EasyChair Preprint

№ 1360

Digital Currency Schemes: More or Less Sustainable? Limits to Growth, Electronification and the Negotiability of Money in Europe

Gabriella Gimigliano and Valentino Cattelan

August 1, 2019

Working Paper

DIGITAL CURRENCY SCHEMES: MORE OR LESS SUSTAINABLE? *LIMITS TO GROWTH*, ELECTRONIFICATION AND THE NEGOTIABILITY OF MONEY IN EUROPE[i]

Gabriella Gimigliano[1] and Valentino Cattelan[2]

1. Introduction: *The Limits to Growth*

In 1972, around 50 years ago, governments met in Sweden for the UN Conference on the Human Environment, and in 1983 the UN created the World Commission on Environment and Development (also known as Brundtland Commission), with the definition of sustainable development as «meeting the needs of the present without compromising the ability of the future generations to meet their own needs». Also in 1972, a famous report entitled *The Limits to Growth* was issued by the so-called Club of Rome (composed of current and former heads of state, UN representatives and high-level government officials, business leaders...) with a computer simulation of the not-indefinite economic growth in presence of a finite supply of resources.

More recently, the reduction of inequality appear among the persistent challenges that the 2030 Agenda of the United Nations has clearly indicated in 2015 in the famous list of its seventeen Sustainable Development Goals (SDGs).

Money has a central role in promoting the sustainability of the economic system. Therefore, the recent technical innovation applied to money, payments and settlement process, question us on the ability of overcoming the *Limits to Growth* and fill in the inequality gap, a problem which is currently affecting also the future development of the European Union

This paper aims at facing this issue by combining a law and humanities approach with a critical eye on the most recent evolution of European Union law on the matter of the electronification of money, negotiability, payment systems and complementary and digital currencies.

To this objective, Part I of the paper takes inspiration from the work by Australian artist Nicholas Mangan *Limits to Growth* (itself related to the 1972 Report) in order to explore the connection between law and economy from an inter- and trans-cultural perspective. In this light, Part I investigates the concept of value in money exchanges through the conceptual relation in Mangan's artwork between the ancient Yapese currency, *rai*, in the form of stone money, and the contemporary crypto-currency of *bitcoins*. Their juxtaposed story of production, consumption and circulation, as well as of re-evaluation, will then be extended to the relation between localised/complementary, on the one side, and globalised/digital currencies, on the other side, to highlight how monetary value, originally "carved" via (closed) criteria of community belonging, *changes* when "sold" to an (open) market dominated by technology.

Part II concerns the normative framework at the European Union level for the "electronification" applied to money, payment and settlement in order to assess whether this regulatory strategy can overcome the *Limits to Growth*. The "electronification" process aims to moving online the whole payment process within the payment system, from the issuance to the settlement of the payment orders, where the "payment system" is meant as «a set of mechanisms

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[1] Gabriella Gimigliano, Ph.D., Senior Researcher in Business Law and Jean Monnet Chair in EU Money Law, Business and Law Department University of Siena.

[2] Valentino Cattelan, Ph.D., Research Associate, Saudi-Spanish Center for Islamic Economics and Finance, Madrid.

for the transfer of money among agents. Its constituent elements comprise the institutions providing payment services, the various forms of money, the means of transferring them, including message instructions and communication channels, and the contractual relationships linking the parties concerned» (Borio – Van den Bergh, 1993).

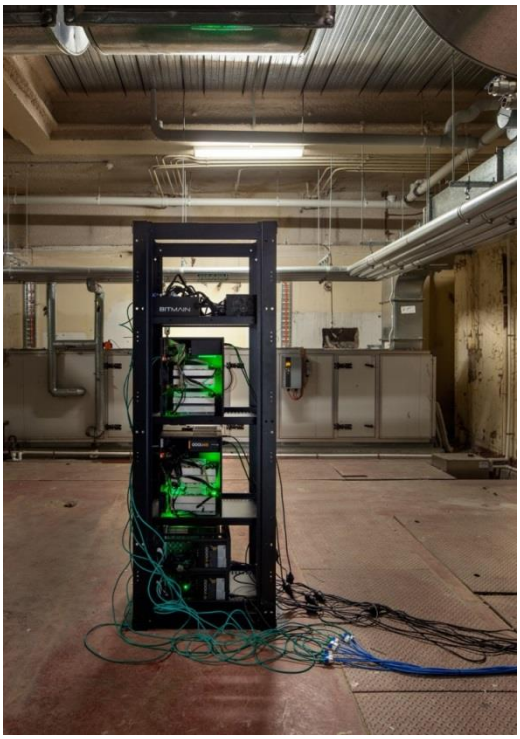
2. Part I – The sustainability of money: law, economics and the impact of technology

Named after the Report mentioned above, *Limits to Growth* is the first survey exhibition by multidisciplinary Australian artist Nicholas Mangan (born 1979, AU) which took place at the KW Institute for Contemporary Art in Berlin from 2 June to 13 August 2017.

