Governance in the absence of regulation: a study of Initial Coin Offerings

William C. Johnson
Sawyer Business School
Suffolk University
Boston, MA 02108
wcjohnson@suffolk.edu

Sangho Yi
Sogang Business School
Sogang University
Seoul, South Korea
yisangho@sogang.ac.kr

February 25, 2019

Abstract. We examine whether the market for initial coin offerings (ICOs) can alleviate asymmetric information and incentive problems through self-imposed governance mechanisms despite the limited regulation in this market. We propose the substitution hypothesis which states that market forces incentivize ICO issuers to voluntarily adopt governance mechanisms as a substitute for regulatory involvement. The substitution hypothesis predicts and we find that when regulation is weak, firms tend to adopt more governance mechanisms. In addition, these governance mechanisms lead to less manager shirking, lower underpricing, better ex-post performance, higher ICO success and more efficient price discovery in the secondary market.

1. Introduction

Initial Coin Offerings (ICOs) are a new financing method in which crypto tokens are auctioned to the public in return for fiat or cryptocurrencies using blockchain-based platforms such as Ethereum. These crypto tokens represent the exclusive right to use products or services the issuer will provide in the future (Chod and Lyandres, 2018). ICOs are very popular with token users, emerging as a new and economically complex financing method, reaching 45% of the value of IPOs in the second quarter of 2018.[1] The advent of ICOs may signal a shift in the traditional role of investment banks and venture capitalists in providing early stage financing for raising new capital.[2]

However, due to their unique technological features and the lack of certified third party brokers such as investment banks and venture capitalists, ICOs raise significant hurdles for regulatory authorities. In addition, the high level of information asymmetry and incentive problems due to the kinds of projects being funded only exacerbates this lack of regulation.[3,4] Previous studies have pointed out unique and potentially beneficial aspects of ICOs including the revelation of consumer demand (Strausz, 2016; Catalini and Gans, 2019) and the fact that the ICO process is decentralized (Yermack, 2017, Catalini and Gans, 2017). However, these benefits cannot guarantee the success and viability of ICOs in a limited regulatory environment unless ICO issuers' self-imposed governance mechanisms effectively alleviate asymmetric information and incentive problems. Whether ICOs have developed such governance mechanisms in their short time of existence is an open question unexplored in the extant literature.

In this paper, we empirically explore whether certain endogenously arising mechanisms effectively deal with the high level of information asymmetry and incentive problems in the market for ICOs even with limited regulatory involvement. Specifically, we consider how market forces drive firms to voluntarily adopt governance mechanisms that reduce managerial moral hazard, a topic of intense study in the finance literature (Shleifer and Vishny, 1997). When ICO issuers sell their crypto tokens, they try to sell them for the highest price possible. But, if investors suspect that there is a chance ICO managers may indulge in opportunistic behavior, wasting the investment, investors will cut the price they are willing to pay for crypto

[1] "ICOs were 45% of IPOs in Q2 2018, as cryptos disrupt investment banks" Forbes, July 22nd, 2018.
[2] "Despite Shadiness and Crackdowns, the ICO boom is bigger than ever" MIT Technology Review, July 3rd, 2018.
[3] Reflecting these concerns, SEC chairman Jay Clayton comments that there is limited investor protection and many possibilities for fraud and manipulation in the market for ICOs ("SEC chairman: ICO can be an effective way of fundraising" https://www.coinspeaker.com/sec-icons-securities-laws/).
[4] Previous studies argue that certain features of crypto tokens may lead to incentive problems which do not exist in other capital raising methods. For example, Chod and Lyandres (2018) argues that a traditional Myers (1977) debt overhang problem may arise between ICO managers and token holders since tokens are offered to well-diversified investors and managers retain control rights. Also, Sockin and Xiong (2018) point out that the ICO model has certain features which may provide disincentives for ICO issuers to disclose information.

tokens. To persuade investors that the managerial moral hazard risk is low, ICO managers will bind their own hands by adopting strict governance mechanisms.

