

# Singapore's Open Digital Token Offering Embrace: Context & Consequences

Robert W. Greene<sup>1</sup>, David Lee Kuo Chuen<sup>1,2</sup>

<sup>1</sup>Singapore University of Social Sciences, Singapore

<sup>2</sup>Stanford University Distributed Trust Initiative, USA

**Correspondence:** [rwg1819@gmail.com](mailto:rwg1819@gmail.com)

**Received:** 17 May 2019 **Accepted:** 4 June 2019 **Published:** 28 June 2019

## Abstract

The overall global public's ability to purchase some portion of a digital token project's initial batch of tokens is the defining feature of an open digital token offering. Using a dataset that differentiates this token distribution model from other varieties – a distinction often underemphasised in regional analyses of digital token sale trends – this research estimates 2017-18 open digital token offering activity by jurisdiction, finding that Singapore-registered projects accounted for 21 percent of Q3/Q4 2018 dollar-volume, more than any other country. Conversely, by late 2018, previous hubs of this distribution model represented a much smaller share. Reasons for Singapore's rise as a global hub of the open digital token offering are explored, with a particular focus on examining contrasting regulatory approaches to distinguishing between this token distribution model and traditional securities offerings. Notably, 11 percent of Singapore-registered Q3/Q4 2018 token offering dollar-volume was purely-private, versus 94 percent in the U.S. Policy considerations related to this distribution method and the open digital token offering are presented, as are contrasting outcomes: this research estimates that over 70 percent of Singapore's one-to-two-year-old open token offerings resulted in operational networks or minimum-viable-products, versus fewer than 40 percent of U.S. private sales. Also, about 40 percent of smart contract platform projects that conducted 2017-18 token sales were Singapore-registered – many more than in any other country. For reasons explored in this research, these findings support the view that open digital token offerings benefit projects aiming to concurrently raise funds, build up a user-base, and incentivise technologists to contribute to project development. Moreover, risks to retail participants posed by this distribution method are manageable. Singapore's policy approach towards open digital token offerings has benefited the Lion City, which was likely home to more digital token projects that conducted 2018 token sales than any other city in the world.

**Keywords:** *blockchain, digital token markets, digital token offerings, ICO, international finance, securities law, Singapore, smart contracts*

**JEL Classifications:** *G18, G28, F39, K20, K22, K23, O16, O38*

## 1. Introduction

Last year, the dollar-volume of digital token distributions eclipsed the value of initial public offerings within a developed economy with robust capital markets infrastructure. In Singapore, the value of 2018 initial public offerings was \$730 million [1], yet as this research finds, Singapore-registered 2018 digital token sales raised over \$1.6 billion [2].<sup>i</sup> Understanding Singapore's important role within the digital token economy first necessitates understanding digital tokens. For purposes of this research, “digital tokens” are defined as “transferable units generated within a distributed network that tracks ownership of the units through the application of blockchain technology” [3]. Unlike traditional financial assets, a digital token serves as “a

cryptographically-secured representation of a token-holder's rights” to perform certain functions within or receive benefits from a token network [4] [5]. In the case of virtual currencies, a type of digital token, these rights include the ability to store and exchange value within a distributed peer-to-peer payments network [4].

The initial batch of a project's digital tokens can be distributed through various approaches.<sup>ii</sup> For the last two years, the most popular approach, by far, has been the open digital token offering. This article defines an “open digital token offering” as occurring when a software project or business provides purchasing access to some portion of the initial supply of digital tokens associated with a project to most of the global public

(some barriers to access may exist<sup>iii</sup>). Conversely, “private initial token sales” – an alternative form of initial token distribution – restrict outside purchases of any share of a project’s first batch of tokens to only a relatively small number of participants, generally high-net-worth or institutional buyers. Funds raised via these two distribution approaches are commonly used to finance the development of a digital token project’s network, platform, or services.

Section 2 presents estimates of 2017-18 regional open digital token offering trends, finding that the Cayman Islands, Singapore, Switzerland, and the U.S. were the four major hubs of “successful” 2017 open digital token offerings,<sup>iv</sup> but by Q3/Q4 2018, only Singapore remained a leading home to this distribution model. During the second half of 2018, purely-private digital token sales accounted for nearly all digital token offering dollar-volume in the U.S., but just 11 percent in Singapore. This contrast stems from differing regulatory approaches examined in Section 2, which help explain Singapore’s role as a dominant hub of the open digital token offering.

Section 3 assesses the outcomes of Singapore’s open digital token offering embrace, finding that a significantly greater share of one-to-two-year-old Singapore-registered open token offerings relative to U.S. private initial token sales resulted in operational associated networks or services. Singapore-registered token offerings also accounted for a disproportionately large share of 2018 “smart contract platform” projects (defined below). For reasons explored in Section 3, these outcomes provide support to the view that open digital token offerings are well-suited for projects aiming to use a token distribution event to concurrently fundraise, build up a project’s user-base, and incentivise contributions by developer communities. Of course, operational projects are not inherently successful projects, and many may fail, so the scope and management of risks facing open digital token offering retail participants is examined with a focus on Singapore. The extent to which token projects registered in Singapore are primarily physically-based in the country is also estimated.

Section 4 concludes that the consequences of Singapore’s open digital token offering embrace highlight beneficial features of this distribution model, which is well-suited for the swift development and deployment of new distributed services and networks. Singapore, likely home to more digital token projects that conducted successful 2018 token sales than any other city,

stands to benefit in the years to come from its open digital token offering embrace.

## 2. How Policy Influenced Regional Trends in 2017-18 Open Digital Token Offerings

While the first open digital token offering took place in 2013 [5], overall token sale volume did not dramatically accelerate until 2016 and 2017 [3], after Ethereum’s 2015 release. Ethereum is an open-source, decentralised platform for executing and recording “smart contracts” (“set[s] of promises, specified in digital form, including protocols within which the parties perform on these promises” [6] [7], and as a “smart contract platform,” it allows programs to be transparently appended to and run on its blockchain [8]. The late 2015 development of an open-source standard for Ethereum smart contracts [9], the “ERC-20 standard,” provided best practices for coding applications that generate new types of tokens recorded on the Ethereum blockchain (tokens “run on top of Ethereum”) [8]. This drove a huge increase in token offering volume [10] – roughly \$12 million was raised via 2015 digital token sales; in 2016 and 2017, that figure grew to over \$100 million and over \$7.5 billion, respectively [3]. While a token project may eventually swap tokens running on top of Ethereum for tokens recorded and transmitted within a new network it launches [5], at least 60 percent of digital tokens with active secondary markets run on top of Ethereum [11], and many of these may be used within applications designed to permanently run on the Ethereum blockchain.