The exhibition (accompanied by a volume published by Sternberg Press; see list of references: Mangan 2016a) brought together five art projects that the artist developed over the last nine years on inter-connected themes such as the on-going impacts of colonialism, consumption cultures and the dynamics of global political economy. In particular, the exhibition itself lent its title from Mangan's most recent artwork *Limits to Growth* (2016-2017), where he forges interdependence between two (apparently distant, but actually much closer one another than expected) monetary currencies: ***rai***, the ancient large stone coins from the Micronesian island of Yap, and ***bitcoin***, the most popular crypto-currency currently in use in the global market.

Mangan, N., installation view *Limits to Growth,* KW Institute for Contemporary Art, 2017
(photo by Frank Sperling, published online at http://www.kw-berlin.de/en/press/)

The installation *consumes* "money" that is *produced* by a *bitcoin* mining ring installed in the Museum basement to pay for the production of large-format photographs of *rai* stone coins, with an indexical relationship to the energy employed by the *bitcoin* mining taking place below, thus *re-formulating* "value" from an exchange medium to the other. Photographs are also juxtaposed to an underwater video of a *rai* stone lying on the bottom of the Miil Channel off the northwest coast of Yap. The sound of a human breathing through a scuba apparatus is taken from the video, and mixes with that of the *bitcoin* miners and the noise of the building's air-conditioning system. As Mangan underlines in his website presentation of the opus, all these sounds "allude to the presence of closed systems and the notion of the necessity of *circulation* in any currency."



9 terrahash Bitcoin ASIC mining ring. Installation detail
(picture taken from Mangan's personal website)

Limits to Growth gives form to a complex interaction between matter and energy by incorporating together "sculptural objects and environments, film, sound and evolving and contingent systems that act to generate and sustain his work through time" (Clark, 2017). The opus becomes in this way a generative project that draws on materials and labour in order to explore the evolution of money value, as well as its cultural re-formulation in time and space.

In actual fact, although *rai* were carved large stones and *bitcoin*, on the contrary, are virtual and in a sense immaterial, since minted by computers solving complex algorithms, both currencies share (as *any* currency) a common story of *production* and *consumption* of monetary value within *their own* (closed) exchange system, overlapping with further layers of *circulation* and *re-formulation of value* when located in an (open) exchange environment, in the interaction with other systems of meaning.

Mangan, N., installation view *Limits to Growth,* KW Institute for Contemporary Art, 2017
(photo by Frank Sperling, published online at http://www.kw-berlin.de/en/press/)

2.1. *The Island of Stone Money*: rai, bitcoins *and how to* produce *and* consume *monetary value*

The story of *rai* (also called *fei*) stones is popular among economists, and has been mentioned by Keynes, Friedman, Tobin and Makiw (as reported by Goldberg, 2005, p. 959). The first source of the story dates back to 1910, with a book by physician and ethnographer William Henry Furness III, of which some excerpts were also reproduced in *The Economic Journal* (1915).

In 1903 Furness spent some months on the island of Uap (or Yap), part of the Caroline Islands, in the Pacific Ocean east of the Philippines. He was particularly impressed by the local monetary system, and accordingly gave his book the title *The Island of Stone Money* (1910). Local legend held that around six centuries before an expedition of Yapese fishermen landed accidentally 250 miles away in one of the islands of Palau: they found there limestone rocks (inexistent in Yap) which looked very valuable to them. A first stone was then carved in the shape of a whale (*rai* in their native language), while others, later on, were made circular, since (probably) the round shape was easier to transport (the original name of *rai* did not change).

Being such a rare commodity, so difficult to quarry, carve and transport, the stones had a great value and soon became currency on Yap, following a similar process that gold had in the Mediterranean cultures of antiquity (Giménez, 2014). Their value, in actual fact, was not only material: *rai* was a currency that represented genuine labour, as it was mined and carved on Palau, carried hundreds of miles by outrigger canoes and 10-20 men were needed to move the largest ones (3-4 meters in diameter) on Uap island. Along the time, the monetary value of a specific stone was linked not only to its size and the quality of craftsmanship, but also to its history, being more valuable if many people died during the transportation, or a famous sailor carried it to Yap.

