

Big Bits and Small States: Examining Reasons for Variation in
Cryptocurrency Regulation in Europe



Alex Rathod

S1425978

MA International Relations: European Union Studies

Supervised by Dr Vera Scepanovic

Leiden University

July 2018

Words: 14,999

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Abstract

The advent of cryptocurrencies is the latest evolution in the marriage of monetary systems and technology, at its heart being digital assets; the oldest and most well-known of these is bitcoin. The subject of cryptocurrencies has proved extremely divisive, from those who believe they will ultimately replace national currencies to those who see them as a digital incarnation of an anachronistic system like the gold standard. These divisive opinions have manifested themselves through government regulatory approaches as well, with some governments seeking outright bans on cryptocurrencies within their borders. Some generally smaller states however, are pursuing establishment of flexible and progressive regulatory frameworks, seeking to become financial technology hubs for cryptocurrency development and trade. This thesis explores why these progressive regulatory responses to cryptocurrencies are being pursued by certain European 'crypto-friendly' states, and use both a case study and international relations theory - namely small state theory as developed by Peter Katzenstein in his seminal work 'Small States in World Markets' (1985) - in an attempt to understand why these differences exist.

Introduction

With even just a peripheral awareness of the mainstream news in 2017, one can have hardly failed to notice that the subject of *bitcoin* has been increasingly-present amongst the headlines. The year bore witness to a meteoric rise in value of the digital currency, as it began transitioning from being the concern of a distinct subset of computer science and programming experts, into the mainstream. To describe the rise of the digital asset as meteoric is not to overstate it; between January

1st, 2017 and January 1st, 2018, the US dollar value of one *bitcoin* rose from \$985 to \$15,527, a rise of more than 1,300%¹.

Bitcoin is just one of a huge raft of digital currencies traded on the internet and is not alone in having made extraordinary gains in value in an extremely short time period; *ethereum*, the digital asset often dubbed ‘silver’ to *bitcoin*’s ‘gold’, saw gains of more than 9,000% in 2017. *Litecoin*, a derivative of the same algorithm behind *bitcoin*, rose by over 5,000%, whilst other, more obscure ‘alt-coins’ such as *ripple* and *NEM* had gains in value of 36,018% and 29,842% in 2017 respectively². To put this in perspective, \$100, invested in *ripple* in January 2017 would have yielded a real return of over \$35,000 in January 2018. These are no small sums; the total market capitalisation for the cryptocurrencies in the last quarter of 2017 (and in December 2017, there were more than 1,300 registered for trade on CoinMarketCap.com) was over six-hundred billion dollars (Coindesk 2018).

Cryptocurrency’s explosion has been in large part propelled by a boom in *initial coin offerings* (ICOs), in essence a novel way of crowdfunding for project development by innovative tech start-ups. Similar in many ways to an *initial public offering* (IPO) on the stock market, ICOs can attract vast amounts of capital to projects in a short amount of time by selling their own cryptocurrencies to speculative investors. The rapid rise in value and awareness of cryptocurrency and ICOs through 2017 has left something of a regulatory void in most legal systems because it represents an entirely new category of asset, and ICOs a new category fundraising. Their nature means they do not simply fit into existing legal frameworks because of, for example, issues of ownership and jurisdiction; jurisdiction of digital objects is notoriously difficult to argue in legal terms and just as with many other digital products, one cannot touch a *bitcoin*, nor trace its location to a specific place. In many cases, this legal ambiguity is being addressed by the extension of existing laws pertaining to tax and prevention of criminal activity, to cover cryptocurrency as well. In the United States, this has meant the extension of *know your customer* (KYC) laws to now cover *bitcoin* transactions as well (Conley 2017). Similarly, in the European Union, this can be seen in the extension of the ‘Anti-

¹ For a full table of figures, see Figure 1, appendix.

² See Figure 2, appendix.

Money Laundering' directive (AMLD) of which a 2016 amendment is to be implemented in 2018, which requires the identities of owners of cryptocurrency exchange accounts in Europe to be present and accessible to authorities should it be required (European Commission 2016).

But not all government responses are equal in their approach to cryptocurrency; the appetite for regulation varies hugely globally. China, whose domestic exchanges previously accounted for as much as 90% of *bitcoin's* trade volume globally, has sought an ever-tougher stance on cryptocurrencies through rigorous regulation, taking steps throughout 2017 designed to make trading and mining in China more difficult (Weese 2017). South Korea and Russia have both also sought to increase government control over cryptocurrency usage. Meanwhile some countries have moved in the opposite direction: Japan, in a landmark move in April 2017, passed laws recognising *bitcoin* as a legal form of payment within the country. It has also introduced blockchain-based protocols³ into many government systems (Nikkei inc 2017) . Singapore, similarly has experimented with virtual currency technologies; the Monetary Authority of Singapore announced in 2017 that it had been trialling a tokenised version of the Singapore dollar on a private blockchain with positive results⁴. Venezuela meanwhile launched its own cryptocurrency, *Petro* in 2018.

Within Europe too, there have been greatly varying responses from governments. Despite the aforementioned amendment to the AMLD, there still exists virtually no EU level regulation which refers to cryptocurrency and, at the time of writing, there exists no regulation which specifically targets cryptocurrencies within the EU. In its absence, member states have taken it upon themselves to pursue their own measures over the new policy area. Germany has called for global regulation of the digital currency space following the publication of Chinese plans to enforce limitations on the trading of digital currencies (Gaunt 2018). France has commissioned a working group headed by Jean-Pierre Landau, the former deputy-governor of the Bank of France, tasked with development of national cryptocurrency regulations in order to minimise risks caused by speculation (Sundararajan 2018). The UK and Estonia have both announced research plans into launching their own domestic digital

³ Blockchain, the technology upon which the *bitcoin* network runs, is further discussed in section 2.1.

⁴ For the full report, see (Monetary Authority of Singapore et al. 2017).

currencies, pegged to sterling and the euro respectively (Thorpe 2018; Teffer 2017). Switzerland meanwhile, has actively pursued business-friendly regulation to attract financial technology firms to its territory, creating ‘regulatory sandboxes’ for digital currency start-ups, in which young enterprises can test new technologies with the freedom of a low-regulatory environment (The Federal Council of Switzerland 2016). The Swiss city of Zug is widely known by the epithet, ‘*Crypto-Valley*’, due to the high number of financial technology firms located there.

But the question arises of how the variation in government responses to cryptocurrency can be understood; why is this phenomenon drawing such mixed reactions from states? There are doubtless many potential reasons for why governments may take different stances regarding cryptocurrencies. The market’s notorious volatility, which has seen price swings of over 30% in 24-hour periods on multiple occasions has drawn strong criticism from many in both the public and private sector. Jamie Dimon, CEO of JP Morgan Chase infamously referred to *bitcoin* as ‘a fraud’ and ‘worse than tulip bulbs’ (Son, Levitt and Louis 2017) and Charlie Munger, vice-chairman of Berkshire Hathaway described *bitcoin* as a ‘noxious poison’ which governments need to ‘step on ... hard’ (La Roche 2018). Other critics cite the technology’s lack of tangibility and unpredictability as reasons for scepticism. Conversely, others wish to create attractive legal environments in order to draw in investor capital and which can foster technological development and growth, so that the technology may become more stable and diversify use cases.

Nevertheless, through the stark variation in approaches from European states, a potential trend seems to emerge in that it is generally a number of Europe’s smaller states which seem to be taking the lead in creating ‘crypto-friendly’ regulatory environments. Larger states such as the UK, France and Germany have not issued any notable regulation which directly concerns cryptocurrencies; this is not to say that they have therefore been regulated against, but rather there has been no active regulating at all. Active construction of a regulatory environment has rather come from countries, often peripheral to larger economic centres. These include, Estonia, Belarus, Slovenia, Gibraltar, Malta and Switzerland. All of these nations have shown evidence that they are pursuing creating a regulatory environment which makes doing business with cryptocurrencies easier. The concept of the

small state is a notion which has a wealth of literature behind it in the field of international relations. Among other things, small states have been identified to behave in different ways to larger ones; historically, they have had to explore creative areas for investment which get around the handicaps of having a small workforce or low natural resource endowment (Vital 1967). Larger states often need to satisfy a greater variety of interest groups within a larger bureaucracy, making adoption of new laws cumbersome.

In light of these varying levels of regulation, in correlation with the apparent smallness of states, the question of why these states pursue more stringent regulations than larger ones is clearly a relevant enquiry. The reasons for this may be numerous and this paper certainly cannot go into all of them. It will however examine existing regulatory stances by using a case study and looking through the lens of small state theory in attempt to discover if they are able to offer an explanation as to why these variations exist. With this in mind, this paper will attempt to answer the research question:

‘Why are small European states more likely to perceive cryptocurrencies as an opportunity for economic growth than larger ones?’

1.0 – Methodology

The remainder of this paper will unfold over several steps. Firstly, there will be an expansion on the topic of cryptocurrency, where some context will be provided and relevant aspects of cryptocurrencies and ICOs discussed, with analysis of the opportunities and challenges facing regulators within this new field. Secondly, the list of ‘crypto-friendly’ states will be examined in more detail through exploration of what exactly makes them ‘crypto-friendly’ in terms of policy goals which they are pursuing.

Thirdly, small state theory will be assessed. This theory as presented in Peter Katzenstein’s, *Small States in World Markets* (1985) has formed much of the basis of this research. Katzenstein’s

work has been chosen because of its significance within the broad field of international relations⁵ and also because it lends itself for comparison: as Katzenstein discussed small European states and their relationships in world markets, this paper shall investigate how far his findings hold true for small European states in cryptocurrency markets. Fourthly, a case study on Estonia will be conducted in order to test how far the country's cryptocurrency stance can be explained by characteristics attributed by small state theory. Finally, concluding remarks will be made.

2.0 – Cryptocurrencies and ICOs: Opportunities and Challenges

This section will provide an outline of the subject matter, namely cryptocurrencies and ICOs, and the regulatory challenges they present. For states of all sizes, there are a number of challenges which are held in common when attempting to legislate for this novel field. Through this section, it should become clear what a positive stance toward cryptocurrencies and ICOs entails, as the hurdles which must be overcome are identified. Regulators have faced numerous challenges vis-à-vis regulating cryptocurrencies from issues of jurisdiction to taxation. Through these factors, it is clear that cryptocurrencies present a great challenge to regulators because of their novelty. In some sense this is obvious: they are the first asset in history which is entirely digital, which sets them in a completely new paradigm to which new rules apply. This requires new frameworks to be constructed and any effective regulatory framework must target three broad areas:

1. *The technology on which cryptocurrencies run*
2. *The unique nature of cryptocurrencies themselves*
3. *The practice of ICOs*

⁵ Mark Blyth (2012) cites it as one of the three foundational texts within the field of political economy, along with, Peter Gourevitch's *Politics in Hard Times* (1986) and Peter Hall's *Governing the Economy* (1986).

