysis in the theoretical debate on the functioning of the present two-layer monetary systems, where central banks control fiat money and money markets conditions, and commercial banks collect deposits and multiply the fiat money.

Though embedding price stabilization mechanisms, stablecoins pose risks for both financial stability and monetary policy implementation, essentially in connection with the level and composition of backing, stabilizing reserves. Stablecoins operators may not be in a condition to redeem them in cash, fueling runs from users or exchanges side (with possible spill-over effects on banks, as shown by the recent collapse of the Silicon Valley Bank). Moreover, the yield on a stablecoin backed by a diversified reserve basket will be marginally affected by monetary control measures aimed to stabilize interest rates on a single currency. For countries with highly unstable currencies, this could drive a widespread adoption of private cryptos and a substantial loss of monetary sovereignty.

Authorities can contrast these drawbacks either adopting measures to constrain the backing reserves composition, or trying to limit the recourse to stablecoins by issuing CBDCs. The CBDC would help maintaining monetary control but at the cost of risks of both economic and, more generally, political nature. In case of banks disintermediation phenomena, possibly more acute in stressed phases, there could be uncertain effects on banks credit and on the money multiplier, as pointed out also by Bini Smaghi. Should a strong competition arise between the central bank and the banking system on the deposit market, the two-layer monetary set up could even be hindered, with unpredictable effects. Politically sensitive issues could be the loss of privacy on CBDC holdings and risks of political interference in credit allocation, insofar disintermediated banks come to strongly depend on central banks refinancing. In view of the various issues of concern and unpredictable risks, the authors emphasize the importance that CBDCs are properly designed and managed.

Savona analyzes the possible, undesirable effects of cryptos on the monetary set-up from an institutional perspective. He depicts a two-tier scenario, where sovereign fiat currencies coexist with cryptos, with the latter component crowding out both cash and traditional non-cash payments instruments (i.e. cards, credit transfers or direct debits), in a sort of Gresham Law. In turn, such monetary regime change and, more generally, "platformization" of the economic system induced by technology could have two structural effects: 1) a profound impact on banking business models: at an extreme, banks would be pushed outside the monetary circuit, diverting activity to savings collection and management and project financing, similarly to multifunctional financial company, with no role anymore in influencing the money multiplier; 2) the purchasing power exogenously created by crypto miners (and multiplied through exchanges) would affect the

income distribution, which could not be contrasted by monetary policy due to loss of authority monopoly over money creation and control of interest rates; in turn, this could exacerbate risks of social and political instability.

CBDC would be the way central banks adapt to the new technological paradigm in order to maintain the monetary control, or at least a "signaling" function with regard to the desired monetary stance. Savona, however, deems that the risks for monetary, financial and economic stability associated with cryptoassets should be faced and contained basically through a timely, internationally consistent and comprehensive regulation, associated to effective supervisory tools. In his view, a full awareness of the need of such an approach is still missing.

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