Next to these cultural-related factors of **(1) *production*** of the value of *rai* stones, also their **(2) *consumption*** process was deeply inserted in the **(closed) exchange system of the Yapese society**.[3] Since the stones were usually too heavy to move and high was the risk of damage, their value passed from one person to another simply by agreeing that the ownership was changed (the physical location of the *rai* did not matter) and the transaction was recorded through the oral history of the community. In other terms, the *consumption* of *rai* stones did *not* require any *physical circulation*, but was based on a shared history of ownership, by means of its oral transmission in the closed social space of Yap island. The social recognition of the stones value was so strong that even when a large *rai* accidentally sank to the sea floor, and was never seen again, everyone agreed that it still existed and could be transacted as genuine currency, even if not physically accessible to any party (while validly owned and transmitted by one member to another of the community).[4]

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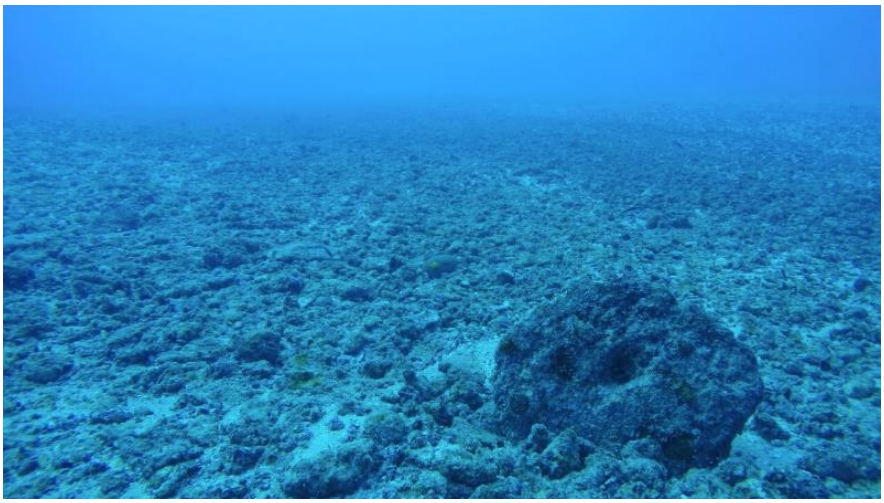
[3] For a brief anthropological depiction of the use of *rai* currency see Fitzpatrick and Pinkowski (2004).

[4] Furness (1910) reports in his book what his faithful old friend, Fatumak, a local native, narrated to him, "that there was in the village near-by a family whose wealth was unquestioned, - acknowledged by every one – and yet no one, not even the family itself, had ever laid eye or hand on this wealth; it consisted of an enormous *fei* [i.e. *rai*], whereof the size is known only by tradition; for the past two or three generations it had been, and at that very time it was lying at the bottom of the sea! Many years ago an ancestor of this family, on an expedition after *fei*, secured this remarkably large and exceedingly valuable stone, which was placed on a raft to be towed homeward. A violent storm arose, and the party, to save their lives, were obliged to cut the raft adrift, and the stone sank out of sight. When they reached home, they all testified that the *fei* was of magnificent proportions and of extraordinary quality, and that it was lost through no fault of the owner. Thereupon it was universally conceded in their simple faith that the mere accident of its loss overboard was too trifling to mention, and that a few hundred feet of water off shore ought not to affect its marketable value, since it was all chipped out in proper form. The purchasing power of that stone remains, therefore, as valid as it were leaning visibly against the side of the owner's house."

Chief Magistrate Anghel Gargog in costume wearing basket near two coral money discs, 1962
(Photographer: Roy H. Goss. National Anthropological Archives, Smithsonian Instit., Washington, D.C.;
picture taken from Mangan's personal website)



Mangan, N., *Limits to Growth*, 2016, video still (picture taken from http://www.the8thclimate.org/)

Mangan's artwork *Limits to Growth* makes visible the conceptual interdependence between *rai* and *bitcoins* as media of exchange where (physical) matter (i.e. stone) and (immaterial) energy (i.e. the electricity used to power the ASIC miners) **produce** monetary value, whose **consumption** transforms the latter into a representation of the former (in the installation the value of *bitcoin* is used to print indexed large photographs of *rai* stones), in a process of **cultural translation** that explores the interrelation between **shared social norms** (where a **legal dimension** is present) and the recognition of **economic power** within a given community (the Yapese community and the one of *bitcoin* users, hence the community of contemporary global markets). In addition to this, the story of *rai* stones explored by Mangan may give further insights into processes of **cultural encounters** in the form of

- **(3) circulation** and
- **(4) (re-)formulation** of (monetary) **values** (i.e. **meaning**).

2.2. *Yap money and the (new) world: two striking events of value* circulation *and* re-evaluation *in a cross-cultural context, and the role of foreign norms affecting closed social systems*

There are two remarkable events (apart from their unique way of production and consumption within the Yapese society) that belong to the story of *rai* stones, and are highly significant for this research project, as inspired within the conceptual frame of Mangan's *Limits to Growth*.

Both events can be described as examples of **cross-cultural (3) circulation and (4) re-formulation of value** (i.e. re-evaluation) that occur when a closed exchange system enters into contact with others that are validated by **different norms** in an **open exchange environment,** affected either by the impact of new technology or the re-assertion of 'local values'.