Each of these areas will be explored and challenges for each area will be highlighted. In order to better inform one's understanding of the analysis, it is worth acknowledging the great deal of variation and inconsistency with terminology in this emerging field of research⁶. Cryptocurrency is often described in terms which mirror established monetary and exchange systems which exist today; one hears these novel digital assets described using everyday vocabulary like, 'coin', 'currency' and, 'wallet'. Linguistic choice and variation in explanation and publications reflects a variety of contributing factors, from the discipline in which the author has been trained, their personal biases, to the purpose of the text being produced. Walch (2017) highlights a number of motivating factors behind language choice in the cryptocurrency space, including the desire to attract capital to projects, as well as *word taint*⁷. Despite the fact that cross-mixing of semantic fields is largely unavoidable with any new technology (and by no means problematic in itself), every effort for specificity and consistency must be made, so as much clarity as possible is maintained in this extremely young area of research. With this in mind, this section will aim to provide clarity of definition of key terms as well as analysis.

2.1 – The Technology on which Cryptocurrencies Run

Blockchain is the technology behind cryptocurrencies; the network on which they run, which first found application as the platform on which *bitcoin* was launched. It is, at its heart, a record of all transactions which have ever taken place on its network (Nakamoto 2008). Filippi and Wright describe it as 'a chronological database of transactions recorded by a network of computers.' (Wright and Filippi 2015). What makes it so compelling, is that this database is *highly* tamper-resistant; indeed, provable accuracy forms the basis of the technology's significance and appeal (Werbach

⁶ See Angela Walch's, '*The Path of the Blockchain Lexicon (and the Law)*' (2017) for a full exploration of this subject.

⁷ Word taint refers to the pejoration of certain terms; the term cryptocurrency itself, is highlighted as one which has become associated with speculation and hype around bitcoin. 'Virtual currency' on the other hand is a more favoured label used by those wishing to sound more 'restrained and controlled' (Walch 2017).

2018). Whilst blockchain was created specifically as a platform for *bitcoin* to run on when it was launched in 2009, the technology has since been replicated innumerable times and today it serves as an integral part of, not only cryptocurrency networks, but also many other types of databases and record-keeping tools both in the private and public sector⁸.

The term, ‘blockchain’ – also widely referred to as ‘distributed ledger technology’ (DLT) – was first mentioned in the ‘*Bitcoin Whitepaper*’ (Nakamoto 2008), and derives its name from the nature in which information is recorded on the ledger. Blocks of recorded data⁹ are linked together in a chain, with specific coding connecting each block to the previous one in the chain; this creates a smooth and observable sequence of connectivity where each block in the chain contains the signature of the previous one recorded in it. The significance of this is that it is extremely difficult to alter any information once it is recorded, as this would create a disparity in the chronology of the code sequencing. The recording of the data is overseen automatically by *nodes*, which communicate with one another to verify the blockchain so far, and *miners* who are incentivised to approve transactions in exchange for payment, thereby adding blocks to the blockchain.

The mechanics of the blockchain’s system allow for its use-value – and therefore that of cryptocurrencies – to be theorised, which as Salzman (2016) and Liljeqvist (2018) state, can be identified as pertaining to five areas, which current financial infrastructure does not provide.

Provenance refers to the traceability of transactions; on the blockchain, this is entirely decentralised and trustless. This holds huge implications for transparency and accountability in the monetary system. *Consensus* refers to the way information is secured within the network. The fact that there is no central authority which oversees the network, but rather it is secured through consensus between the network’s nodes, means there is no central party’s interests which are being considered; this is a

⁸ Walmart, Maersk and British Airways are among those transnational corporations which have implemented blockchain technology to provide solutions to operating inefficiencies (Morris 2017; Nash 2018). The US state of West Virginia announced in March 2018, that it would be using blockchain technology to allow absentee voters to participate in the senate primary elections in May 2018 (State of West Virginia 2018).

⁹ In the case of the bitcoin blockchain, this data is bitcoin transactions, however applications can be myriad. British Airways for example apply it to prevent conflicting flight information appearing across their media; Walmart use it to track supply-chain data of fresh produce, in order to better be able to locate the origins of food which must be recalled (Nash 2018).

great increase in economic efficiency. The reliability of this consensus depends on network size; the larger the network, the more nodes in operation and therefore the greater the security of the network against malicious actors, who might seek to add alternative information to the blockchain. *Security and immutability* refers to the reliability of transaction history as well as the fact that information, once recorded, cannot be changed. This has huge implications for trust in transacting, removing the need for middlemen and third parties in many cases. It also ensures there is no danger of double-spending of funds and reduces possibilities for fraudulent behaviour. *Availability* refers to the fact that due to the decentralised nature of cryptocurrency networks, there is no way to shut them down; they are always available. Whereas with traditional digital infrastructure, where a server failure, or network maintenance may result in a loss of service, cryptocurrency networks like the *bitcoin* network are administered and stored simultaneously by its users, meaning that network disruption is almost impossible, as it would require all network users to disengage from it. *Finality* refers to the irreversibility of transactions; once a transaction is recorded on the blockchain, it cannot be reversed. The value of this attribute lies in the fact that parties who do not know or trust each other can nevertheless transact together. Smart contracts enable a simultaneous execution of transaction and both parties can rest assured in the fact that the transaction cannot be reversed in any way (Sklaroff 2017).

These qualities are at once what make blockchain so potentially revolutionary as well as problematic when constructing a regulatory framework. Whilst the opportunities it creates are numerous as it can be used to increase operational efficiency in virtually all operations which require any form of record-keeping, it can at the same time present compliance problems with the law. This is exemplified by its potential conflict with the EU General Data Protection Regulation (GDPR), as data which is stored on the blockchain is *immutable*. GDPR regulation stipulates any person's right to be forgotten must be respected by owners of databases. The inability to remove data from the blockchain as well as its decentralised nature (meaning that copies of the ledger and therefore the information it contains are in multiple locations across the network) present significant problems for regulators. Finck notes that this conflict serves to illustrate a clash of two normative objectives: protection of

fundamental rights and promotion of innovation which will sooner or later need to be resolved (Finck, Blockchains and Data 2017).

2.2 – The Unique Nature of Cryptocurrencies

Cryptocurrency refers to a broad range of coins and tokens which exist in the digital space; these are a new type of digitally-based asset class. Whilst *bitcoin* remains the most well-known, there are hundreds of others besides. Many are designed with specific use cases in mind and so the opportunities they present are manifold, potentially improving efficiency in many sectors of the economy. Cryptocurrencies can be argued as the logical extension of fiat for the digital age; the ultimate liberation from the opportunity costs of using material currencies to facilitate trade¹⁰. Whilst the capped total – and therefore deflationary quality¹¹ – of many cryptocurrencies may draw some comparison with more anachronistic commodity-backed systems such as the gold standard, with respect to the diversion of other resources to create the currency, the comparison is superficial. Cryptocurrencies present a much more malleable concept than would be possible with any physical currencies or commodity; design with highly specific use-cases in mind create a host of opportunities for achieving distinct objectives. For example, *Ripple (XRP)* is used for reducing both transaction costs and latency for banks transacting globally (Schwartz, Youngs and Britto 2014). *Stellar (XLM)* is designed to address problems of interaction between closed economic systems, enabling simultaneous transactions with pairs of currencies at once; with *Stellar*, a sender may send money in dollars, which the recipient will receive almost instantaneously in, for example, euros or *bitcoin* (Maziers 2016). Cryptocurrency's ability to transcend the geographical and physical limitations of transacting with

¹⁰ Adam Smith described this as the 'waggon-way through the air' (Smith 2000).

¹¹ With a pre-defined amount of, for example, *bitcoin* and based on the notion of an ever-expanding use-network, the currency's value will rise over time due to its increasing scarcity. This quality is a huge disincentive for holders to spend their *bitcoin*, as it may be worth more in future.

any other tangible commodity serves as the keystone for why comparison with previous systems of trade, such as the gold standard, do not hold up to full scrutiny.

Meanwhile, regulators face challenges regarding how to categorise cryptocurrency within the law. Cryptocurrencies have been described as lying somewhere at the crossroads between money, investment instruments and commodities (Vardi 2016). However, using any of these labels on its own inevitably results in a description which does not capture the full scope of what cryptocurrencies are or can be used for. With regard to specificity of terminology, it is worth noting that even the term ‘currency’ already becomes problematic, in that it leads one to draw overly general parallels between these new asset types and traditional fiat currencies. The primary function fiat currencies generally fulfil is the same worldwide: a medium of exchange between members of a society to make trade easier (Greaves Jr. 1973). Global variation in currencies – i.e. the reason multiple currencies exist throughout the world – is present because of numerous factors, including reasons of sovereignty, national jurisdiction and different economic realities between countries. Whilst these variations do not explicitly mean that currencies may not be used as monetary systems outside of the jurisdiction of the issuing authority (indeed, many countries throughout the world have official currencies which are not issued by their own central bank because they are seen as more stable than the domestic currency), it is not common because of its conflation with a devolution of sovereign power by the nation in question to an *external* sovereign authority; countries who do not issue their own currency have no choice but to accept the policies of the issuing party. Furthermore, they are left with a more limited set of tools with which to tackle economic problems and downturns, because they cannot use monetary policies such as quantitative easing at times when the economy may be struggling to restore competitiveness (Baldwin and Wyplosz 2015). Incidentally, this is precisely the problem that emerged during the Eurocrisis of 2012, which saw southern European countries like Greece struggling to recover competitiveness due to their inability to devalue their currency in relation to their debts (Haan, Hessel and Gillbert 2014).

But the reason why the term ‘currency’ is arguably a misnomer for cryptocurrencies, is because there is *no* issuing authority. This is highly significant and challenges the notion of what

attributes are required for something to be a currency. Cryptocurrencies are theoretically decentralised, meaning that there is no central authority or bank which can enact any monetary policy over them. They run on a cryptographic protocol which controls how the currency can be created and / or traded (Filippi 2014). Furthermore, the majority of cryptocurrencies have built-in caps on the amount which can ever be created, making them finite resources¹².

These properties of finiteness and decentralisation are used as pros and cons by cryptocurrency proponents and opponents in equal measure. Free-market fundamentalists use these attributes to promote cryptocurrencies as answers to the problems of self-interest and greed inherent in institutions of power in the financial system, which inevitably bring about recessions. Others, such as economist Paul de Grauwe, use these attributes to justify why *bitcoin* can never work as a currency because it has *already* been proven to fail; De Grauwe's logic is that its properties – finiteness, deflationary nature – mean it can in essence be equated to the gold standard which ran – and failed – on the same principles (de Grauwe 2018).