By 2017, hundreds of token projects were utilising smart contract platforms so that project supporters across the world could receive some of a project’s initial batch of tokens in exchange for providing funds to the project to support its team’s efforts to either build out an application or launch a new network – a process that some policymakers consider to be, under certain circumstances, an unregistered public securities offering. The disclosure, reporting, and structural requirements of a registered public securities offering, however, are quite costly [12]. Moreover, while regulators may exempt small-sized securities offerings or sales exclusively available to wealthy persons from certain public offering requirements, exemptions can lead to regulatory complications for digital token projects, as explained later. Indeed, widely-distributed digital tokens are often quite different than the equity securities historically issued via these public and private channels, which generally entitle holders to a share of distributed profits and the value of a firm, and can provide ownership rights [13].<sup>v</sup> One analysis of 253

digital tokens distributed from 2014 through late 2017 finds that three dominant uses are: 1) access to platform services (68 percent); 2) project governance decisions (25 percent); and 3) payments (21 percent) [14]. Other research finds that over 75 percent of tokens distributed by projects from 2013 through early 2017 provide access to platform services and about half enable payments [5]. Given the stark differences between traditional securities and most digital tokens, applying traditional securities regulations to small projects focused on developing digital token networks can make those projects unworkable [15].

The analysis below estimates 2017-18 successful open digital token offering trends by jurisdiction using data primarily obtained through collaboration with Smith+Crowne, a research and advisory consultancy. Policy factors that influenced 2017-18 trends, particularly those related to securities law, are concurrently examined, revealing external and internal forces behind Singapore's role as a hub of the open digital token offering. The Appendix sets forth the methodology used to construct this study's dataset – unlike other datasets used to analyse regional token offering trends, it distinguishes between private initial token sales and open digital token offerings as well as a token project's physical location versus the jurisdiction of legal registration for its token sale.

## 2.1. Switzerland, the Cayman Islands, Singapore, and the U.S.: 2017 Open Token Offering Hubs

As Figure 1<sup>vi</sup> shows, in 2017, Switzerland was the jurisdictional home to a larger dollar-volume share of successful open digital

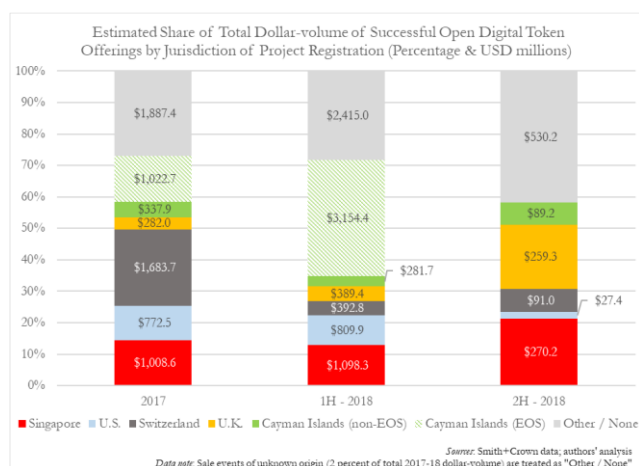


Figure 1. Unlike other jurisdictions, Singapore was a leading home of open digital token offerings during both 2017 and 2018

token offerings (24 percent) than any other jurisdiction in the world, followed by the Cayman Islands (19 percent, of which over 75 percent was U.S.-located EOS's token sale) [2]. Singapore and the U.S. accounted for 14 and 11 percent of total 2017 dollar-volume, respectively, and no other jurisdiction made up more than five percent [2].

In Singapore, the Securities and Futures Act's pre-existing definition of a security [16] (which in the digital token context, largely hinges on a determination of whether ownership or a security interest over the token issuer's assets exists [4] [17]) enabled many open digital token offerings to not be classified as securities offerings throughout 2017. Singapore's emergence as a hub of this distribution model was further enabled by its technologist and legal communities' proactive engagement with the Monetary Authority of Singapore ("MAS") [18] – the country's chief financial markets regulator. By August 2017, the MAS clarified that many open digital token offerings are not securities distributions [4]. In November 2017, it released guidelines providing clear examples of what token sale activities do and do not constitute a securities offering, as well as regulatory responsibilities of a digital token project [19].<sup>vii</sup>

In 2017, the regulatory posture towards open token offerings in the U.S., Switzerland, and the Cayman Islands was relatively less proactive. U.S. Securities and Exchange Commission ("SEC") 2017 enforcement actions provided some insights into circumstances under which the agency will, by applying an ambiguous multi-pronged legal test,<sup>viii</sup> view open digital token offerings to constitute securities distributions, but activity to clarify the regulatory status of particular offering approaches was minimal [3]. Switzerland's top securities market regulator announced in late 2017 that it was investigating some previous open digital token offerings for regulatory breaches [20], but that depending on the circumstances, open digital token offerings may not be considered securities distributions [21]. In the Cayman Islands, regulators made no statements regarding the applicability of securities law to open digital token offerings, although its legal definition of a security is quite narrow [22].

## 2.2. Singapore Remained an Open Token Offering Hub as Policies Elsewhere and Market Trends Shifted

Figure 1 illustrates how by the second-half of 2018, negative digital token market conditions contributed to a sharp dollar-volume decline in open token offerings relative to early 2018. Yet these conditions were global, and do not explain the disparate shifts in jurisdictional shares of dollar-volume

illustrated above. By the second-half of 2018, Cayman, Swiss, and U.S. open digital token offerings accounted for just seven, seven, and two percent of total global dollar-volume, respectively [2]. Alternatively, 21 percent occurred in Singapore, 42 percent took place in smaller jurisdictions (each accounting for less than five percent of total 2018 volume), and 20 percent was in the U.K. [2].<sup>ix</sup>

Several factors help explain these outcomes. For starters, some Asian jurisdictions banned forms of open digital token offerings in Q3 2017 [23]. Singapore’s location, regulatory approach towards open digital token offerings, and rules on foreign investment and visitors – some of the most open in the world, and less-restrictive than those in Switzerland, the U.K., and the U.S. [24] – drew Asia-based projects to Singapore the following year amidst these unfavourable regulatory shifts. Indeed, data indicate that half of non-Singapore-based digital token project teams that conducted successful 2018 Singapore-registered token offerings were primarily physically-located elsewhere in Asia (excluding Russia) [2]. Also in 2018, policy changes drove Swiss banks to close accounts for digital token projects in large volumes and reportedly dramatically increased the relative cost of certain compliance processes [25] [26]. As some countries’ regulatory approaches towards open token offerings became stricter, relatively more accommodative policy frameworks in the U.K. and smaller countries [27] attracted a few sizable open digital token offerings [2],<sup>x</sup> helping explain the larger role of these jurisdictions in 2018 as compared to 2017. Conversely, after the enormous EOS sale ended, Cayman-registered projects accounted for a much smaller share of global open token offering dollar-volume. Perhaps most notably, 2018 U.S. securities regulation trends drove an embrace of the private initial token sale over the open digital token offering for digital token projects seeking sale participants from the U.S.