(i) The first event (1871) witnessed a **value re-formulation** due to practices of **extra-cultural circulation**: "foreign norms" of value *production* replaced local ones, hence *consuming* the "value" (i.e. meaning) of "new" *ray* stones which were not recognized comparable to the "original" local ones.

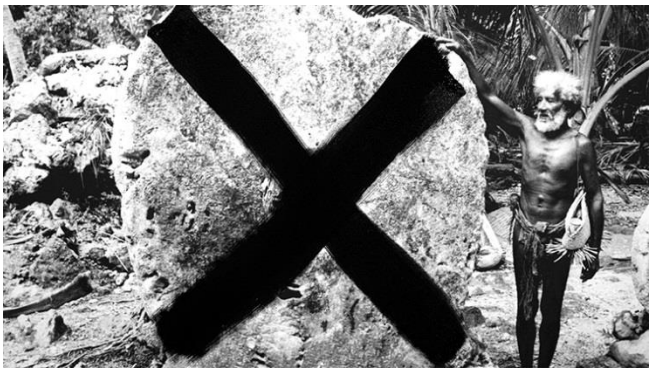
It was the forces of nature rather than self-determination that caused a collision between the new world and the self-contained Yapese culture. It was a typhoon, or so it's said, that threw up a desolate and desperate Captain David O'Keefe onto the island of Yap in 1871. O'Keefe had taken to the seas to establish himself as a trader… [of copra, dried coconut meat, which was valuable export in the Far East], [but] his new world money had no exchange value within their stone currency.

A baffled and frustrated O'Keefe departed Yap to Hong Kong on a passing steamer empty-handed only to return with a Chinese junk ship and a large supply of modern iron hand tools; if the Yapese wouldn't accept his form of coinage then he would insert himself into the cycle of their own currency. However O'Keefe was not "buying" or "selling" with the stones. Instead he facilitated an infrastructure introducing the wholesale trade in transporting Rai, which he rendered in exchange for marketable goods, such as copra (Mangan, 2016b).[5]

The relative ease of excavation and shipping of "new" *rai* stones (*produced* through "foreign" norms, the iron tools) altered the economy of Yap, a form of inflation set in and *consumed* their value. Coming back to *Limits of Growth*, this is "an important concept that Bitcoins share with stone money of Yap: Bitcoins have a cap on the production of money to avoid inflation" (Giménez, 2014).

(ii) The second event (1898), in reverse, occurred in the form of a **re-evaluation** through **intra-cultural circulation** of Yap money: "locals norms" of *consumption* were applied to (*re-*) *produce* the value (i.e. meaning) of *ray* stones to the advantage of "foreign actors." The case, reported by Furness (1910), occurred when the German Government assumed the ownership of the Caroline Islands, after their purchase from Spain, and the new rulers decided to pave them, demanding the Yapese to repair their roads and put them in good order. But the roughly dressed blocks of coral were, however, quite good enough for the bare feet of the natives; and many were the repetitions of the command, which still remained unheeded. At last, by a happy thought, the fine was exacted by sending a man… throughout the disobedient districts, where he simply marked a certain number of the most valuable *fei* [i.e. *rai*] with a cross in black paint to show that the stones were claimed by the government. This instantly worked like a charm; the people, thus dolefully impoverished, turned to and repaired the highways to such good effect from one end of the island to the other, that they are now like park drives. Then the government dispatched its agents and erased the crosses. Presto! The fine was paid, and the happy… [people] resumed possession of their capital stock, and rolled in wealth (Furness, 1910).

[5] It should be mentioned here that in 1954 the adventure of Captain David O'Keefe on Yap island also became the subject of a film directed by Byron Haskin and starring Burt Lancaster, under the title *His Majesty O'Keefe*.



Mangan, N., *Limits to Growth* (2016/17), video still
(Photograph: Roy H. Goss, National Anthropological Archives, Smithsonian Institute, Washington, DC)

One may comment on this case and the immediate reaction could be "How silly. How can be people so illogical?" Indeed, after raising this question in a paper having the same title of Furness' book *The Island of Stone Money*, Milton Friedman turns to the understanding of (and the sympathy for) the "innocent people of Yap" (1991, p. 3) by equating the monetary role of the stone money to the U.S. reserves of gold held in Fort Knox for foreign governments, when in 1932-33 the Bank of France feared that the U.S. would not stick to the gold standard and consequently asked the Federal Reserve Bank of New York to covert U.S. dollar assets that it had there into (material) gold.

To avoid the necessity of shipping the gold across the ocean, it requested the Federal Reserve Bank simply to store the gold on the Bank of France's account. In response, officials of the Federal Reserve Bank went to their gold vault, put in separate drawers the correct amount of gold ingots, and put a label or mark on those drawers indicating that they were the property of the French – for all it matters they could have done so by marking them "with a cross in black paint" just as the Germans did to the stones (Friedman, 1991, pp. 3-4).

Friedman significantly concludes his paper with the following observations.