The challenges therefore lie in creating a new field of terminology for a new asset class; if it is not a currency, what is it? This in itself poses problems regarding the fact that there is, as yet, no real legal precedent set in this area; it is still too new. However, one can witness a definition slowly taking shape as prominent voices in finance declare what cryptocurrency is not. Speaking at the London School of Economics in 2016, the deputy governor of monetary policy at the Bank of England, Ben Broadbent said *bitcoin* cannot be a unit of account due to its high volatility and limited network reach (Broadbent 2016). Two years later, Mark Carney maintained the bank's line and used his speech to the Scottish Economics Conference in 2018 to state that because of its inefficiency in being a store of value or efficient medium of exchange, *bitcoin* has 'failed as a currency'¹³ (Carney 2018). In June of 2018, William Hinman, Director of Corporate Finance at the United States

¹² It is noted however that one may argue a supply cap in sense equals a kind of monetary policy.

¹³ Incidentally, proponents of *bitcoin* and other cryptocurrency argue that cryptocurrencies are truer than most fiats; whereas governments can manipulate the value of their currencies through policy and regulatory action, cryptocurrency value is determined by pure supply and demand (Filippi 2014).

Securities and Exchange Commission (SEC) announced that they would not be classifying *bitcoin* or *ethereum* as a security due to their lack of central authority (Hinman 2018).

Incidentally, Carney quoted economist Hyman Minsky in his speech, who said, ‘anyone can create money; the problem is to get it accepted’. Ironically *bitcoin*’s exponents assert that its endurance and continued usage since inception in 2008 show exactly this acceptance which is required (Barber, et al. 2012) Cryptocurrency’s ability to potentially solve significant problems within the current financial system, such as lengthy international transaction times and fees, as well as providing solutions for financial exclusion, makes their ascension to a degree inevitable and with increased usage will likely come greater price stability.

As noted, cryptocurrencies exemplify an amalgamation of attributes not previously seen together in any type of financial asset (Vardi 2016); this unique and novel nature presents a number of challenges for regulators as it requires construction of a new regulatory paradigm into which they can fit functionally. As can be distilled from the literature, ‘crypto-friendly’ legislation, whilst still in its infancy everywhere can be seen to focus on three areas, which have been identified as, *classification*, *enforcement* and *subsidiarity*.

2.2.1 – Classification

As noted, a challenge is presented by the fact that too much variation in classification of cryptocurrencies exists (Walch 2017; Wright and Filippi 2015); cryptocurrencies operate for the large part in legal grey areas throughout the world but frequently find themselves at the centres of legal classification rows¹⁴. The uncertainty created by grey areas in classification is not conducive to either development, perception or adoption of the technology; firms are inevitably reluctant to develop ideas without the certainty that they will not one day find themselves on the wrong side of the law and the

¹⁴ This for example is evident in the US, where, whilst the SEC has ruled that *Ethereum* is not a security, they are nevertheless in the process of deciding whether the Ethereum Foundation launched their 2014 ICO as a ‘non-compliant security’ (Michaels and Vigna 2018). If this is found to be the case, the SEC may impose legal penalties on the Foundation for illegal sale of a security.

majority of the general public will continue to regard cryptocurrencies with suspicion as long as they only operate on the peripheries of society – a position to which they are relegated until these assets receive legal clarity from governments. As Walch (2017) states, the legal lexicon must be expanded and adapted in order to encompass cryptocurrencies into a legal framework as well. The legal lexicon surrounding cryptocurrencies requires tightening in order to create a more efficient legal framework. Inefficient or inaccurate lexical use in legal classification may lead to myriad subtle knock-on effects throughout regulatory systems and societies from money and time which is wasted courtroom battles over classification, to more general issues such as mass-adoption (or lack of) which is based on misunderstandings rather than the actual capabilities of the technology (Walch 2017).

2.2.2 – Enforcement

Regardless of what conclusions are reached insofar as legal classification is concerned, enforcement of the law surrounding cryptocurrency is a complex and multifaceted issue (Filippi 2014; Finck 2016). At current, most activity which is conducted using cryptocurrencies is carried out in such a way which makes it extremely difficult for authorities to police. Opportunities for obfuscation regarding the identities of those involved, currently exists at many points within the transaction process (Filippi 2014). Indeed, their decentralised nature forms the basis of the reason authorities will likely never be able to fully control them; there is no central body or data silo which can be targeted in order to control any aspect of their existence.

Furthermore, it is without doubt that criminal activity around cryptocurrency must be addressed but proportionality must be borne in mind when assessing what this is. A common and often mischaracterised conception regarding cryptocurrencies is that they are predominantly associated with crime, including terrorism financing, money laundering, arms sales, drug dealing, sale of child pornography and human trafficking (Engle 2016). *Bitcoin* certainly carries connotations of shady activity centred around illicit goods transactions, carried out in isolated corners of the deep web, an image which has been cultivated by certain high profile criminal cases, including *bitcoin*'s

use as the financing instrument behind the illegal online marketplace Silk Road¹⁵. As Filippi (2014) points out, the use of cryptocurrencies in illegal activities is certainly an area to which effective enforcement of the law must be extended to. So-called white-collar crime such as tax evasion on capital gains also presents a significant challenge to law enforcement agencies (Ducas and Wilner 2017).

Whilst *bitcoin's* use in transactions of illicit materials does occur, it does by no means characterise the sole nature of the currency itself; *bitcoin* is by no means completely anonymous and it remains possible for wallet addresses to be traced back to user identities (Greenberg 2013). Privacy-focussed coins such as *monero* and *dash* are increasingly being used in favour of *bitcoin* by those wishing to conceal their identities online.

It is and will continue to be difficult to keep track of and monitor all of those who hold cryptocurrency assets and ensure that, for example, they have paid any taxes they owe without working closely and effectively with other parties. This is why, in order to be effective, legal coding would ideally come from constructive and mutual cooperation between authorities and businesses offering cryptocurrency related services. This is, to a degree, already happening. As mentioned, extension of the AMLd in the European Union is requiring all cryptocurrency exchanges to compile databases of user-identities, which authorities can access, should they request it. It is in the interest of authorities and industry alike to build effective and cooperative mutual working relationships and publish clear, simple regulations which are easy to implement for consumers and businesses; whilst cryptocurrencies operate in a space which is at the legal periphery, they will remain extremely difficult to control legally.

¹⁵ Silk Road gained notoriety as an eBay-style marketplace accessible only through the encrypted *Tor* browser, where a wide range of illicit substances could be purchased using *bitcoin*. The website was closed down in 2013 after the arrest of its founder Ross Ulbricht (Dolliver 2015).

2.2.3 – Subsidiarity

At the same time as regulatory frameworks are being constructed, authorities walk a tightrope between making legal coding effective whilst also keeping it from being overbearing or heavy-handed (Barber, et al. 2012; Filippi 2014). Cryptocurrencies are a technology in their early infancy and so regulation which nudges the compass needle of development a few degrees to the left or right could lead to a radically different destination years later. In the presence too heavy or sweeping regulation, innovation may be stifled and relegated to social peripheries such as within special interest groups or the dark net. Not enough regulation – in a sense, what currently exists, which many refer to as, ‘the wild west’ of crypto (Johnson 2018) – and consumers are left vulnerable in a host of ways, including losing vast amounts of money in price swings, scam-ICOs and mistake transactions.

The shape of the regulatory environment of cryptocurrency in future will, for a large part, depend on where regulation comes from; it could either be state-regulated or self-regulated (this could come through market-based mechanisms but also institutions such as the *Bitcoin Foundation* (Filippi 2014)). With expertise on the subject in most regulatory systems still virtually non-existent, self-regulation from inside the industry may be the most efficient approach for these initial stages (Filippi 2014). At the same time, states would be wise to pursue opening channels for knowledge to diffuse between industry and regulators. Again here, mutual cooperation in this field will likely produce the most effective results. The European Union’s commencement of the *Blockchain observatory and forum*¹⁶ may serve as an example of a forum where growth of effective regulation can be successfully fostered through dialogue between industry and policy-makers.

¹⁶ See 4.0 for further explanation on this.

2.3 – The Practice of ICOs

Initial coin offerings (ICOs) are an innovative fundraising method for start-up firms which saw huge adoption in particular, during the second half of 2017. Comparable to crowdfunding, ICOs offer *tokens* to early investors at a fixed price, in exchange for traditional fiat currencies or established cryptocurrencies such as *bitcoin* or *ethereum*. The capital is used by the firm for project development and the *tokens* can then be exchanged by holders for products or services offered by the issuing business venture in future (Wöckener, et al. 2017). The whole process is similar to an *initial public offering* (IPO) on the traditional stock market, but differs in that *tokens* do not represent any form of ownership or dividend right from the venture itself; rather they represent a bet based on the start-up's future success resulting in a higher return in exchange for the token¹⁷ (Wöckener, et al. 2017).

ICOs as a novel fundraising practice, attracted significant controversy following their proliferation during 2017. Their potential lies in the speed with which they can attract capital to projects, as they have proven to be extremely powerful tools for raising large funds in a short amount of time; upon launch of their ICO in May 2017, privacy-focussed internet browser developer *Brave* raised around thirty-five million dollars from investors in under one minute (Roberts 2017). However, with ICOs occupying part of the same legal grey area in which cryptocurrencies find themselves, regulatory protection for investors is lacking from most legal coding. IPOs first have to be approved by the relevant state's financial conduct authority before shares may go on sale. ICOs on the other hand go through no such audit, which has led to an ICO marketplace with a high volume of low-quality products and low investor protection (Roberts 2017). Numerous scam ICOs have been identified since mid-2017. Vietnamese start-up *Modern Tech* raised \$660 million in April 2018 through their *Pincoin* token, before disappearing without trace (Biggs 2018). These so-called 'exit scams' often use the façade of a slick white paper and website to lure investors into putting money

¹⁷ As Wöckener, et al. (2017) point out, this leads to a secondary token market as these assets are fungible in the same way as cryptocurrencies.

down. This, in combination with minimum investment thresholds allows them to acquire huge amounts of cash in extremely short time spans, making exits extremely lucrative.