### 2.3. Singapore Continued Embracing Open Token Offerings as Private Initial Token Sales Dominated in the U.S.

In February 2018, U.S. SEC Chairman Jay Clayton notoriously remarked: “every [initial coin offering] I’ve seen is a security” [28]. If a token project markets to the general public securities not registered with the SEC or issued under certain SEC exemptions, then the issuer can be subject to serious penalties, as well as costly class-action lawsuits [29]. Moreover, non-U.S. persons can be subject to enforcement actions for offering unregistered securities to U.S. persons [30] [31]. Chairman Clayton’s sweeping remarks were followed by about twenty

enforcement actions related to digital tokens [32], and perhaps as many as 100 subpoenas of token projects.<sup>xi</sup> By year-end, no open digital token offering was affirmatively classified by name by the SEC as not being a securities distribution.<sup>xii</sup>

Accordingly, throughout 2018, token projects increasingly banned U.S. persons from participating in open token offerings and relied upon private initial token sales involving a “Regulation D” securities offering to access U.S. buyers. Regulation D allows fundraising events to avoid expensive public securities offerings requirements if sales are generally restricted only to “accredited investors” – primarily defined as individuals/households making over \$200,000/\$300,000 annually or with a net worth over \$1,000,000 [33]. Many Regulation D safe-harbour sales used the U.S. accredited investor threshold as a sole determinant for sale participation regardless of the country where those seeking to purchase tokens were legally-domiciled.<sup>xiii</sup> Several U.S. token projects utilised the Regulation Crowdfunding (“CF”) exemption to conduct open digital token offerings exempted from public securities offering requirements, but these capped sales likely accounted for just 1 percent of overall 2018 token sale dollar-volume [2] [34].<sup>xiv</sup>

As Figure 2<sup>xv</sup> shows, by Q3/Q4 2018, purely-private sales accounted for 94 percent of the dollar-volume of successful U.S. token offerings, versus just 11 percent in Singapore – which continued to embrace the open digital token offering [2]. Indeed, in October 2018, the MAS’s Managing Director Ravi Menon stated that the MAS had “seen quite a lot of [digital token offering] activity that is not security related” [35]. In only

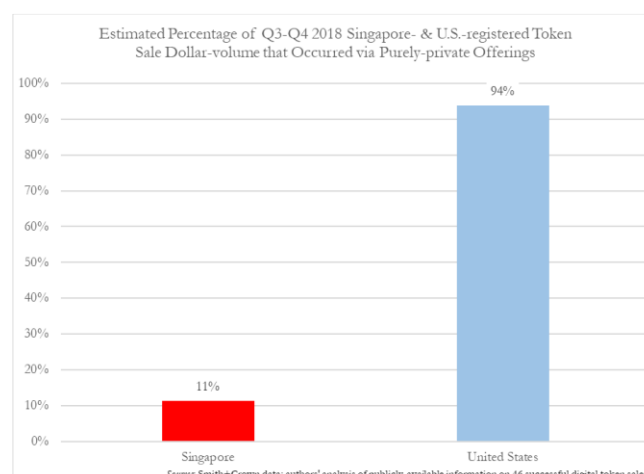


Figure 2. Purely-private token sales accounted for almost all Q3/Q4 2018 U.S. token sale volume, but were relatively minimal in Singapore

one instance in 2018 did the MAS announce that it directed a project to cease offering tokens to Singapore-based persons because it considered the project's sale of tokens to be an unregistered public securities offering [36] – evidence of a clearly-understood regulatory distinction between open digital token offerings and traditional securities distributions.

Surely, some 2018 private initial token sales took place without involving Regulation D. The vast majority of private initial token sale events, however, involved a Regulation D offering [2]. Overall, approximately 75 percent of 2018 digital token offering dollar-volume was open, rather than purely-private [2].

### 3. Exploring the Implications of Singapore's Open Digital Token Offering Embrace

Clearly, a number of external and internal policy factors contributed to Singapore's emergence as a global open digital token offering hub. This section explores outcomes of Singapore's embrace of this token distribution model related to: 1) the operational status and focus of Singapore-registered token projects; 2) open token offering retail participant risks; and 3) the extent to which Singapore-registered projects are physically-based in the country.

#### 3.1. Open Digital Token Offerings Offer Unique Benefits Related to Widespread Token Distribution

As a recent study helps illustrate, open digital token offerings can enable digital token networks to concurrently raise funds and build up an active community of users and project contributors [37]. Indeed, research finds that higher community engagement is associated with a token project's success [38]. As one analysis explains, despite the growing relevance of institutional investors in open digital token offerings (about 37 percent of 2018 token offerings through mid-Q3 reportedly conducted private sale stages [39]), "putting a token into the hands of 50,000 people who actually went through the process of research and purchase is the best form of mass-market engagement available that will increase the likelihood of project success" [40].

Figure 3<sup>vi</sup> suggests that an open token offering model may indeed accelerate the pace at which token networks and applications become operational relative to purely-private sales. It shows that by mid-June 2019, over 70 percent of Singapore-registered projects that conducted successful open digital token offerings from Q3 2017 through Q2 2018 launched

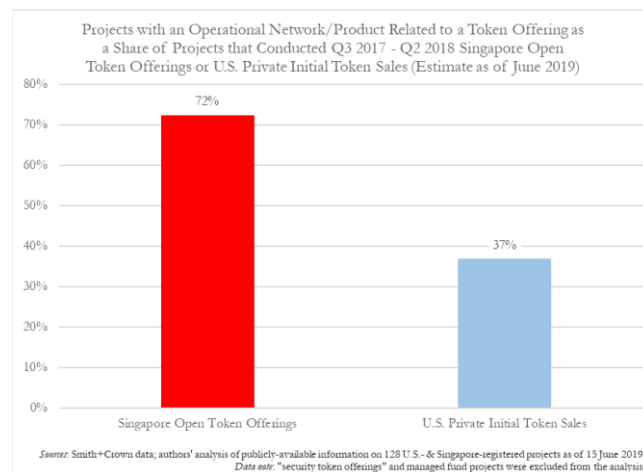


Figure 3. A greater share of one-to-two-year-old Singapore open digital token offerings resulted in operational networks and products relative to Q3 2017 - Q2 2018 U.S. private initial token sales

“operational” products or networks related to the token sale, versus 37 percent of U.S.-registered projects that successfully conducted a Regulation D safe-harbour private initial token sale during that time. “Operational” is defined as the publicly-available release of: 1) a token network's open-source and live testnet or mainnet; and/or 2) a minimum-viable-product usable by the project's targeted customer base.

One driver of the discrepancy in Figure 3 is that regulations restrict the re-sale to non-accredited investors of digital tokens distributed via a Regulation D safe-harbour offering [41] [42]. This impedes the ability of projects that conduct token offerings using the Regulation D safe-harbour to leverage primary or secondary digital token markets to facilitate widespread token ownership by a globally-dispersed community of developers. As the founder of a project that conducted one of the largest private initial token sales to date remarked after apologising that his project's token offering would be purely-private: “[the accredited investor threshold] excludes some of the groups most capable of investing in these kinds of projects, for example, cryptography and game theory PhD students” [43].