The Yap Islanders regarded stones quarried and shaped on a distant island and brought to their own as the concrete manifestation of wealth. For a century and more, the "civilized" world regarded as a concrete manifestation of its wealth metal dug from deep in the ground, refined at great labor, and transported great distances to be buried again in elaborate vaults deep in the ground. Is the one practice really more rational than the other?

What both examples – and numerous additional ones that could be listed – illustrate is how important "myth," unquestioned belief, is in monetary matters. Our own money, the money we have grown up with, the system under which it is controlled, these appear "real" and "rational" to us. The money of other countries often seems to us like paper or worthless metal, even when the purchasing power of individual units is high (Friedman, 1991, pp. 4-5).

3. Part II – Digital currencies and payment services in EU law

From a normative standpoint, the European Union is fertile and interesting terrain for the experimental innovation of means of payment and settlement[6]. Since the beginning of 2000, within – and beyond – the Eurozone[7], the Union has been developing a regulatory process in readiness for the "electronification" of payments, "**electronification**" being the «migration towards the provision of payment services on a fully electronic and highly automated basis» with a view to using the information and telecommunication technology to make the entire payment process fully automated, since the inception, when the payment order is issued (European Central Bank, 2003).

3.1. The "electronification" of the payment and settlement process

The "electronification" of retail payments is seen as a policy tool for the construction of an internal market: the "internal market" is an «*area without internal frontiers in which the free movement of goods, persons, services and capital is ensured in accordance with the provisions of the Treaties*» (art. 26.2, *Treaty on Functioning of the European Union* or TFEU).

To build up an "**internal market**" for payments, the EU has developed a regulatory strategy to support the "electronification" process. This strategy takes the form of a positive harmonisation process aiming to broadly align the legislation of the EU countries in the area concerned[8].

(i) Harmonisation

Harmonisation process is predicated on regulatory action taken at Union level; it involves the European Commission, the European Parliament and the Council, as well as one or more of the European Supervisory Authorities. It is consists of non-binding (or soft) rules and compulsory legislation (such as directives and regulations) and ultimately complies with the principle of neutrality in relation to technological business models.

However, harmonisation varies in degree according to the allocation of jurisdiction between the Member States and the Union itself. The European Union does not always enjoy exclusive regulatory authority, depending on the area concerned: the construction of an internal market for payments - and, therefore, the electronification of the payment and settlement process – is one of the regulatory powers shared between the Union and the Member States[9].

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[6] The European Union (EU) is an international organization, to whom the Member States have transferred elements of their sovereignty; it enjoys its own jurisdiction. It is actually based on the Treaty on European Union (TEU) and the Treaty on the Functioning of European Union (TFEU), which establish the powers of the Union, its objectives, institutional organization, and the legislative process (namely which European institutions are involved and in what way). This means that the EU is also a community of law: the Union and its institutions are entitled to make laws or rules according to the principle of conferral, pursuant to Article 5.1 TEU, «*the Union shall act only within the limits of the competences conferred upon it by the Member States in the Treaties to attain the objectives set out therein*».

[7] The countries of the European Union sharing the same currency – the euro – form the Eurozone, but the Eurozone does not represent an international organization as the European Union does.

[8] We can draw a distinction between positive and negative harmonization processes. Positive harmonization broadly aligns the rules and regulations of the various members of the Union, providing common Community-based rules, so they are established through the ordinary legislation process (art. 114 TFEU).
On the other hand, the negative harmonization process is grounded on the proceedings of the European Court of Justice, which is also responsible for ascertaining whether national administrative or legislative provisions comply with the European Treaty rules or, conversely, may hinder fulfillment of the principles of the European Treaties, especially the free movement of persons, goods, services, capital and payments.

[9] As the construction of a "internal market" is one of the areas of responsibility shared with the Member States, the Union has the power to undertake initiatives (e.g., drafting a directive or regulation) provided this initiative complies with two leading principles, namely the principles of subsidiarity and proportionality.
The principle of subsidiarity provides that «*in areas which do not fall within its exclusive competence, the Union shall act only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States, either at central level or at regional and local level, but can rather, by reason of the scale or effects of the proposed action, be better achieved at Union level*» (art. 5. 3 TEU); in turn, the principle of

This aspect, together with being a market exhibiting strong two-sided and positive externalities, may explain why the "electronification" of payments in Europe seems to be a slow process, fraught with vicissitudes. In other words, the process of harmonising the electronification of payments began early, around the turn of the 80s, with the Commission issuing communications and recommendations on electronic payments and electronic money, setting out non-binding rules. The process continued in the second half of the 90s, establishing hard law rules through directives and regulations.