The challenges regarding ICOs therefore revolve around making the practice safer for investors and addressing the problem of ‘exit scams’. Regulatory framework targeting ICOs is already creeping in in many jurisdictions including China, South Korea and the US, modelling in most cases IPO regulation. The Securities and Exchange Commission (SEC) in the US has generally stuck to its principle of categorising tokens as securities and thereby extending its established framework for securities to many digital tokens as well¹⁸. Nevertheless, ‘exit scams’ remain a problem. As cryptocurrency is in many ways a ‘borderless space’ with firms operating irrespective of geographical location and offering products to clients all over the world, national jurisdictions can only reach so far. If scam ICOs are to be seriously addressed, it may take multilateral cooperation between governments to create an international framework through which governments can work together to seal any cracks in legal coding which scammers can exploit.

2.4 - Use-case Potential: why is this significant for Europe?

When considering cryptocurrency’s use-case potential for Europe, the greater application value of blockchain technology as a whole must be considered. Blockchain’s promise – which has been referred to as, ‘transformative’ (Finck, Blockchain Regulation 2016), ‘opening a new chapter in the history of trade finance’ (Gordon, Hood and Materne-Smith 2017), and ‘the most consequential development in information technology since the internet’ (Werbach 2018) – is evidently immense and arguably much greater than cryptocurrency itself; a little irony as the technology was created as a protocol primarily for *bitcoin* to run on. Nevertheless, cryptocurrencies remain an integral part of blockchain development, creating an opportunity for capital to flow into projects which can be used to

¹⁸ This creates an arguable dissonance, as in June the SEC declared *bitcoin* and *ethereum* did not meet the criteria of securities. However, it is noted that in the speech announcing this, William Hinman, director of corporate finance, stated that despite the manner in which Ethereum was launched (i.e. the ICO) it is now sufficiently decentralised that it cannot be classified as a security (Hinman 2018).

progress the technology further. *Initial coin offerings* (ICOs) are a novel way of crowd funding for start-up projects, and cryptocurrencies and tokens are the assets which allow investment to flow into and around the eco-system. On this point, it is important to highlight that, again, unlike traditional currencies, *bitcoin* and other cryptocurrencies' use-case potential extends beyond it just being a commodity or store of value. *Bitcoin, ethereum* and others are an entire protocol; languages which computers can use to communicate with each other and onto which, in addition to currency, applications and smart contracts¹⁹ can be built (Liljeqvist 2018). The *immutability*²⁰ of the blockchain and therefore of cryptocurrencies, is doubtless one of their most profound and significant attributes. Money, whose entire history can be traced as part of an up to date, 'provably accurate record', has undeniably enormous implications for the way trust is understood when transacting (Werbach 2018). For Europe, this borderless system can potentially further break down remaining barriers to trade and remove redundant middlemen who decrease economic efficiency in transactions. However, if not managed properly, cryptocurrency could present a threat to the established monetary system through capital drain. The deflationary nature of many cryptocurrencies incentivises not spending and therefore run the risk of leading to a stagnant network.

3.0 – Current European Union Responses to Cryptocurrencies

The cryptocurrency space's market capitalisation in the final quarter of 2017 was larger than the GDP of Argentina (Coindesk 2018). With cryptocurrencies and ICOs increasingly becoming destinations for capital, they have also become the increased focus of discussion for regulation both at

¹⁹ Smart contracts are, 'decentralized agreements built in computer code and stored on a blockchain' (Sklaroff 2017). These can be thought of as programable transactions which will only be executed once certain terms are fulfilled, hoping to address inefficiencies in the system of traditional written contracts.

²⁰ The idea is that once data is recorded, it cannot be changed. This again, is a commonly held refrain when discussing the technology which must nevertheless be treated with caution. The possibility of '51% attacks' – the possibility that 51% of nodes become operated by a group of malicious actors, working in coordination, who then use the network's consensus property to record false information onto the blockchain (Kasiyanto 2016) – and the case of the '*DAO hack*' already prove that this libertarian ideal is at any rate, not with us yet (Werbach 2018).

the EU level and among member state governments. Numerous and distinct national perspectives have emerged but to date, these have failed to combine to form a coherent EU stance on the subject. Aside from an amendment to the AMLd, the EU has adopted a ‘wait-and-see’ approach to cryptocurrency. Despite joint calls from French and German authorities to place cryptocurrency regulation on the agenda for the next G20 summit, Valdis Dombrovskis, commissioner for the Euro and Social Dialogue, stated the Commission’s intention only to ‘continue to monitor’ the cryptocurrency space (Dombrovskis 2018).

In order to monitor more effectively, the EU launched the *Blockchain observatory and forum* in February 2018. The observatory’s role is to gather information on global trends and challenges in blockchain technology usage, as well as providing a forum in which various stakeholders can exchange and develop ideas (European Commission 2018). An EU press release announcing the establishment of the observatory, expresses the Commission’s desire to develop blockchain technology projects to help it achieve a deepening of integration in the single market and banking union (European Commission 2018). The project is still young, however a press release in May 2018 announced the creation of two working groups dedicated to clarifying ‘regulatory conditions in order to offer more legal certainty, ... and formulate potential areas for action at a European level.’ (EU Blockchain Observatory and Forum 2018) Whilst this appears to be a step in the right direction, until the arrival of progressive and simple regulation, the Union will struggle to foster real project development on the supranational level.

3.1 – Data Composition: National Responses to Cryptocurrency Regulation

At a national level within the European continent, there are a number of countries which are actively pursuing cryptocurrency-friendly regulations, hoping to cast themselves as ICO and cryptocurrency hubs for Europe and the rest of the world. What must be noted is the sheer range of countries which are listed as being ‘crypto-friendly’ depending on search terms and framing of the

question. A simple google search reveals that there are many lists on technology blogging websites which contain vastly different sets of countries based on differing interpretations of what might constitute being ‘crypto-friendly’. Metrics include, the number of ICOs registered in a country, value of the ICO market in total, countries with the lowest tax rates for cryptocurrency etc. Whilst these countries may have their merits for being locations from which to conduct business regarding cryptocurrencies, they do not all provide regulatory clarity, which is the object of research for this thesis.

Two data sets were considered as preliminary lists of which countries might be authors of progressive and positive regulation. Firstly, data provided by ICObench.com, a website which specialises in analytics regarding ICOs worldwide was considered. Of ICOs per million inhabitants, the following ‘global top five’ data was drawn.

<i>Country</i>	<i>Number of ICOs per million people</i>
Estonia	126.8
Singapore	48.5
Cyprus	32.2
Switzerland	19.9
Slovenia	18.8

(ICObench.com 2018)

Further to this, data collected by BlockShow Europe was considered. BlockShow Europe is an annual industry exposition, most recently held in Berlin in May 2018. BlockShow, which conducted the study, named the top 10 ‘blockchain friendly’ countries in Europe, based on an evaluation of three different metrics: ICO regulations, cryptocurrency as a payment service and taxation frameworks. The list showed the following in order of crypto-friendliness:

1. Switzerland
2. Gibraltar
3. Malta
4. UK
5. Denmark
6. Germany
7. Portugal
8. Netherlands
9. Finland
10. Belarus

(BlockShow Europe 2018)

For this thesis, the objective has been to compile a list of those countries which are actively constructing positive regulatory frameworks designed to invite cryptocurrency-based businesses to that nation. In that sense, not all nations on this list adequately fit the criteria of being ‘crypto-friendly’ as far as this thesis is concerned. For example, those which offer 0% tax rates on cryptocurrency earnings because the government does not recognise cryptocurrency as an asset and therefore falls outside of any regulatory framework, as is the case in Denmark, do not constitute ‘crypto-friendliness’ in this sense.

Each of the European nations listed in the two data sets was investigated further, looking at government websites, documents and press releases produced by governmental institutions, and news articles to assess if active positive regulation was actually being constructed. The following taxonomy was created:

<i>Country</i>	<i>Regulatory Attitude from Government / attitude of financial institutions</i>	<i>Notes</i>
Estonia	Positive	The financial supervision authority of Estonia (Finantsinspektsioon) has issued detailed guidelines for ICOs and cryptocurrency taxation in the country ²¹ .
Cyprus	Neutral / Positive	Cryptocurrency is a legal payment form in Cyprus, however taxation rate remains unclear and no government framework exists.
Switzerland	Positive	The Swiss Financial Market Supervisory Authority (FINMA) has issued detailed guidelines on ICOs and taxation of crypto assets in Switzerland and has created regulatory sandboxes for tech firms ²² .
Slovenia	Positive	Slovenia's prime minister has spoken openly about establishing the country as a blockchain hub and created the Blockchain Alliance CCE, an organisation that fosters cooperation between blockchain technology companies and government ²³ .
Gibraltar	Positive	The government of Gibraltar adopted new legislation as of January 2018. A government press release in October 2017 ahead of the release stated, 'The legislation has been designed to provide an efficient, safe and innovative regulatory framework

²¹ Details can be found on the Finantsinspektsioon website, (fi.ee).

²² Details can be found on the FINMA website, (FINMA.ch).

²³ For more information, see <https://www.blockchainalliance.si/en/>.

		for firms engaging in activities not otherwise subject to regulation and that use DLT for the transmission or storage of value belonging to others (DLT framework).’ (HM Government of Gibraltar 2018).
Malta	Positive	Malta has constructed a ‘broad’ legal framework providing ‘transparency and certainty’ as well as levying a favourable tax rate of around 5% for businesses in this sector (Vaghela and Tan 2018).
UK	Neutral / Negative	The UK has a highly developed financial sector and is home to many ICOs but nevertheless no business regulation has been issued. A number of retail banks refuse to allow their customers to purchase cryptocurrencies.
Denmark	Neutral	Cryptocurrencies remain unregulated by financial legislation in Denmark according to the Danish financial supervision authority (Finanstilsynet). Whether a token falls under existing legislation remains a possibility based on case by case assessment ²⁴ .
Germany	Neutral	The German financial services authority (BaFin) does not regulate ICOs or cryptocurrencies. Their website contains a number of articles advising consumers of the risks associated with investment.
Portugal	Neutral	The Portuguese financial services authority (CMVM) does not regulate ICOs or

²⁴ Details can be found on the Danish FSA website, (finanstilsynet.dk).

		cryptocurrencies. Advice to consumers on investment also exists on its website.
Netherlands	Neutral	The Netherlands has ambitions to create a regulatory framework, but so far nothing has been issued. The Dutch financial regulatory authority (AFM) has issued warnings to investors that most activities regarding cryptocurrencies and ICOs fall outside financial legislation.
Finland	Neutral / Negative	The Finnish financial services authority (finanssivalvonta) has issued numerous warnings about the risks involved with cryptocurrencies. A number of Finnish banks have refused to provide services to customers wishing to buy cryptocurrencies.
Belarus	Positive	Belarus has also introduced a bill which makes ICOs legal and cryptocurrency trades tax-free for the next five years (Makhovsky 2017). 'Decree No. 8 "On the Development of the Digital Economy"' was signed by president Lukashenko in December 2017 and has created numerous favourable conditions for cryptocurrency related businesses ²⁵ .