Indeed, Ethereum sale data and subsequent survey data suggests 50 to 75 percent of Ethereum's open digital token offering participants contributed less than \$1,000 [44] [10], and the network's early attraction of a large community of well-informed retail token-holders played a critical role in its success [10]. Open digital token offerings facilitate participation in open-source software development and create a sense of empowerment and ownership, thus mobilising programmers to test and improve underlying software [14]. This open-source ethos is particularly important for the development of smart

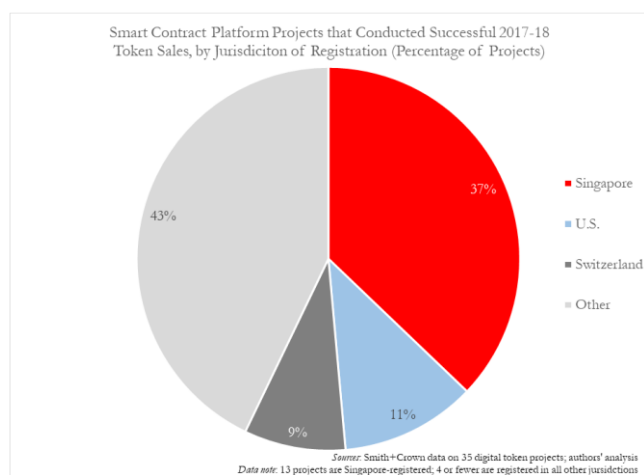


Figure 4. Nearly 40 percent of smart contract platform projects that conducted successful 2017-18 token sales are registered in Singapore

contract platforms such as Ethereum – it is difficult to imagine developers building applications or engaging with strangers on a platform that they do not understand and cannot test [45]. Accordingly, as Figure 4<sup>vii</sup> illustrates, a disproportionate share of smart contract platform projects that conducted 2017-18 token offerings were Singapore-registered, likely due in part to Singapore's embrace of the open digital token offering. These projects largely aim to increase the range of economic and social contexts in which open blockchain solutions can be applied by building platforms that overcome some of Ethereum's scalability challenges.

### 3.2. Risks to Open Digital Token Offering Retail Participants are Manageable

Open digital token offerings can result in inexperienced persons purchasing tokens from digital token projects that are not long-term viable – many projects have failed or probably will fail [46] [47]. Yet inexperienced retail exposure to these tokens is much more likely to be facilitated by online accounts easily-opened with secondary market trading venues rather than directly via open digital token offerings. Moreover, few Singapore-registered digital token offerings involve substantial direct Singapore-based retail purchases, although this is reportedly in part because some projects restrict Singapore persons' participation in token offerings [48]. Research also suggests, however, that most digital token offering participants contribute modest-size dollar-amounts, and that these contributors largely have a technology background or meaningful investment experience [10]. Indeed, participation in open digital token offerings usually necessitates a moderate level of technological acumen and market awareness – a purchaser

often must understand how to operate an ERC-20 “wallet,” and sale participation may require first signing up via a whitelist.

Surely, despite these barriers, the low cost of structuring an open digital token offering can allow fraudsters to solicit funds with relative ease. As much as ten percent of pre-mid-2018 digital token sale dollar-volume were scams [49], although some research suggests that the degree of fraud is much lower [50] and that “investors are shrewd enough to spot [scams]” [46]. Moreover, in Singapore, fraud can result in lengthy jail sentences [51], and while some uncertainty surrounds the applicability of criminal law to matters involving digital tokens [17], two foreigners recently charged for promoting a fraudulent digital token project may face up to five years in jail [52]. Furthermore, the Singapore-registered entity responsible for a token sale must have at least one Singapore citizen or permanent resident on the board, as well as a local secretary [53]. These gatekeepers, as well as Singapore's legal community (which drafts token offering documents) and the Accounting and Corporate Regulatory Authority, further minimise the likelihood of fraudulent open digital token offerings.

While Singapore's open token offering embrace has not made it a safe-haven for fraudulent projects, markets for some tokens generated via Singapore-registered offerings have been nefariously manipulated. Bad actors can create false optimism and spikes in a token's value, and then sell the token at a market high, driving a large price decline that harms retail token-holders [54]. In fact, Singapore's first open digital token offering resulted in a token later manipulated by such a pump-and-dump scheme [55]. Singapore's government has warned of this predatory market behaviour [56], but retail investors can still fall victim. Yet market manipulation is a serious issue for many digital tokens – not a problem exclusive to those generated via open token offerings.

### 3.3. Nearly Half of Singapore-registered Token Projects are Primarily Physically-based in the Country

Despite the large number of Singapore-registered projects primarily physically-based outside the city, Figure 5<sup>viii</sup> shows that a greater share of Singapore-registered projects that successfully conducted token sales in 2018 are domestically-based relative to the respective share of Switzerland- and Cayman-registered projects primarily physically-based in those jurisdictions [2]. Surely, at 46 percent, the share of projects physically-based in Singapore has room to grow. Yet a recent industry survey finding that Singapore is the world's leading

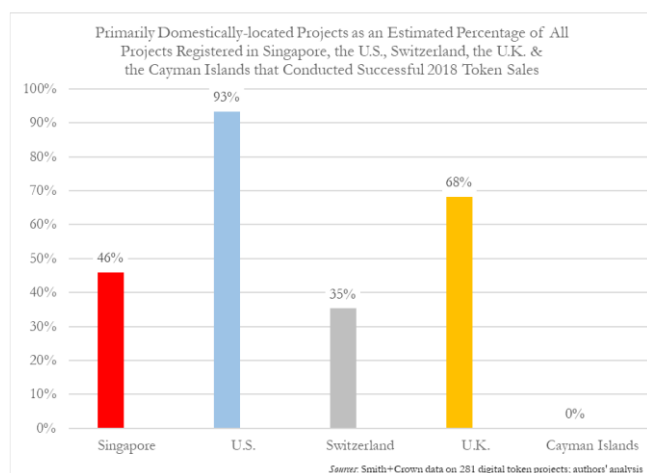


Figure 5: Almost half of projects that conducted successful 2018 Singapore-registered token offerings were primarily physically-located in the city

“crypto hub” city notes that its strengths relative to other cities include not only the robust “activity” of its digital token project community, but also Singapore’s “international ecosystem” [57]. Indeed, Singapore’s relative openness to foreign visitors [24] enables internationally-diverse project teams not primarily physically-located in the country – many of which are based elsewhere in Asia, as mentioned in Section 2 – to regularly visit and maintain a secondary presence there.

Moving forward, Singapore will benefit from its physical concentration of token projects, as research indicates that geographically-concentrated innovation within a particular field begets relatively deeper and swifter innovative activities [58]. Data indicate that Singapore was likely home to more projects that successfully conducted digital token sales in 2018 than any other city, with the second- and third-highest being San Francisco (including Palo Alto) and London [2].

#### 4. Conclusion

The open digital token offering can enable projects to simultaneously: 1) raise funds for the development of a project’s network, platform, or service; 2) build up a user-base; and 3) incentivise globally-dispersed communities of developers to contribute to a project. While in certain jurisdictions, this token distribution model may be deemed to be a securities offering, in practice, the open digital token offering and digital tokens it produces are often fundamentally different than traditional securities distributions and securities, respectively. Singapore’s emergence as a global hub of the open digital token offering was enabled not only through existing legal frameworks and constructive steps to produce regulatory clarity regarding

securities law, but also by its geographic location and openness to foreign visitors and capital.