There was an initial normative phase in which the Union mostly approved directives to achieve a minimum level of harmonisation: this meant that individual EU countries had great leeway in the transposition of directives within their national legal systems, as the European directives set a bare minimum level of regulation, leaving national governments free to enforce tougher rules. Later on, in the second phase, the Union progressed from a minimum harmonisation to a full harmonisation approach, approving directives leaving small or no room for movement to the Member States in the implementation process, in addition to approving European regulations, which are *per se* directly applicable in the Member States.

The "electronification" of payments is rooted in a broad EU-based normative framework, applying to all the countries in the Union and is , mostly based on a full harmonisation approach, covering payment service providers and conditions for access to the relevant market, as well as the payment service contract and alternative dispute resolution mechanisms, (payment) data protection rules, etc.

The 2015 Payment Service Directive excluded from the field of regulation all paper cheques, governed by the 1931 Geneva Convention and any comparable paper-based commercial instruments, including all bills of exchange, promissory notes and other such instruments falling within merchant law that cannot be fully digitalized (i.e., from the beginning, when the payment order is issued to the end, when the payment order is settled).

Anything not "digital" does not belong to the future of payment within the European Union, despite still belonging to the civil law tradition and practice of several EU countries.

(ii) Leading objectives

At European Union level, the legal framework would prefer to address the payment service contract between a payment service user (creditor or debtor of a sum of money) and a payment service provider rather than cover monetary obligations directly, i.e., an obligation with a sum of money as its object.

This normative framework is far from straightforward: it is true that there is no definition of money and no statute for monetary obligation *per se*, but both are indirectly influenced by the framework of the payment service contract. In the "electronification" process, **payment** is addressed as a **flow of information** either in a payment system or through a series of interoperable payment systems; the flow of information amounts to a payment service.

The EU-based legal framework for the "electronification" of payments, adhering to the policy priorities set out at the international level since the second half of the 80s, has promoted a **continuous, efficient, and safe flow of information,** where this flow (regarding the sum of money) amounts to a payment service (provided by the business entity to the debtor or the creditor of a sum of money). Where does the information flow to? In a **payment system or in mutually interoperable payment systems**, where the **payment system** is a contract-based network it is defined as a «*funds transfer system with formal and standardised arrangements and common rules for the processing, clearing and/or settlement of payment transactions*» (art. 7, n. 4, PSD2). Therefore, each payment system consists of a matchmaker providing the common technical and regulatory standards, enabling the payment service providers to communicate with each other, and

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proportionality establishes that «*the content and form of Union action shall not exceed what is necessary to achieve the objectives of the Treaties*» (art. 5.4 TEU).

there are often settlement services and payment service providers providing the payment services. At the base of this payment network are the payment service users, debtors and creditors.

Here, there are some examples to give an idea of the EU-based legal framework supporting the continuous, efficient, safe flowing of information/funds:

- the European directives on late payments in business-to-business transactions provide that the creditor is automatically entitled to interest for late payment when: «*(a) the creditor has fulfilled its contractual and legal obligations; and (b) the creditor has not received the amount due on time, unless the debtor is not responsible for the delay*» (art. 3, directive 2011/7/UE); the same rationale underlies the settlement finality directive providing that «*transfer orders and netting shall be legally enforceable and binding on third parties even in the event of insolvency proceedings against a participant, provided that transfer orders were entered into the system before the moment of opening of such insolvency proceedings*»[10]; both of them, in different ways, are conducive to a **continuous flow of information** from one node to another of the payment system or interconnected payment systems;

- the 2007 and 2015 Payment Service Directives set out a new, slimmer, business model – namely, the hybrid or pure payment institutions – with a view to spurring non-banking or non-financial operators to enter the relevant market (especially the Internet service operators): this business model enjoys lower levels of capital and own funds, applying a risk-based approach[11]; again the Payment Service Directives focus on a pro-competitive role for information before entering a payment service contract in order to foster stiff competition among service providers; in both cases, the European legal framework aims to improve **competition** in the internal market with a view to increasing the **efficiency level** of payment systems (and the flow of information);

- the 2007 and 2015 Payment Service Directives make the payment service providers liable for late, unauthorized, or incorrectly executed payment operations; in addition, the directives mentioned above allow a business entity to enter the relevant market as long as it is provided with a tailor-made license; in the end, the central banks (or other competent authorities) of EU countries are empowered to supervise the financial stability of (non-banking) payment service providers for the duration of their lifetime; all such directive provisions and many others are committed to making the payment system **safe and affordable**, supporting the users' trust in the electronification process.

Ultimately, the European regulatory strategy for the "electronification" of payment and settlement processes prioritizes a continuous, efficient, and safe flow of information right through the payment systems. This may be conducive to building trust in the construction of a European digital market for goods and services as well as easing the building up of a capital market Union, but is this strategy sufficient to allow the Union to overcome *The Limits to growth*?