Based on the information uncovered, only the countries which are seen to be pursuing positive action have been considered 'crypto-friendly' in the context of this thesis. These are:

²⁵ The full decree is available at http://president.gov.by/ru/official_documents_ru/view/dekret-8-ot-21-dekabrja-2017-g-17716/ (Russian only).

- *Switzerland*
- *Estonia*
- *Slovenia*
- *Malta*
- *Gibraltar*
- *Belarus*

4.0 – Small and Peripheral States in Europe

As can be seen, what initially appeared to be a group of nations of mixed size and economies, has been distilled into a group of arguably unexpected nations, upon closer inspection of hard evidence; their uncommonalities may seem to strike one first, before their commonalities. After further consideration however, what they do seem to share in common is smallness and peripherality in varying degrees.

Geographical peripherality is most obvious, with all of these countries apart from Switzerland being located at the physical edges of Europe. Even Switzerland however, contained within its mountains is in some sense geographically ‘cut off’, isolated from the rest of Europe’s cities and hubs.

Political peripherality is also a characteristic which all of these nations share to a degree. Switzerland and Belarus are outside of the EU and do not hold any significant power in terms of international relations or politics. Indeed, Belarus is commonly referred to as ‘the last dictatorship in Europe’ and arguably represents a political anachronism in the world today. Estonia, Gibraltar, Malta and Slovenia, whilst inside the EU, do not hold much real weight when it comes to deciding the Union’s policies. Estonia has eight seats in the European parliament whilst Malta and Slovenia have six; Gibraltar, as a dependent territory of the UK has none.

Economic peripherality can be understood in a number of ways. Through traditional methods such as measuring GDP, but also whether these countries are seen as destinations for capital or being economically developed. Switzerland, is perhaps the biggest outlier here. It has a long history of being a destination for capital and GDP per capita is amongst the highest in the world. However, whilst it may feature in the global top 20 countries with the highest GDP, it does not mean it is a significant economic player globally. Furthermore, the somewhat caricatured ‘Swiss bank account’ is an anachronism in contemporary times, after international pressure throughout the second half of the twentieth century forced the Swiss to move away from this style of banking. All of the other countries have modest to poorly performing economies which certainly make them peripheral players when compared with other European nations like the UK, France or Germany.

Regarding smallness, none of these states has a population higher than ten million; fewer people than live in greater London. This arguably serves as an explanation for their peripherality; being removed from the large population centres of the continent, small states inevitably remain peripheral to larger economic centres.

The definition of small states is contested in international relations as the word can measure a number of different things. The word ‘small’ in the international relations context, comes with significant assumptions about a state’s ability to act on the world stage. Within the literature one encounters arguments that these are states which cannot assure their own security through their own capabilities alone, which cannot survive materially without the help of comprehensive external trade networks and must to a degree align their actions with those of their neighbours in order to survive (Keohane 2012). Looking closer at the problem, Keohane draws attention to the fact that the word small is a comparative by highlighting, ‘small states are defined by what they are not’ (Keohane 2012). If ‘small’ states are those who lack the power to defend themselves against any aggressor, presumably the US, Russia and China are the only ‘great’ powers in the world. But any binary distinction, for example ‘small’ and ‘great’ is clearly not nuanced enough. Keohane (2012) points out the arbitrariness of using the word ‘small’ to create a group which at once includes both Italy and Lesotho. A third category which consists of medium powers does help (Neumann and Gsthl 2012) but

there are still hugely comparative differences relating to geographical location and historical experience; a ‘small’ nation in Europe certainly carries more weight internationally than even some quite large states in Africa or Asia (Vital 1967). Identifying a usable definition in this context is therefore made easier by the fact that the sample is entirely European.

Ingebritsen et al. (2012) make the claim that the ‘European bar’ for small states in the 20th Century is those states with a population size smaller than the Netherlands: around 17 million (Ingebritsen, Neumann and Gsthl 2012). This definition is sufficient for this paper as all of the states which are considered ‘crypto-friendly’ fall into this bracket.

So, what has led these countries to be the first movers in constructing regulatory frameworks, when other states initially considered may not have? Katzenstein’s *Small States in World Markets* (1985) offers some potential insights. One of the most fundamental points Katzenstein makes is that, for small states in Europe, ‘economic change is a fact of life’ and that these ‘states have made economic flexibility compatible with political stability’ (Katzenstein 1985). The thesis of his argument is that a degree of economic openness exists in these smaller economies of the continent which is not present in larger ones, because of historical experience and development in a theatre of larger interests. Historical subjection to the changeability of world markets has made these countries comparatively more open than larger ones, for whom a degree of protectionism has always been an option.

This adaptability has manifested itself in a number of ways. One may first highlight the brand of corporatism which is present in European small states. Particularly, this refers to the notion that small states are run with the view of using the pursuit of economic prosperity as a means to achieve greater autonomy (Katzenstein 1985); the more prosperous a state is, the more political clout it carries. In order to achieve this, pursuit of economically liberal values is prioritised and businesses are given a freer rein to achieve growth. In this regard, the potential earning power of ICOs is likely to appeal greatly to small states. The vast amounts of money ICOs can generate potentially creates a large revenue stream from businesses registered in small states. Furthermore, a greater flexibility regarding regulation of financial practices is a common feature seen in small states in pursuit of

economic liberalism. Small states, in their corporatism, tend to pursue more consensual as opposed to confrontational regulatory policies (Jones 2008). The creation of cryptocurrency sandboxes within the Swiss financial regulatory structure is therefore easier to rationalise from this perspective.

This adaptability is also evident in the nature of the political structures in small states. In small states, political organisation tends to be more centralised and close-knit (Katzenstein 1985). Small territory leads to a political bureaucracy which is much more concentrated with fewer and more concentrated interest groups, as well as a smoother process of bargaining between political actors (Katzenstein 1985). This in itself makes the process of bringing new laws into effect and changing existing regulation comparably easier than in larger states. This serves as a strong indication of how these ‘crypto-friendly’ states have been able to be the first movers in terms of constructing a regulatory framework; the process is much shorter for these small states than larger ones such as the UK and Germany where interest groups and lobby powers are much larger and more prolific leading to a considerably more protracted process of law-making. Belarus may, via a different route, arrive at the same destination here; its undemocratic regime will result in a greater concentration of power amongst a few individuals, also equalling a shorter law-making process.

Furthermore, if we take to be true Katzenstein’s notion that protectionism has never been an option for small states, then one may assume that opposition to new cryptocurrency and ICO based companies must be smaller. Indeed, Katzenstein suggests that small states within Europe have recognised the need to let their primary industrial sectors decline throughout the second half of the 20th century; they recognised a need to evolve into modern incarnations of themselves in the name of increasing efficiency in order to survive (Katzenstein 1985). A lot of small states have moved into areas where their natural handicaps of a small labour force or small territory are not determinants of success; the trend of firms in small states to ‘exploit profitable market niches’ is highlighted (Katzenstein 1985). The example of industrial firms in Switzerland is given which, since the 1970s have recognised the limitations created by the scarcity and high cost of Swiss labour, and so have moved into high expertise niches, such as software development and consulting (Katzenstein 1985). All of these points – niche exploitation, the pursuit of efficiency, low protectionism – can help to

underline the possible appeal of cryptocurrency-based industry to small states. Increases in efficiency are one of the most notable promises of the technology. Furthermore, its development as an industry is not bound by the traditional factors of labour force endowment, or exploitable land etc. which form some of the more traditional limitations to industry growth in small states.

Naturally Katzenstein's work – which is now celebrating its forty-third birthday – can now only be used to draw the broadest of inferences about how small states behave. Further contemporary testing of Katzenstein's conclusions must be carried out, in order to truly validate their applicability for the small states of Europe today. The mass-adoption of the internet and digital medias globally will almost certainly challenge some of the author's conclusions. Furthermore, the seven early industrialising nations of Europe of Katzenstein's initial study – Belgium, the Netherlands, Switzerland, Austria, Denmark, Sweden and Norway – present a much more economically, politically and culturally homogenous group of countries than the 'crypto-friendly' states of Europe. Belarus for example, will certainly not be subject to the same economic and legal pressures as Switzerland; they each score a 3 (authoritarian regime) and a 10 (full democracy) respectively in *the Economist's* democracy index of 2017²⁶.

5.0 - Case Study: Estonia

In order to properly test the arguments of small state theory as an explanation for the regulatory frameworks present in Europe's 'crypto-friendly' states, a case study will be conducted. For this, Estonia has been selected²⁷. Estonia is no less surprising than any other as a nation leading the way at the regulatory vanguard of this industry. This tiny nation of 1.3 million people on Europe's

²⁶ This is available at, '<https://infographics.economist.com/2018/DemocracyIndex/>'.

²⁷ The reason for its selection lies mainly in the high availability of English language literature in comparison with the other nations.

north-eastern edge does not hold any remarkable credentials for creating progressive legal coding or having an exceptionally well-developed financial system.

5.1 – How has Estonia Implemented Cryptocurrency-Friendly Regulation?

Estonia's positive stance through regulation manifests itself in a number of ways. Firstly, in such a new and legally grey area, the sheer existence of any legal codification which refers directly to cryptocurrencies and ICOs is already a huge boon in itself; regulation explicitly stating that ICOs are legal, is greatly reassuring to entrepreneurs looking to invest time and capital in the industry. Operations taking place in regulatory uncertainty or voids creates shaky legal ground which may change without prior warning. Legal clarity regarding cryptocurrencies and ICOs within states acts as a draw because the legal status of innovative projects is less likely to change, compared with a state which has no legal clarity on a certain area.

Secondly, the reality of Estonia's regulation is motivated by a desire to create clear and uncomplicated rules for tech firms. These come in the form of a streamlined business registration and licensing process for tech start-ups, ensuring compliance with the country's anti-money laundering laws. This process is completed in under thirty days, after which time the company will be granted a cryptocurrency exchange license.

Thirdly, Estonia's laws and public-sector infrastructure, incentivise cryptocurrency business-incorporation in Estonia. Through VAT breaks for cryptocurrency transactions as well as low minimum capital requirements required to register a limited liability company and apply for a cryptocurrency license²⁸, the government has created a favourable situation in Estonia's legal framework for young companies to establish themselves. Estonian cryptocurrency regulators are also known for being high quality and easily contactable, making business smoother (Witismann 2017).

²⁸ Specifically, 2,500 euros of charter capital, and up to 5,500 euros for the registration process (Schwarz 2018).