The inclusiveness of open digital token offerings, as well as Singapore’s regulatory clarity regarding this distribution model, help explain why a greater share of one-to-two-year-old Singapore-registered open digital token offerings, relative to U.S. private initial token sales, have resulted in operational networks or minimum-viable-products, and why so many token offerings for 2018 smart contract platform projects were Singapore-registered. Indeed, open digital token offerings are well-suited for incentivising the development of open-source projects. While this distribution model can ease the ability of bad actors to conduct fraud, fraudulent projects are likely not a major concern in Singapore, in part due to local gatekeepers and strict laws. There are also practical barriers-to-entry associated with open token offerings that preclude large-scale participation of an uninformed public.

While open digital token offerings have flaws and can support likely-to-fail projects, trends highlighted in this research support claims that this distribution model is advantageous relative to securities offerings and private initial token sales for certain types of projects, particularly those focused on launching distributed open-source networks and services. Because of its embrace of the open digital token offering, as well as other policy factors, Singapore is well-positioned to remain a hub of open blockchain innovations.

#### 5. Appendix

Token projects included in the dataset used in this research’s estimates of token sale activity (the “Primary Dataset” [2]) were initially sourced by Smith+Crowe through: 1) a detailed Smith+Crowe intake survey submitted by token projects; 2) Smith+Crowe’s bi-monthly reviews of online data aggregators and the SEC EDGAR database; and 3) Smith+Crowe’s reviews of ongoing industry events. Before including projects identified through these channels in the Primary Dataset, Smith+Crowe confirmed that project team member identities were transparent, there was a reasonable amount of public documentation and information available on the project, the project raised over \$25,000, and funds raised were not returned to initial backers – for purposes of this article, these criteria are used to classify a “successful” digital token offering. This sourcing methodology makes the scope of Smith+Crowe’s data smaller relative to those of some popular online aggregators,

which may exclusively rely on information sourced through token project self-reporting.

To obtain dollar-raised figures, Smith+Crown sourced token projects' self-reported dollar-raised amounts from data aggregators, and then verified those amounts using on-chain analysis,<sup>xix</sup> SEC EDGAR, other government filings, reports from reliable news sources, or official project statements. If a raise amount was unverifiable, then Smith+Crown entered the amount raised by the project as zero. Generally, token sale dates were determined using the reported date of a sale period ending, and multiple sale stages of a single token offering were treated as a single offering event as long as: 1) sale terms were largely similar; and 2) sale periods were not separated by more than thirty days (otherwise, sales were treated separately).<sup>xx</sup>

Unlike datasets used in other analyses of global token sale trends (for example, [27] [59]), the Primary Dataset clearly distinguishes between a project's legal jurisdiction and physical location. The legal jurisdiction of the entity responsible for a token offering was determined for almost all 2017-18 token sale dollar-volume, and was identified using information provided on the sourcing survey, which Smith+Crown verified and, as necessary, corrected through a review of a project's website and sale terms in collaboration with the authors.<sup>xxi</sup> To determine the primary physical location of digital token projects, publicly-available information on the project's website was used. When data was not available, LinkedIn.com information was reviewed, and the reported city of the project's or CEO's LinkedIn page was treated as the project team's location. If that data was not available, then the self-reported location of the CTO or the predominant location of other project team members was used. For six percent of the projects reviewed to produce Figure 5, the primary location of the project team was listed as unknown, and overall, for approximately 25 percent of 2018 token sale events contained in the Primary Dataset, project team location information was unknown or not recorded.

To determine whether a token offering was an open digital token offering or a private initial token sale, Smith+Crown and the authors reviewed government filings, project announcements, reputable news sources, and token sale terms.<sup>xxii</sup> Multi-tiered sales consisting of both public and private sale stages (including Regulation D offerings followed by public sales) were generally treated as one open digital token offering, in line with this article's definition of that distribution method; conversely, private sales conducted in advance of cancelled or planned (but yet to occur) open sale rounds were treated as

private initial token sales (for example, Telegram's token sale). Digital token projects that conducted Regulation D offerings concurrently or shortly before an open digital token offering that restricted U.S. non-accredited-investors from participating were treated as part of a single open digital token offering. Security token offerings and token sales by projects structured as investment funds were not treated as open digital token offerings, but were included in this article's holistic analyses of digital token offerings (including Figures 2 and 5).<sup>xxiii</sup>

Figure 3 was produced using a definition of "operational" set forth in Section 3 and developed in collaboration with Smith+Crown, LongHash, and other industry participants. Q3 2017 to Q2 2018 Singapore open digital token offerings and U.S. private initial token sales were classified as "operational" or not as of mid-June 2019 based on a review of publicly-available information. Proof-of-works and proof-of-concepts were not treated as "operational" projects. Project classifications used to produce Figure 4 were developed from Smith+Crown's review of project white papers and public information. Based on that review, Smith+Crown tagged certain projects as "smart contract platform" projects, meaning that the project's primary focus is developing a smart contract platform.

**Competing Interests:**

*None declared.*

**Ethical approval:**

*Not applicable.*

**Author's contribution:**

*RWG<sup>1</sup> and DLKC<sup>1,2</sup> designed and coordinated this research and prepared the manuscript in entirety.*

**Funding:**

*RWG<sup>1</sup> wants to thank the Foundation of the Chamber of Digital Commerce for a modest travel and conference expenditures grant that funded research-related visits to Hong Kong, Singapore, and Tokyo.*

**Acknowledgements:**

*RWG and DLKC deeply thank Smith+Crown (Matt Chwierut, Brian Lio, Alistair Simmonds, and Stuart Young) for providing data that made this research possible. The authors are also appreciative of helpful insights shared by LongHash (Emma Cui and Shi Khai Wei) and CoinMarketCap (Carlyne Chan and Aaron Khoo), as well as by Paul S. Atkins, Perianne Boring, Jehan Chu, Matthew Comstock, Nizam Ismail, Amy Davine Kim, TM Lee, Daniel Liebau, Bobby Ong, Remington Ong, Teong Jing Sim and Diego Zuluaga.*

**References:**

- [1] "Singapore IPO proceeds plunge to \$730m in 2018," Singapore Business Review, 2018 Dec 21. [Online]. Available: <https://sbr.com.sg/markets-investing/in-focus/singapore-ipo-proceeds-plunge-730m-in-2018>. [Accessed 15 Jun 2019].