3.2. Digital currencies and the EU legal framework

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[10] According to the European Settlement Directive, a "transfer order" is «*any instruction by a participant to place at the disposal of a recipient an amount of money by means of a book entry on the accounts of a credit institution, a central bank, a central counterparty or a settlement agent, or any instruction which results in the assumption or discharge of a payment obligation as defined by the rules of the system*»; where a "participant" is a network node or, in other words, «*an institution, a central counterparty, a settlement agent, a clearing house or a system operator*».

[11] The new business model concerns "payment institutions". These are financial intermediaries other than credit institutions, specialized in providing payment services. The capital ratios and the own funds thresholds applied to payment institutions are strictly proportionate to the level of risk raised by the activities, i.e. the payment services, to be performed.

Harmonisation does not cover virtual currencies[12]: the European policymakers have opted for a "wait and see" approach.

In 2012, the ECB defined them as «a type of unregulated, digital money, which is issued and usually controlled by its developers, and used and accepted among the member of a specific virtual community» (European Central Bank, 2012) arguing that such products neither pose, at least in the short-to-medium term, a risk for price stability nor influence the velocity of money flow. The ECB therefore suggested monitoring the interaction between virtual currencies and the real world without taking regulatory action.

When, three years later, the European Central Bank released a new study on the subject in question, there was no change to the regulatory approach, but emphasis was lain on the importance of ensuring that VCSs are not used for illegal purposes. This concern especially involved VCSs that can be converted into currencies, which are to be monitored carefully as they may become a threat to financial stability because of their global reach, their accessibility through the Internet, and greater anonymity (ECB, 2015).

Therefore, expressing an opinion on the 5th anti-money laundering directive proposal, the European Central Bank took an active role in extending the scope of the directive to cover exchanges and wallet providers handling virtual currency schemes, with a view to avoiding anonymous transfers into fiat currencies.

Indeed, the final version of the AML directive (directive n. 843/2018/EU) amended the list of "obliged entities" adding the «*providers engaged in exchange services between virtual currencies and fiat currencies*» and the «*custodian wallet providers*»[13]. Both must be registered, and they must set-up and maintain a central database registering users' identities and wallet addresses accessible to Financial Intelligence Units (FIUs), and they must also provide self-declaration forms for the use of virtual currency users.

However, it is very difficult to establish, for now, the potential impact of virtual currencies on the goal of a sustainable European Union growth because there are too many uncertainties on the legal nature of virtual currencies. What are they in legal terms?

In 2015, the Court of Justice of the European Union treated virtual currencies as private currencies "comparable" to fiat currencies, exempting transactions using virtual currencies from VAT. In this preliminary ruling (Case C-264/14), the Court argued that It is commonly accepted that the 'bitcoin' virtual currency is «neither a security conferring a property right nor a security of a comparable nature», but constitutes «non-traditional currencies, that is to say, currencies other than those that are legal tender in one or more countries, in so far as those currencies have been accepted by the parties to a transaction as an alternative to legal tender and have no purpose other than to be a means of payment, are financial transactions».

There is no uniform approach to the qualification definition of virtual currencies either by scholars or by supervisory authorities. In legal scholarship, virtual currencies are treated as commodity-based money, intangibles, or financial instruments (Vardi, 2016; Nabilou – Prum, forthcoming; Hacker – Thomale, 2018); while several central banks and supervisory authorities argue that virtual currencies, especially those similar to bitcoins, are neither legal currencies nor financial instruments (ECB, 2015)[14].

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[12] The terms "virtual currency" or "virtual currency schemes" cover «digital entities, neither issued nor regulated or monitored by any public authority like central bank or private institution like banks or electronic money institutions (EMI). They are not money in the usual regulated form of legal tender, banking money or electronic money, but they act as accepted money by participants in their specific schemes» (Bonaiuti, 2016).

[13] The 5th AML directive states that "virtual currencies" means a «*digital representation of value that is not issued or guaranteed by a central bank or a public authority, is not necessarily attached to a legally established currency and does not possess a legal status of currency or money, but is accepted by natural or legal persons as a means of exchange and which can be transferred, stored and traded electronically*» while the term "custodian wallet provider" includes any entities that provide «*services to safeguard private cryptographic keys on behalf of its customers, to hold, store and transfer virtual currencies*».

[14] An interesting example of divergencies is provided by Germany. While the German Ministry of Finance has stated that it regards bitcoins as a unit of account, the financial supervisor «added that units of account (such

One of the main obstacles to qualifying bitcoins as currency is that they cannot act as a reserve of value and, consequently, cannot properly act as a unit of account.

In legal terms, virtual currencies, like bitcoins, challenge the nominalistic principle whereby «if a debtor extinguishes his debt through payment of money issued by the State for a quantity that nominally corresponds to the sum of money for which the debt was contracted, he pays good money and must accordingly be discharged» (Vardi, 2011).