Finally, the channels available to entrepreneurs who want to start a business are made more available thanks to the country's e-residency programme. Estonia allows citizens outside the country to register as *digital citizens*, which grants them among other things, the ability to register and digitally administer a company in Estonia, even though they may not be located or do any business there. This potentially opens the door to many entrepreneurs and start-up ventures from all over the world who want to do business in a cryptocurrency-friendly regulatory environment.

As can be seen here, the Estonian authorities have created a regulatory framework which is liberal in attitude. It aims for simple and uncomplicated codification which will make life easy for firms. This is in keeping with Katzenstein's theory on small states' and the brand of corporatism they tend to hold. Liberal economic practices help form part of the strategy to incentivise firms to establish themselves in Estonia.

The country's efforts to be an author of progressive regulation comes set against the backdrop of its established digital public infrastructure; the country is well-known for having an internationally strong e-state profile (Lember, Kattel and Tonurist 2018), with government digital infrastructure already heavily reliant on technology similar to blockchain as part of the *X-road* citizen database and bureaucracy. Its stance on cryptocurrency regulation aims to put it at the global regulatory vanguard, making the process of setting up an enterprise which engages in the cryptocurrency and ICO market easy and straightforward for young start-up firms. This highly specialised exploitation of a market niche is another feature typical of small states.

The technological leap forward which has taken place in Estonia since the fall of Communism has been quite revolutionary; Tallinn's cobbled streets and medieval architecture are a distinct antithesis to the country's developmental direction. In 1991, at the time of independence, fewer than one in two people owned a telephone (Zon 2005). Just over a quarter of a century later, the country has become a global leader in information technology development and boasts the fastest broadband speeds in Europe, making its digital infrastructure ideal for cryptocurrency- and blockchain-based firms (Zon 2005). The country's rapid digitisation has been a deliberate move on the part of the government, which used the country's lack of technological infrastructure as an opportunity; a clean

slate upon which it could build using the latest technologies, rather than having to update archaic systems which had been installed previously. Maart Laar, Estonia's prime minister in 1992 headed a government whose average age was 35 years, a telling indicator of a sufficient foundational appetite amongst those in power to prioritise progressive electronic technological development (The Economist 2013). Today, children as young as seven are taught coding in school, and internet access has been enshrined as a human right in the country's legal coding (Beech 2018).

5.2 - Estonia's Technological Renaissance

Estonia has had a long history of domination. It has been conquered by Swedish and German armies, invaded by Russia three times and ruled for over 250 years in total (Beech 2018). After the country became independent after the fall of the Soviet Union, it was underdeveloped and backward. Its journey to becoming a digital hub began with projects throughout the 1990s, designed to bring Estonia's domestic infrastructure into step with Western Europe. Due to the country's small size and limited resources, the government states that the most efficient and cost-saving practices were pursued. This led to development of a digital infrastructure in the public sector, which minimized bureaucracy and wastage (Heller 2017). Citizens have online profiles and through these, can vote in elections online, and each citizen's records relevant to over four-thousand services, from medical history and financial records to information relevant for registering a new business, are stored electronically on a database, meaning that the relevant institution as well as the citizen has access to it when it is required (Scott 2014). This digitisation is part of a larger ambition by the government to create a *'once only'* policy – the idea behind this being that a citizen should only ever have to input a piece of information once and thereafter, this information can be drawn upon when required (Heller 2017). In reality, this translates into many documents which are online and largely 'auto-filled',

meaning that citizens must only fill in the gaps on, for example, their tax returns²⁹. This growth of Estonia's digital bureaucracy can lead one to draw parallels to Haas' theory of neofunctionalism, which holds at its core the idea of 'spillover'. This holds that integration in one area will inevitably lead to integration in other areas. This is evident through the ever-increasing number of public services which are accessed through the country's digital infrastructure. In 2014, Estonia became one of the founding members of the Digital 5 (D5) group, along with the UK, Israel, New Zealand and South Korea. These five nations, all considered to have advanced digital state profiles, committed in a non-binding agreement to create a forum for sharing information in order to further strengthen the capacity for the digital economy and digital bureaucracy.

The pervasiveness of the government's use of its online database attracts many questions about privacy; how can data be safely stored and how is it kept safe from hackers or other malicious agents? The government's online platform, known as *X-road*, uses cryptographic hashing functions in an equivalent way to blockchain to keep a record of all those parties who access citizen's data, and which specific part they access. This record is available for consultation by citizens at any time, who can see by whom and for what reason their data was accessed. This method of record-keeping allows for interoperability of data, without the fear of unfettered access to data by unknown parties.

Heller remarks that the government reports that the saving in salaries and expenditures which comes through the efficiency of its digitalised system amounts to as much as 2% of the country's GDP per year – incidentally this is the cost of the country's NATO membership; on this point, Heller remarks that former president Toomas Hendrik Ilves joked that the country essentially 'got its protection for free' (Heller 2017). This is highly significant given that relations between the EU and Russia are already strained and Estonia, together with Latvia and Lithuania would likely find itself on the frontline of any armed conflict between the two powers. Indeed, with the deterioration of relations between Russia and the West in recent years, the presence of NATO troops on Estonia territory has increased and the country's defence spending has almost doubled since 2005 (Batchelor 2017).

²⁹Estonia's government boasts that tax returns now take around five minutes to complete since the implementation of this digital system (Heller 2017).

Estonia exemplifies a region of the world which has historically struggled with security, typical of Katzenstein's description of small states. Upon gaining independence, the country's pursuit of efficient administrative practices is characteristic of small states in order to maximise the potential of their available resources. The notion that Estonia's digitisation might be motivated out of a desire to shore up its borders against Russia sounds at first a sensational example of potential reasons for its authoring of 'crypto-friendly' legislation. However, when seen through the lens of small state theory, the notion becomes more logical. Furthermore, that the very technology which provides the country's efficiency savings should also increase informational security in itself acts as a double indicator of Estonia's desire to increase its own security.

Heller goes further to cite Estonia's national digital advisor, Marten Kaevats, who remarked that the costs cut for the public sector should by no means be seen as the only benefit of Estonia's digitisation; Kaevats sees the enthusiasm and openness to progressive digital technologies and solutions in Estonia as a huge value in itself, which has been a direct result of public policy (Heller 2017). This is insightful and echoes the findings of Lember, Kattel and Tonurist (2018), whose study highlights the importance of technological integration as a contributor to shaping the direction of growth of a government's administrative capacity. Essentially, technological integration into the public sector, they claim, has huge implications for the ways in which the public sector will develop and what capacities it will be responsible for (Lember, Kattel and Tonurist 2018). This is indicative of an organisational co-evolution between the integration of technology and the development of public policy (Nelson and Winter 1982). Naturally the use of technology similar to blockchain as part of the *X-road* system, the cornerstone of the government's online administration, may lead one to draw reasoned estimations of the country's position on cryptocurrency and ICO development, supporting Nelson and Winter's (1982) findings further. Given the public-sector implementation of hi-tech solutions which has already taken place in Estonia, this gives the country's policy-makers a greatly more informed view of cryptocurrency's use cases and vulnerabilities.

The factor of having a strong digital profile on a state level is something unique to Estonia amongst the group of European 'crypto-friendly states'. None of the other seven states boast such an

established digital profile. None are present in the D5 group which contains only one other European country, the UK. As was shown in section 2 of this paper, the nature of cryptocurrencies and technology which surrounds them is highly technical. The fact that Estonia has a significant advantage in terms of potentially understanding blockchain and its uses, through its high level of digital bureaucracy through the government's *X-road* system, naturally puts it in an advantageous position to transfer knowledge and create a functioning cryptocurrency infrastructure. The notion of 'spillover' (Haas 1958), can further be applied here in order to argue that it might be seen as only logical that Estonia might redirect its expertise to this area in order to further exploit this highly specialist 'market niche' (Katzenstein 1985). Path dependency may also be used to support the notion that it is only logical that citizens of Estonia, having been in a sense primed in such a way throughout their lives, might see cryptocurrency as an opportunity rather than regard it with scepticism. However, if this is the case it would logically follow that Estonia sees cryptocurrency primarily as a technological venture rather than an economic or financial one. However, as none of the other countries which are pursuing pro-cryptocurrency regulation are doing so from a point of any remarkably established digital infrastructure this may just be a happy coincidence for Estonia rather than a primary motivating factor.

Estonia, whose population is only 1.3 million, has seen a rapid decline in its primary industrial sector. *Foreign direct investment* (FDI) since independence has prioritised service sector operations whilst many primary activities such as fishing have been moved away from and are no longer profitable (Eamets 2001). Fishing, agriculture and manufacture formed a large part of the Estonian economy at independence (almost 50% of total economic output), however these sectors have declined by more than two thirds in the last twenty years (Estonian Statistical Office 2000). The permitted decline of primary industry is a feature of small states, remarked upon by Katzenstein (1985) to make way for more high-tech specialist areas of industry which permit relinquishment of wage restraint. The country's reliance on FDI since independence shows an international orientation and goes some way toward explaining why the notion of ICOs and cryptocurrency may appeal to those in power in the country.

Furthermore, it should be noted that since joining the EU, Estonia has become an aging society with the youth (those under 26 years) a particularly rapidly shrinking section of society (Bart, et al. 2014). There are a number of reasons for this, most notably: the birth-rate is extremely low and has fallen consistently since 2005. Compounding this fact is that migration figures are net negative, with young people in particular leaving the country in search of opportunities in other EU countries, notably Finland, Germany and the UK (Bart, et al. 2014). Lastly, Estonia is home to a large ethnically Russian minority whose youth in particular are greatly at risk of marginalisation from society and vulnerable to poverty; 27% of these youths were unemployed in 2010 (Bart, et al. 2014).

The aging population that the country suffers from illustrates possible motivating factors for active creation of cryptocurrency-friendly regulatory spaces by the government. With the decline of primary industry, the government should naturally attempt to fully exploit profitable niches to create revenue. A niche that may help solve a problem in another area (namely the aging population) is likely to appeal to policy-makers. Cryptocurrency, a sector generally dominated by young people, may lead the government to expect that investment in these areas will also persuade more young people to remain in Estonia, as well as attract young entrepreneurs from outside Estonia to make their home there.

6.0 – Conclusion

This thesis set out to answer the research question, *‘Why are small European states more likely to perceive cryptocurrencies as an opportunity for economic growth than larger ones?’*

It is clear from the evidence gathered that there are many contributing factors, not all of which could be explored in this thesis. The advent of blockchain technology seems to be regarded by many as a significant part the paradigm shift that is taking place as the world passes into a fully-fledged digital age. Nevertheless, through exploration of the concept of small states, it appears that a number

of characteristics which the theory traditionally holds to be true can be found as evident in the ‘crypto-friendly’ states of Europe.