- [2] Smith+Crowne, Dataset on file with authors [see Appendix for methodology used by Smith+Crowne and the authors to construct dataset], 2019.
- [3] Token Alliance, “Understanding digital tokens: market overviews and proposed guidelines for policymakers and practitioners,” Chamber of Digital Commerce, 2018.
- [4] MAS, “MAS clarifies regulatory position on the offer of digital tokens in Singapore,” 1 Aug 2017. [Online]. Available: <http://www.mas.gov.sg/News-and-Publications/Media-Releases/2017/MAS-clarifies-regulatory-position-on-the-offer-of-digital-tokens-in-Singapore.aspx>. [Accessed 15 Jun 2019].
- [5] D. Chuen, L. Low and Y. Wang, “Introduction to initial crypto-token offering,” in *Inclusive FinTech: Blockchain, Cryptocurrency and ICO*, Singapore, World Scientific Publishing Company, 2018, pp. 83-114.
- [6] N. Szabo, “Smart contracts: building blocks for digital markets,” 1996. [Online]. Available: [http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart\\_contracts\\_2.html](http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart_contracts_2.html). [Accessed 15 Jun 2019].
- [7] Ethereum Foundation, “Developer resources: guides, resources, and tools for developers building on Ethereum,” [Online]. Available: <https://www.ethereum.org/developers/>. [Accessed 15 Jun 2019].
- [8] P. V. Valkenburgh, “What does it mean to issue a token ‘on top of’ Ethereum?,” *Coin Center*, 10 May 2017. [Online]. Available: <https://coincenter.org/entry/what-does-it-mean-to-issue-a-token-on-top-of-ethereum>. [Accessed 15 Jun 2019].
- [9] F. Vogelsteller, “ERC: token standard,” *GitHub*, Nov 2015. [Online]. Available: <https://github.com/ethereum/EIPs/issues/20>. [Accessed 15 Jun 2019].
- [10] D. Chuen, L. Low, M. Chwierut, W. Anderson, B. Lio and B. Downes, “The characteristics of token investors,” in *Inclusive FinTech: Blockchain, Cryptocurrency and ICO*, Singapore, World Scientific Publishing Company, 2018, pp. 125-171.
- [11] CoinMarketCap, Dataset on file with authors, 2019.
- [12] PricewaterhouseCoopers, “Considering an IPO to fuel your company’s future? Insight into the costs of going public and being public,” Nov 2017. [Online]. Available: <https://www.pwc.com/us/en/deals/publications/assets/cost-of-an-ipo.pdf>. [Accessed 15 Jun 2019].
- [13] International Monetary Fund, “Handbook on securities statistics,” 2015. [Online]. Available: <https://www.imf.org/external/np/sta/wgsd/pdf/hss.pdf>. [Accessed 15 Jun 2019].
- [14] S. Adhami, G. Giudici and M. Stefano, “Why do businesses go crypto? An empirical analysis of initial coin offerings,” *Journal of Economics and Business*, vol. 100, pp. 64-75, May 2018.
- [15] H. Peirce, “Regulation: a view from inside the machine,” 8 Feb 2019. [Online]. Available: <https://www.sec.gov/news/speech/peirce-regulation-view-inside-machine>. [Accessed 15 Jun 2019].
- [16] Securities and Futures Act (Cap. 289), Section 2(1).
- [17] J. W. Lim, “A facilitative model for cryptocurrency regulation in Singapore,” in *Handbook of Digital Currency: Bitcoin, Innovation, Financial Instruments, and Big Data*, London, U.K., Elsevier Inc., 2015, pp. 361-380.
- [18] S. Yep, “How Singapore became Asia’s ICO hub,” *LongHash*, 30 Apr 2018. [Online]. Available: <https://www.longhash.com/news/14>. [Accessed 15 Jun 2019].
- [19] MAS, “A guide to digital token offerings,” 14 Nov 2017. [Online]. Available: <http://www.mas.gov.sg/News-and-Publications/Monographs-and-Information-Papers/2017/Guidance-on-Digital-Token-Offerings.aspx>. [Accessed 15 Jun 2019].
- [20] FINMA, “FINMA is investigating ICO procedures,” *FINMA*, 29 Sep 2017. [Online]. Available: <https://www.finma.ch/en/news/2017/09/20170929-mm-ico/>. [Accessed 15 Jun 2019].
- [21] FINMA, “FINMA guidance 04/2017,” 29 Sep 2017. [Online]. Available: <https://www.finma.ch/en/~media/finma/dokumente/dokumenten-center/myfinma/4dokumentation/finma-aufsichtsmittelungen/20170929-finma-aufsichtsmittelung-04-2017.pdf>. [Accessed 15 Jun 2019].
- [22] N. Rogers and C. Macculloch, “Building blocks for ICOs in the Cayman Islands,” *Cayman Financial Review*, 22 Jan 2018. [Online]. Available: <https://www.caymanfinancialreview.com/2018/01/22/building-blocks-for-icos-in-the-cayman-islands/>. [Accessed 15 Jun 2019].
- [23] J. Russell, “First China, now South Korea has banned ICOs,” *TechCrunch*, 29 Sep 2017. [Online]. Available: <https://techcrunch.com/2017/09/28/south-korea-has-banned-icos/>. [Accessed 15 Jun 2019].
- [24] I. Vásquez and T. Porcnik, “The human freedom index, XLSX (2016 “foreign ownership/investment restrictions,” “capital controls,” and “freedom of foreigners to visit” variables),” *Cato Institute*, 2018. [Online]. Available: <https://object.cato.org/sites/cato.org/files/human-freedom-index-files/hfi2018web-revised3.xlsx>. [Accessed 15 Jun 2019].
- [25] A. Irrera and B. H. Neghaiwi, “Switzerland seeks to regain cryptocurrency crown,” *Reuters*, 19 Jul 2018. [Online]. Available: <https://www.reuters.com/article/us-cryptocurrencies-banking-switzerland/switzerland-seeks-to-regain-cryptocurrency-crown-idUSKBN1K91AY>. [Accessed 15 Jun 2019].
- [26] K. Sedgwick, “Swiss regulations are driving ICOs away,” *Bitcoin.com*, 9 Apr 2018. [Online]. Available: <https://news.bitcoin.com/swiss-regulations-are-driving-icos-away/>. [Accessed Jun 15 2019].
- [27] W. Kaal, “Initial coin offerings: the top 25 jurisdictions and their comparative regulatory responses (as of May 2018),” *Stanford Journal of Blockchain Law & Policy*, vol. 2, 2019.
- [28] M. Orcutt, “Cryptocurrencies crashed in 2018. Now they’re right where they should be,” *MIT Technology Review*, 26 Dec 2018. [Online]. Available: <https://www.technologyreview.com/s/612659/cryptocurrencies-crashed-in-2018-now-theyre-right-where-they-should-be/>. [Accessed 15 Jun 2019].
- [29] G. P. Fondo, M. Chang, M. Spillane, S. Fox and T. Kistner, “ICO participant liability — could you be liable for assisting in the sale of unregistered securities?,” *Bloomberg Law*, 15 Dec 2017. [Online]. Available: <https://news.bloomberglaw.com/securities-law/ico-participant-liability-could-you-be-liable-for-assisting-in-the-sale-of-unregistered-securities>. [Accessed 15 Jun 2019].