This principle is theoretically based on the State theory of money, but it is still valid and applied, save forprovided there is no change in the role performed by the State (or the public authority). Indeed, instead of issuing coins and notes as chattels, the State exercises monetary sovereignty, preserving monetary stability of the currency (in which the payment is denominated) and, as such, allows money to perform the functions of reserve of value and unit of account. The **nominalistic principle** is enshrined in the European Treaties and applied to countries joining the Eurozone, but it represents a common heritage shared by all Member States.

Virtual currencies are a decentralized, bi-directional means of exchange, representing the latest development on the money market, but can they help fill the inequality gap and overcome *The Limits to growth*?

3.3. Negotiability and *The Limits to growth*

Taking into due consideration the European legal framework set up to support the "electronification" of the payment and settlement process, establishing a continuous, efficient and safe flow of information, or better, of funds, may be of support to the capital market and the growth of digital business transactions at both business-to-business and consumer-to-business levels.

In turn, virtual currencies mostly fall outside the scope of European harmonisation. Virtual currencies establish both centralised and decentralised payment networks, which, at best, may support the development of the digital market and increase competition against conventional payment systems on the market, stimulating improvement in terms of efficiency.

However, the analysis of the European legal framework from the point of view of competition law shows that the bottleneck of this market is credit access, overdraft[15] conditions, and a shortage of funds to make payments.

From the Commission's investigation and the Court of Justice case law, it emerges that current or payment accounts have a tying effect because they are at the crossroads between the access to credit and the operation of payment operations. The market for overdrafts is distinct from, but closely connected to, the market for payment services. What can be done to improve the overdraft market?

Several years ago, furthermore, the same type of market was considered a grey area from the competition point of view in the 2000 Cruickshank Report, which stated that the price of an overdraft does not drive the choice of current account. The Office of Fair Trading reached almost the same conclusions in 2013 (OFT, 2013), while the same Office recently tried to claim its own stake in terms of overdraft fees (see: High Court of Justice, OFT vs Abbey National and 7 others, 2008 [EWHC] 875 Com).

Analysis of the legal framework regulating competition raises questions among legal scholars concerning how the "electronification" of payment and settlement may affect overdraft cost or credit extension in relations to payment accounts. Negotiability may meet this demand to some extent.

Negotiability is not simply the ability to transfer a credit to a still outstanding sum of money: it also refers to «the rules that permit a bona fide holder to take an instrument free from all claims

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as Bitcoin, IMF special drawing rights, regional currencies, etc.) that are not legal tender do qualify as financial instruments» (ECB, 2015).

[15] «If a customer draws on an account which has inadequate funds, it is regarded as beinga request to the bank for an overdraft» (Wadsley – Penn, 2000).

to it and free from most defences that the parties obligated on it might have had in the underlying transaction for which the instrument was given» (Rogers, 1995).

Apart from the legal technicalities, negotiability allows credit on a sum of money to circulate safely, filling the liquidity gaps of a number of debtors, who end up enjoying a certain degree of credit extension in order to make a payment, based upon existing and potential financial resources.

Negotiability reminds us of the importance of a mechanism like the mutual credit system, working in complementary currency systems such as Sardex, which is not replaced by the *electronification* or *digitalisation* of currencies.

III- Concluding remarks

The "privatisation" of money represents a long-standing process; it is based on technological innovation, changing from time to time. In the case of the story of *rai* stones, the impact of the technology through the intervention of a "private actor" (captain O'Keefe) had a negative effect on the local economy of Yap – though 'multiplying' the (nominal) availability of money (Part I). Regarding the European Union (Part II), in the past there were the bank deposits, while at present there are, among other things, the virtual currencies and alike: the electronification of money is opening new frontiers for the payment system, but the impact on the availability of credit instruments is still uncertain

In this light, apart from the feeling of pretty euphoria for the new frontiers of the "electronification" process, the recent financial and sovereign debt crisis on the one side and the sustainable development goals, on the other side, remind us that paper, virtual or digital money «itself cannot have inherent value as a substance. Whatever it represents must be the basis of a social agreement» (Mellor, 2010).

The link that this paper has made between the story of the ancient *rai* stones in relation to contemporary *bitcoins* (as represented in the art installation by Mangan) and the process of electronification (as regulated by the European Union) may provide useful interpretive tools to consider how much "technological value" cannot substitute the "substantive value" of social agreement and so the role of the community to determine how money affects growth. In other terms, how the *Limits to Growth* are necessarily connected to social policies aimed at locating the value of money in a market functioning through the participation of all the economic actors.

In this direction, the issues of negotiability and financial inclusion also remind us that "bona fides", that is to say "mutual trust" in monetary exchanges, is never created by technology but grounded on shared social value. And that, to guarantee, preserve and supervise the dynamics of this shared social value in a global economy (where stones, coin or paper money are substituted by digital money) represents a challenge that regulators have still to face in its entirety.

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[i] Gabriella Gimigliano has authored Part III and Valentino Cattelan Part II, while they have co-authored the Introduction and the Concluding remarks.