In particular, the need for security potentially forms a significant part of the behaviour of Estonia, vis-à-vis, not only its approach to cryptocurrency regulation, but also its establishment of digital infrastructure in general since achieving independence. Estonia’s efficiency-savings through its digital development have equalled its NATO membership fee. The existing digital infrastructure in the country also clearly provides a significant and solid foundation from which to branch out into cryptocurrency-based business hosting. Attempting to set up the country as a cryptocurrency hub may be explained as a combination of two things: natural extension of already-present computing expertise and exploitation of a narrow but significant market niche. Both are characteristic of small states.

Whether the results of the Estonian case study can be extrapolated to Switzerland, Slovenia, Malta, Gibraltar or Belarus would require further research. However, it would seem that perhaps the factors present in Estonia may be somewhat unique among these nations. None of the other five states has anything like the established digital infrastructure which Estonia has, from which to transfer knowledge or expertise. Estonia’s presence in the D5 group, as stated, underlines this. However, vulnerability and the need for security is something common to all of these states to relatively high degrees; a number have been in the past highlighted as areas of strategic significance from a military perspective and remain so to a certain extent. The Baltic membership of NATO and the EU often forms a source of tension for Europe-Russia relations. Gibraltar is generally a contentious subject between the UK and Spain. Malta was part of the British empire and of strategic significance in the Mediterranean; British forces only left the island in 1979. Belarus is a close ally of Russia and is of particular significance, forming a large buffer between the monolith and the EU. Slovenia has known war on its territory as part of the Yugoslav wars of the 1990s and Switzerland, whilst famously a neutral nation, is surrounded by EU states. Developing its cryptocurrency sector may work as part of a strategy to help it maintain its independence in future.

But in answer to the research question, one may interpret the findings as grounds for argument that small states are not more likely than larger ones to perceive cryptocurrency as an

opportunity but rather that they just have a better foundation from which to act, explaining why these small states have done it first. Their open economies and their tendency to exploit niches creates better conditions from which to develop legal frameworks in that favour.

These peripheral states which, as has been discussed, have their political and economic options to a certain degree, dictated by the actions of regional hegemony must explore more creative options to achieve economic growth and make their countries destinations for capital. In spite of this, a possible argument which seems to emerge is that states which see cryptocurrency as an opportunity, see it as an opportunity to develop their technological and business sectors. One gets the sense that those larger states who see it as a threat, see it as a threat to their established, traditional economic and financial sector. This is the sense given from the Bank of England speeches noted earlier. What makes states perceive cryptocurrency as either an *economic* threat, or a *business* opportunity, may be a question for further research.

But evidently the reality of being a small state is not the only factor relevant when European nations choose to create a favourable environment for cryptocurrency start-ups and ICOs. Many small, peripheral states which are comparable have not taken this path which could be accredited to a number of reasons. Further research might attempt to examine a number of possibilities, including the relationship between the economic history of nations and their approach to cryptocurrencies and ICOs, or average age within a country and their approach towards cryptocurrency.

Finally, it seems worth pointing out that the sheer speed with which this industry is developing means that there are very few certainties. Any research conducted runs the risk of becoming out dated extremely quickly. Whilst the industry is still young there are likely to be many sudden changes and whether the ‘crypto-friendly’ states of Europe are still the same ones a year from now, is far from guaranteed.

Works Cited

- Baldwin, Richard, and Charles Wyplosz. 2015. *The Economics of European Integration*. London: McGraw-Hill.
- Barber, Simon, Xavier Boyen, Elaine Shi, and Ersin Uzun. 2012. "Bitter to Better — How to Make Bitcoin a Better Currency." *Financial Cryptography and Data Security* 7397: 399-414.
- Bart, Simon, Liisa Mürsepp, Iiona-Evelyn Rannala, Marti Taru, and Maarja Toots. 2014. *Youth and Public Policy in Estonia*. Review of Youth Policy, Berlin: Youth Policy Press.
- Batchelor, Tom. 2017. "The map that shows how many Nato troops are deployed along Russia's border." *The Independent*, February 5: 1. Accessed June 5, 2018. <https://www.independent.co.uk/news/world/europe/russia-nato-border-forces-map-where-are-they-positioned-a7562391.html>.
- Beech, Peter. 2018. "Wandering stars: are Tallinn's digital nomads building the city of the future?" *The Guardian*, May 15. Accessed June 29, 2018. <https://www.theguardian.com/cities/2018/may/15/are-tallinn-digital-nomads-building-the-city-of-the-future>.
- Biggs, John. 2018. "Exit scammers run off with \$660 million in ICO earnings." *Tech Crunch*, April 13. Accessed June 29, 2018. <https://techcrunch.com/2018/04/13/exit-scammers-run-off-with-660-million-in-ico-earnings/>.
- BlockShow Europe . 2018. "Study Results." *BlockShow Europe 2018 website*. May 18. Accessed June 15, 2018. https://blockshow-rating.com/?utm_source=newsletter&utm_medium=rating&utm_campaign=media.
- Blyth, Mark. 2012. "An Approach to Comparative Analysis or a Subfield within a Subfield?" In *Comparative Politics: Rationality, Culture and Structure*, by Mark Irving Lichbach and Alan S. Zuckerman, 193-219. Cambridge: Cambridge University Press.
- Broadbent, Ben. 2016. "Ben Broadbent: Central banks and digital currencies." London: BIS Central Bankers' Speeches, March 2. 1-11.
- Carney, Mark. 2018. "The Future of Money." Edinburgh: The Bank of England, March 2.
- Coindesk. 2018. *State of Blockchain - Q4 2017*. Quaterly Cryptocurrency Statistics Report, New York: Coindesk.
- Conley, John P. 2017. *Blockchain Cryptocurrency Backed with Full Faith and Credit*. Working Paper, Nashville, TN: Vanderbilt University: Economics Department.
- de Grauwe, Paul. 2018. "Bitcoin Is Not The Currency Of The Future." *Social Europe Website*. January 11. Accessed March 31, 2018. <https://www.socialeurope.eu/bitcoin-not-currency-future>.
- Dolliver, Diana S. 2015. "Evaluating drug trafficking on the Tor Network: Silk Road 2, the sequel." *International Journal of Drug Policy* (ELSEVIER) 26: 1113-1123.
- Dombrovskis, Valdis. 2018. "Remarks by Vice-President Dombrovskis at the Roundtable on Cryptocurrencies." *Europa.eu*. February 26. Accessed February 26, 2018. http://europa.eu/rapid/press-release_SPEECH-18-1242_en.htm.

- Ducas, Evangeline, and Alex Wilner. 2017. "The security and financial implications of blockchain technologies: Regulating emerging technologies in Canada." *Canada's Journal of Global Policy Analysis* (SAGE) 74 (4): 538-562.
- Eamets, Raul. 2001. *Reallocation of Labour during Transition. Disequilibrium and Policy Issues. The Case of Estonia*. PhD Thesis, Tartu: University of Tartu.
- Engle, Eric. 2016. "Is Bitcoin Ratpoison? Cryptocurrency, Crime and Counterfeiting." *Journal of High Technology Law* (2): 341-393.
- Estonian Statistical Office. 2000. *Statistical Yearbook of Estonia*. Tallinn: Estonian Statistical Office.
- EU Blockchain Observatory and Forum. 2018. "EU Blockchain Observatory and Forum names members to core Working Groups." *EU blockchain observatory and forum website*. May 18. Accessed July 2, 2018. <https://www.eublockchainforum.eu/news/eu-blockchain-observatory-and-forum-names-members-core-working-groups>.
- European Commission. 2016. *Amending Directive (EU) 2015/849 on the prevention of the use of the financial system for the purposes of money laundering or terrorist financing and amending Directive 2009/101/EC*. Directive of the European Parliament and the Council, Strasbourg: European Commission.
- . 2018. "European Commission launches the EU Blockchain Observatory and Forum." *European Commission - Press release*. Brussels: European Commission. 1-2.
- Filippi, Primavera de. 2014. "Bitcoin: a regulatory nightmare to a libertarian dream." *Internet Policy Review* 1-12.
- Finck, Michèle. 2016. *Blockchain Regulation*. Research Paper, Munich: Max Planck Institute.
- Finck, Michèle. 2017. "Blockchains and Data Protection in the European Union." *Max Planck Institute for Innovation and Competition Research Paper No. 18-01* 1-31.
- Gaunt, Jeremy. 2018. "Any rule on Bitcoin must be global, Germany's central bank say." *Thomson Reuters*, January 15. Accessed March 15, 2018. <https://www.reuters.com/article/us-bitcoin-regulations-germany/any-rule-on-bitcoin-must-be-global-germanys-central-bank-says-idUSKBN1F420E>.
- Gordon, Paul, Marni Hood, and Henry Materne-Smith. 2017. "Crypto-contracts: The Coming of the Blockchain Revolution." *Bulletin (Law Society of South Australia)*, April 3: 34-35.
- Greaves Jr., Percy L. 1973. *Understanding the Dollar Crisis*. Belmont, MA: Western Islands.
- Greenberg, Andy. 2013. "Follow The Bitcoins: How We Got Busted Buying Drugs On Silk Road's Black Market." *Forbes*, September 5: 1. Accessed May 02, 2018. <https://www.forbes.com/sites/andygreenberg/2013/09/05/follow-the-bitcoins-how-we-got-busted-buying-drugs-on-silk-roads-black-market/#1b3ab77dadf7>.
- Haan, Jakob de, Jeroen Hessel, and Niels Gillbert. 2014. "Reforming the architecture of EMU: Ensuring stability in Europe." *DNB working paper*.
- Haas, Ernst. 1958. *The Uniting of Europe: Political, Social, and Economic Forces 1950-57*. Stanford, CA: Stanford University Press.
- Heller, Nathan. 2017. "The Digital Republic." *The New Yorker*, December 18-25: 84-93.