- [30] T. Hanusik and T. Rodriguez, "I don't live in the United States, so how can the SEC sue me? SEC actions against a foreign national living outside the United States," *Bloomberg Finance L.P.*, 2008. [Online]. Available: <https://www.crowell.com/documents/SEC-Actions-against-a-Foreign-National-Living-Outside-the-United-States.pdf>. [Accessed 15 Jun 2019].
- [31] J. Debler, "Foreign initial coin offering issuers beware: the Securities and Exchange Commission is watching," *Cornell International Law Journal*, vol. 51, pp. 245-272, 2018.
- [32] SEC, "Cyber enforcement actions," [Online]. Available: <https://www.sec.gov/spotlight/cybersecurity-enforcement-actions>. [Accessed Jun 15 2019].
- [33] U.S. Code of Federal Regulations Title 17 Parts 230.501-230.508.
- [34] P. H. Lee, "Crowdfunding capital in the age of blockchain-based tokens," *St. John's Law Review*, vol. 92, pp. 833-913, 2018.
- [35] C. Chanjaroen and H. Amin, "Singapore will help crypto firms set up local bank accounts," *Bloomberg*, 10 Oct 2018. [Online]. Available: <https://www.bloomberg.com/news/articles/2018-10-10/singapore-aids-crypto-firms-seeking-banks-while-staying-vigilant>. [Accessed Jun 15 2019].
- [36] MAS, "MAS warns digital token exchanges and ICO issuer," 24 May 2018. [Online]. Available: <http://www.mas.gov.sg/News-and-Publications/Media-Releases/2018/MAS-warns-Digital-Token-Exchanges-and-ICO-Issuer.aspx>. [Accessed 15 Jun 2019].
- [37] J. Li and W. Mann, "Initial coin offering and platform building," Working paper, Jun 17 2018. [Online]. Available: [https://www.jbs.cam.ac.uk/fileadmin/user\\_upload/research/centres/alternative-finance/downloads/2018-af-conference/paper-li.pdf](https://www.jbs.cam.ac.uk/fileadmin/user_upload/research/centres/alternative-finance/downloads/2018-af-conference/paper-li.pdf). [Accessed 15 Jun 2019].
- [38] H. T. Sabrina, M. Niessner and D. Yermack, "Initial coin offerings: financing growth with cryptocurrency token sales," ECGI working paper series in finance, working paper no. 564/2018, Jul 2018. [Online]. Available: [https://ecgi.global/sites/default/files/working\\_papers/documents/finalhowellniessneryermack.pdf](https://ecgi.global/sites/default/files/working_papers/documents/finalhowellniessneryermack.pdf). [Accessed 15 Jun 2019].
- [39] J. Lee, "ICOs are turning exclusive as wealthy investors snatch up deals," *Bloomberg*, 8 Aug 2018. [Online]. Available: <https://www.bloomberg.com/news/articles/2018-08-08/token-sales-turn-exclusive-as-private-investors-snatch-up-deals>. [Accessed 15 Jun 2019].
- [40] M. Dibb, "Are public token sales a thing of the past?," *Medium: Astronaut Capital*, 29 May 2018. [Online]. Available: <https://medium.com/astronaut-capital/are-public-token-sales-a-thing-of-the-past-15c89efefa1a>. [Accessed 15 Jun 2019].
- [41] U.S. Code of Federal Regulations Title 17 Part 230.144.
- [42] U.S. Code of Federal Regulations Title 17 Part 230.144A.
- [43] I. Allison, "Filecoin laments shutting out crypto supporters to meet SEC regulations," *International Business Times*, 8 Aug 2017. [Online]. Available: <https://www.ibtimes.co.uk/filecoin-laments-shutting-out-crypto-supporters-meet-sec-regulations-1633620>. [Accessed 15 Jun 2019].
- [44] V. Buterin, "Ether sale: a statistical overview," *Ethereum Foundation*, 8 Aug 2014. [Online]. Available: <https://blog.ethereum.org/2014/08/08/ether-sale-a-statistical-overview/>. [Accessed 15 Jun 2019].
- [45] P. V. Valkenburgh, "What is 'open source' and why is it important for cryptocurrency and open blockchain projects?," *Coin Center*, 17 Oct 2017. [Online]. Available: <https://coincenter.org/entry/what-is-open-source-and-why-is-it-important-for-cryptocurrency-and-open-blockchain-projects>. [Accessed 15 Jun 2019].
- [46] H. Benedetti and L. Kostovetsky, "Digital tulips? returns to investors in initial coin offerings," Working paper, May 20 2018. [Online]. Available: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3182169](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3182169). [Accessed 15 Jun 2019].
- [47] J. Daniell, "Ethereum's Vitalik Buterin on 'tokens 1.0,'" *ETHNews*, 24 Oct 2017. [Online]. Available: <https://www.ethnews.com/ethereum-vitalik-buterin-on-tokens-10>. [Accessed 15 Jun 2019].
- [48] R. Jayaseelan, "Singapore's ICO gamble," *The Star Online*, 24 Dec 2018. [Online]. Available: <https://www.thestar.com.my/business/business-news/2018/12/24/singapores-ico-gamble/>. [Accessed 15 Jun 2019].
- [49] Statist Group, "Cryptoasset market coverage initiation: network creation," *Bloomberg*, Jul 2018. [Online]. Available: [https://research.bloomberg.com/pub/res/d28giW28tf6G7T\\_Wr77aU0gDgFQ](https://research.bloomberg.com/pub/res/d28giW28tf6G7T_Wr77aU0gDgFQ). [Accessed 15 Jun 2019].
- [50] D. Liebau and P. Schueffel, "Cryptocurrencies and initial coin offerings: are they scams? - an empirical study," *The Journal of The British Blockchain Association*, vol. 2, no. 1, pp. 47-55, 2019.
- [51] S. Sharpe, "Financial crime in Singapore: overview," *Thomson Reuters Practical Law*, 2017. [Online]. Available: [https://uk.practicallaw.thomsonreuters.com/3-618-7957?\\_lrTS=20190325161937875&transitionType=Default&contextData=\(sc.Default\)&firstPage=true&comp=pluk&bhcp=1#co\\_anchor\\_Ib17914890ef411e798dc8b09b4f043e0](https://uk.practicallaw.thomsonreuters.com/3-618-7957?_lrTS=20190325161937875&transitionType=Default&contextData=(sc.Default)&firstPage=true&comp=pluk&bhcp=1#co_anchor_Ib17914890ef411e798dc8b09b4f043e0). [Accessed 15 Jun 2019].
- [52] R. Mui, "Two men charged in Singapore with promoting 'fraudulent cryptocurrency' OneCoin," *The Business Times*, 10 Apr 2019. [Online]. Available: <https://www.businesstimes.com.sg/government-economy/two-men-charged-in-singapore-with-promoting-fraudulent-cryptocurrency-onecoin>. [Accessed 15 Jun 2019].
- [53] Flag Theory, "Where to set up a foundation for an ICO (a comparative analysis)," 6 Oct 2017. [Online]. Available: <https://flagtheory.com/foundation-initial-coin-offering-ico/>. [Accessed 15 Jun 2019].
- [54] J. Xu and B. Livshits, "The anatomy of a cryptocurrency pump-and-dump scheme," in *28th Usenix Security Symposium*, Santa Clara, CA, USA, 2019.
- [55] S. Shifflett and P. Vigna, "Traders are talking up cryptocurrencies, then dumping them, costing others millions," 5 Aug 2018. [Online]. Available: <https://www.wsj.com/graphics/cryptocurrency-schemes-generate-big-coin/>. [Accessed 15 Jun 2019].
- [56] Singapore Government, "Are digital tokens such as cryptocurrencies a simple, safe, and sure-fire way of making money?," *Factually*, 25 May 2018. [Online]. Available: <https://www.gov.sg/factually/content/digital-tokens>. [Accessed Jun 15 2019].
- [57] R. Kurani, "Which are the best locations for blockchain companies?— we asked our well-travelled crypto friends," *Medium*, 22 Feb 2019. [Online]. Available: <https://medium.com/birds-view/which-are-the-best-locations-for-blockchain-companies-bd816c940456>. [Accessed 15 Jun 2019].

- [58] M. Muro and B. Katz, "The new 'cluster moment': how regional innovation clusters can foster the next economy," Metropolitan Policy Program, Brookings Institution, Sep 2010. [Online]. Available: [https://www.brookings.edu/wp-content/uploads/2016/06/0921\\_clusters\\_muro\\_katz.pdf](https://www.brookings.edu/wp-content/uploads/2016/06/0921_clusters_muro_katz.pdf). [Accessed 15 Jun 2019].
- [59] Ernst and Young, "EY research: initial coin offerings (ICOs)," EY, Dec 2017. [Online]. Available: [https://www.ey.com/Publication/vwLUAssets/ey-research-initial-coin-offerings-icos/\\$File/ey-research-initial-coin-offerings-icos.pdf](https://www.ey.com/Publication/vwLUAssets/ey-research-initial-coin-offerings-icos/$File/ey-research-initial-coin-offerings-icos.pdf). [Accessed 15 Jun 2019].
- 
- <sup>i</sup> Dollar-volume figures throughout this article are in U.S. dollars. This figure includes open digital token offerings, security token offerings, and private initial token sales. See the Appendix for methodology used to calculate dollar-volume figures of 2017-18 digital token sales presented throughout this research.
- <sup>ii</sup> Trends related to initial mining events and airdrops are not analysed in this research.
- <sup>iii</sup> Obstacles related to retail investor technological acumen are discussed in Section 3. Additionally, compliance with anti-money laundering laws, sanctions, and/or securities law interpretations may cause projects to decide to prohibit certain nationalities from participating in open digital token offerings.
- <sup>iv</sup> For an explanation of how this research defines a "successful" digital token sale, see the Appendix.
- <sup>v</sup> The U.S. legal definition of a security extends beyond equity and debt securities and includes "investment contracts," defined according to a multi-prong common law test [3] (see footnote viii and accompanying text).
- <sup>vi</sup> Figure 1 was produced by the authors using a Smith+Crowne dataset of 2017-18 digital token offerings [2]. Sale-level data related to country of registration and distribution type were independently reviewed by the authors for approximately 90 percent of the dollar-volume of token sale events included in the dataset (see Appendix for more on methodology).
- <sup>vii</sup> These guidelines also clarified that open digital token offerings not subject to direct MAS regulation are nonetheless likely subject to certain Singapore laws aimed at combatting money laundering and terrorism financing [19].
- <sup>viii</sup> According to the Supreme Court's 1946 "Howey Test," an "investment contract" – a type of security – exists if 1) an investment is made in 2) a common enterprise by 3) investors reasonably expecting to earn profits 4) as a result of others' managerial or entrepreneurial efforts (see [3] [15]).
- <sup>ix</sup> Small jurisdictions with a sizable share of 2018 open digital token offering dollar-volume include Gibraltar (4 percent) and Estonia (4 percent) [2]. Singapore and the U.K. accounted for 14 and 7 percent of 2018 dollar-volume, respectively [2].
- <sup>x</sup> For example, approximately half of the dollar-volume of the U.K.'s nine successful Q3/Q4 2018 open digital token offerings is attributable to two projects [2]. In Singapore, on the other hand, there were over 20 successful open digital token offerings during this time, the largest of which accounted for just 11 percent of total offering dollar-volume [2].
- <sup>xi</sup> Figure estimated through conversations with U.S.-based legal and regulatory experts.
- <sup>xii</sup> Bitcoin's initial distribution was not an open digital token offering (as defined in this research), but rather, was an initial mining event.
- <sup>xiii</sup> For example, Filecoin's private initial token sale.
- <sup>xiv</sup> Regulation CF offerings are each capped at \$1.07 million and represented approximately \$22 million of token sale dollar-volume in 2017 through mid-2018 [34]. While in 2018 some projects reportedly applied to sell tokens to the public using the SEC's Regulation A+ exemption, the SEC did not approve any Regulation A+ token sales.
- <sup>xv</sup> Figure 2 was produced by the authors using a Smith+Crowne dataset of 2017-18 digital token offerings and through the authors' classification of token sale type as determined by a review of publicly-available information related to 46 Q3/Q4 2018 U.S.- and Singapore-registered digital token sales (see Appendix for more on methodology) [2].
- <sup>xvi</sup> Figure 3 was produced by the authors using a Smith+Crowne dataset of 2017-18 digital token offerings and through the authors' classification of token sale type and the operational status of networks or products associated with a token sale as determined by a review of publicly-available information related to 128 U.S.- and Singapore-registered digital token projects that conducted open digital token offerings or private initial token sales from Q3 2017 through Q2 2018 (see Appendix for more on methodology) [2].
- <sup>xvii</sup> Figure 4 was produced by the authors using a Smith+Crowne dataset of 2017-18 digital token offerings (see Appendix for more on methodology) [2].
- <sup>xviii</sup> Figure 5 was produced by the authors using a Smith+Crowne dataset of 2017-18 digital token offerings (see Appendix for more on methodology) [2].
- <sup>xix</sup> When possible, Smith+Crowne used Etherscan to examine the actual amounts raised by a token project. As off-chain sales of digital tokens proliferated, this method became less workable.
- <sup>xx</sup> One exception to this general rule was EOS's large, prolonged fundraising event, which was "grouped into monthly amounts, with each month being treated as a separate [sale event]" [3]. In a few instances, data constraints forced the estimation of sale dates and/or the consolidation of sale periods with unclear start or end dates.
- <sup>xxi</sup> For approximately two percent of 2017-18 open digital token offering dollar-volume, legal jurisdiction was classified as unknown [2].
- <sup>xxii</sup> The authors independently reviewed publicly-available information on distribution type and country of legal jurisdiction for approximately 90 percent of 2017-18 token sales by dollar-volume.
- <sup>xxiii</sup> These types of projects accounted for approximately two percent of successful 2017-18 digital token distribution dollar-volume [2].