- Hinman, William. 2018. "Digital Asset Transactions: When Howey Met Gary (Plastic)." *US Securities and Exchange Commission* . June 14. Accessed June 30, 2018. <https://www.sec.gov/news/speech/speech-hinman-061418>.
- HM Government of Gibraltar. 2018. "Press Release, Government of Gibraltar." *Gibraltar.gov.gi*. May 18. Accessed June 4, 2018. <https://www.gibraltar.gov.gi/new/sites/default/files/press/2018/Press%20Releases/283-2018.pdf>.
- ICObench.com. 2018. *ICObench.com*. June. Accessed July 8, 2018. <https://icobench.com/stats>.
- Ingebritsen, Christine, Iver Neumann, and Sieglinde Gsthl. 2012. *Small States in International Relations*. Washington: University of Washington Press.
- Johnson, Tim. 2018. "The trouble with bitcoin: Keeping it from getting hacked, lost or stolen." *The Seattle Times*, May 13. Accessed May 25, 2018. https://www.seattletimes.com/business/the-trouble-with-bitcoin-keeping-it-from-getting-hacked-lost-or-stolen/?utm_source=RSS&utm_medium=Referral&utm_campaign=RSS_all.
- Jones, E. 2008. *Economic adjustment and political transformation in small states* . Oxford: Oxford University Press.
- Kasiyanto, S. 2016. "Security Issues of New Innovative Payments." In *Bitcoin and mobile payments : constructing a European Union framework*, by Gabriella Gimigliano, 153-154. London: Palgrave Macmillian.
- Katzenstein, Peter. 1985. *Small States in World Markets*. New York: Cornell University Press.
- Keohane, Robert. 2012. "Liliputian's Dilemas." In *Small States in International Relations*, by Christine Ingebritsen, Iver Neumann and Sieglinde Gsthl, 55-76. Washington: University of Washington Press.
- Kivimäki, Petteri. 2018. "There is no blockchain technology in the X-Road." *Nordic Institute for Interoperability Solutions*. April 26. Accessed May 16, 2018.
- Krugman, Paul, and Robin Wells. 2012. *Macroeconomics (3rd ed.)*. Basingstoke: Worth Publishers.
- La Roche, Julia. 2018. "Charlie Munger: Bitcoin is 'poison' and the government needs to 'step on it hard'." *Yahoo Finance*, February 14. Accessed March 15, 2018. <https://finance.yahoo.com/news/charlie-munger-bitcoin-poison-government-needs-step-hard-211254983.html>.
- Lember, Veiko, Rainer Kattel, and Piret Tonurist. 2018. "Technological capacity in the public sector: the case of Estonia." *International Review of Administrative Sciences* 1-26.
- Liljeqvist, Ivan. 2018. *Introduction to Bitcoin*. February 1. Accessed February 19, 2018. <https://ivanontech.teachable.com/courses/248526/lectures/4251869#/questions/1>.
- Makhovsky, Andrei. 2017. "Belarus adopts crypto-currency law to woo foreign investors." *Reuters*, December 22. Accessed June 4, 2018. <https://www.reuters.com/article/us-belarus-cryptocurrency/belarus-adopts-crypto-currency-law-to-woo-foreign-investors-idUSKBN1EG0XO>.
- Maziers, David. 2016. *The Stellar Consensus Protocol: A Federated Model for Internet-level Consensus*. Cryptocurrency White Paper, Stellar Development Foundation.

- Michaels, Dave, and Paul Vigna. 2018. "World's Second Most Valuable Cryptocurrency Under Regulatory Scrutiny." *Wall Street Journal*, May 1.
- Monetary Authority of Singapore et al. 2017. *The Future is Here: Project Ubin: SGD on Distributed Ledger*. Trail DLT System Evaluation, Singapore: Monetary Authority of Singapore.
- Morris, David Z. 2017. "Maersk Tests Blockchain-Based Freight Tracking." *Fortune*, March 5. <http://fortune.com/2017/03/05/maersk-tests-blockchain-based-freight-tracking/>.
- Nakamoto, Satoshi. 2008. "Bitcoin: A Peer-to-Peer Electronic Cash System." *Bitcoin.org*. Accessed February 18, 2018. <https://bitcoin.org/bitcoin.pdf>.
- Nash, Kim S. 2018. "Business Interest in Blockchain Picks Up While Cryptocurrency Causes Connotations." *The Wall Street Journal*, February 6. <https://blogs.wsj.com/cio/2018/02/06/business-interest-in-blockchain-picks-up-while-cryptocurrency-causes-connotations/>.
- Nelson, Richard, and Sydney Winter. 1982. *An Evolutionary Theory of Economic Change*. Harvard University Press: Cambridge MA.
- Neumann, Iver, and Sieglinde Gsthl. 2012. "Liliputians in Gulliver's World?" In *Small States in International Relations*, by Christine Ingebritsen, Iver Neumann and Sieglinde Gsthl, 3-39. Washington: University of Washington Press.
- Nikkei inc. 2017. "Japan looks to blockchains for more secure e-government systems." *Nikkei Asian Review*, June 29. Accessed May 25, 2018. <https://asia.nikkei.com/Japan-Update/Japan-looks-to-blockchains-for-more-secure-e-government-systems>.
- Poon, Joseph, and Thaddeus Dryja. 2015. *The Bitcoin Lightning Network: Scalable Off-Chain Instant Payments*. November 20. Accessed April 3, 2018. <https://www.weusecoins.com/assets/pdf/library/Lightning%20Network%20Whitepaper.pdf>.
- Rajasalu, T. 1992. *Estonian Economy at the Dawn of Independence*. Statistical Report, Tallin: Estonian Academy of Sciences.
- Roberts, Jeff John. 2017. "Why Tech Investors Love ICOs — and Lawyers Don't." *Fortune*. June 26. Accessed March 19, 2018. <http://fortune.com/2017/06/26/ico-initial-coin-offering-investing/>.
- Salzman, Keith. 2016. *Blockchain-an Emerging Technology that has Promise to Address Functional and Security Needs in Healthcare IT*. Industry analysis of blockchain use-case scenario, IBM, IBM Center for the Business of Government. Accessed April 4, 2018. <http://www.businessofgovernment.org/blog/business-government/blockchain-emerging-technology-has-promise-address-functional-and-security-0>.
- Schwartz, David, Noah Youngs, and Arthur Britto. 2014. *The Ripple Protocol Consensus Algorithm*. Cryptocurrency White Paper, Ripple Labs Inc.
- Schwarz, Mark. 2018. "Comment: Why cryptocurrencies are so popular in Estonia." *International Investment.net*, April 08. Accessed May 25, 2018. <http://www.internationalinvestment.net/opinion/comment-cryptocurrencies-popular-estonia/>.
- Scott, Mark. 2014. "Estonians Embrace Life in a Digital World." *The New York Times*, October 9: B1.
- Sklaroff, JEREMY M. SKLAROFF Jeremy M. 2017. "Smart Contracts and the Cost of Inflexibility." *University of Pennsylvania Law Review* 263-303.

- Smith, Adam (1723-1790). 2000. *The Wealth of Nations / Adam Smith ; Introduction by Robert Reich ; Edited, with Notes, Marginal Summary, and Enlarged Index by Edwin Cannan*. New York: Modern Library.
- Son, Hugh, Hannah Levitt, and Brian Louis. 2017. "Jamie Dimon Slams Bitcoin as a 'Fraud'." *Bloomberg*, September 12. Accessed March 15, 2018. <https://www.bloomberg.com/news/articles/2017-09-12/jpmorgan-s-ceo-says-he-d-fire-traders-who-bet-on-fraud-bitcoin>.
- State of West Virginia. 2018. *Pilot Project: Secure Military Mobile Voting Solution*. March 28. Accessed April 4, 2018. https://gallery.mailchimp.com/8f557e1c6ac0b5aa70dfd4c00/files/4b0e5aad-c98d-4387-b9cd-c05bedae2a5/Secure_Military_Mobile_Voting_Solution.pdf.
- Sundararajan, Sujha. 2018. "France Creates Working Group for Cryptocurrency Regulation." *Coindesk*, January 16.
- Teffer, Peter. 2017. "Estonia to launch own virtual currency." *EUobserver*, December 19. Accessed March 15, 2018. <https://euobserver.com/economic/140344>.
- The Economist. 2013. "How did Estonia become a leader in technology." *The Economist*. July 31. Accessed March 2, 2018. <https://www.economist.com/blogs/economist-explains/2013/07/economist-explains-21>.
- The Federal Council of Switzerland. 2016. "Reduction of barriers to market entry for fintech firms." Bern: Federal Department of Finance FDF, November 2.
- Thorpe, David. 2018. "Bank halts crypto-currency plans over stability fears." *FT Adviser*, January 4: 15. Accessed March 2018. <https://www.ftadviser.com/investments/2018/01/04/bank-halts-crypto-currency-plans-over-stability-fears/>.
- Vaghela, Viren, and Andrea Tan. 2018. "How Malta became a hub of the cryptocurrency world." *Bloomberg*, April 23. Accessed May 19, 2018. <https://www.bloomberg.com/news/articles/2018-04-23/how-malta-became-a-hub-of-the-cryptocurrency-world-quicktake>.
- Vardi, Noah. 2016. "Bit by Bit: Assessing the Legal Nature of Virtual Currencies." In *Bitcoin and Mobile Payments: Constructing a European Framework*, by Gabriella Gimigliano, 55-73. London: Palgrave Macmillan .
- Vital, David. 1967. *The Inequality of States: a study of the small power in international relations*. London: Clarendon.
- Walch, Angela. 2017. "The Path of the Blockchain Lexicon (and the Law)." *Boston University Review of Banking & Financial Law* 713-764.
- Weese, Leonhard. 2017. "Bitcoin Regulation In China Still Unclear, But Chinese Exchanges Thrive Overseas." *Forbes*, November 29. Accessed March 15, 2018. <https://www.forbes.com/sites/leonhardweese/2017/11/29/bitcoin-regulation-in-china-still-unclear-but-chinese-exchanges-thrive-overseas/#6b8ff6986487>.
- Werbach, Kevin. 2018. "Trust, But Verify: Why the Blockchain Needs the Law." *Berkeley Technology Law Journal (forthcoming 2018)* 1-60.
- Witismann, Robert. 2017. "Top 5 Reasons To Incorporate Your Cryptocurrency Business In Estonia." *Medium Blog Website*. November 3. Accessed March 15, 2018.

https://medium.com/@Incorporate_ee/top-5-reasons-to-incorporate-your-cryptocurrency-business-in-estonia-4b96e6d8bc6b.

Wöckener, Karsten, Carsten Lösing, Thilo Diehl, and Annkatrin Kutzbach. 2017. *Regulation of Initial Coin Offerings*. Client Information Report, White and Case.

Wright, Aaron, and Primavera De Filippi. 2015. "Decentralized Blockchain Technology and the rise of Lex Cryptographia." *Social Science Research Network* 1-58.

Zon, Hans von. 2005. "The variety of information society development paths in central Europe." *Springer: AI and Society* 309-326.

Appendices

Figure 1 (Table created using tools available on CoinMarketCap.com)

<https://coinmarketcap.com/currencies/bitcoin/#charts>



Figure 2 (Original table supplied by Quartz journal)

<https://qz.com/1169000/ripple-was-the-best-performing-cryptocurrency-of-2017-beating-bitcoin/>

2017's biggest cryptocurrencies ranked by performance