Applying this logic with limited regulation, we propose a hypothesis we call the substitution hypothesis. To partially substitute for investor protection regulation, crypto token issuers are driven by market forces to adopt governance mechanisms, which lowers managerial moral hazard, improves token performance in the long-term and enhances efficient price discovery in the secondary market. By investigating this hypothesis, we provide insight into the viability of ICOs as an efficient method of raising capital. Studying this hypothesis is also important because the extant ICO literature largely ignores the significant portion of issuers who exert limited effort or never intend to develop a product at all. Previous ICO studies including Li and Mann (2018) and Catalini and Gans (2019) simplify their models and analysis by ignoring the substantial influence of this large group of ICO issuers. Our study fills this gap in the literature by allowing for the fact that a portion of ICO issuers may intend to abscond with ICO proceeds without ever delivering a product.

In light of the importance of governance for ICO firms[5], we consider a series of research questions related to governance mechanisms and ICO issuer performance. First, in the absence of regulatory intervention, are market incentives sufficient to drive issuers to voluntarily adopt governance mechanisms that enhance investor trust? The common belief and regulatory attitude toward ICOs is that they lack significant governance mechanisms to reduce managerial incentive problems due to limited regulatory enforcement. However, previous studies including Stein (2003) predict that in the absence of significant regulation, firms will adopt curative measures such as strong corporate governance to alleviate asymmetric information and incentive problems. Anecdotal evidence also suggests that ICO firms are concerned with the alignment of incentives between issuers and purchasers of tokens. For instance, ETHLend states in its prospectus:

> "All tokens distributed to the core team are subject to vesting. [This] Vesting model ensures more value and security for the token contributors. Vesting provides more loyalty from the core team towards the project and ensures that LEND is not subject to market manipulation and provides stable market development for the LEND token. Eventually vesting is a way for the ETHLend team to show the commitment and loyalty for the ETHLend project."

[5] We use the term firm here refer to all organizational forms of ICO issuers including single entrepreneurs, partnership and corporations. Our sample shows that single entrepreneur and partnership issuers occupy 80.4% and corporate issuers occupy 19.6%. In this paper, we use the term "firm" to refer to all of these organizational forms of ICO issuers.

To systematically test this issue, we are interested in examining whether ICO issuers are more incentivized to adopt strong governance mechanisms when these mechanisms are valuable.[6] More specifically, we test whether these governance mechanisms are more common when potential managerial moral hazard problems are severe, when regulatory protection of investors is unlikely, when a greater percent of investors are less sophisticated, and when information asymmetry between ICO issuers and investors is large. In addition, our substitution hypothesis predicts that issuers in a geographic region where regulation is less likely have stronger incentives to adopt more governance mechanisms.

Second, we examine whether ICO issuers choose governance mechanisms stringent enough to effectively constrain their own actions and reduce the potential for managerial moral hazard. The specific moral hazard behavior of ICO issuers we examine in this paper is issuer shirking in the development of a token platform and/or service. Consistent with the substitution hypothesis, we predict that strong governance mechanisms are positively associated with an ICO issuer's efforts to develop the platform for which token holders have contributed cryptocurrency.

Third, we examine whether these strong governance mechanisms are related to the likelihood of ICO success. As long as the market for ICOs is efficient, the ability of governance mechanisms to limit asymmetric information and incentive problems will lead to a higher likelihood of ICO success.

Fourth, we examine the impact of governance mechanisms on the ex post performance of the ICO firms in terms of their underpricing. ICO underpricing is an excellent measure for managerial moral hazard and the substitution hypothesis predicts that strong governance mechanisms lead to lower underpricing. For similar reasons, the substitution hypothesis predicts that strong governance mechanisms lead to better ex-post performance of the ICO firms in the primary and secondary markets. Since underpricing is a large cost to the issuer and reduces efficient resource allocation by the market, the way governance mechanisms affect ICO underpricing is critical.

Finally, we examine how governance mechanisms affect the efficiency of price discovery in the secondary market for exchange-traded ICOs. The success and sustainability of the ICO mechanism heavily depends on efficient functioning of secondary token markets to support ICOs. Previous studies suggest that good governance mechanisms may enhance or improve the ability of secondary token markets to elicit information through price discovery since these mechanisms allow managers to more effectively

[6] One may argue that ICO issuers may use boilerplate to determine the governance mechanisms of crypto tokens. However, this is not the case, even within a single industry. For instance, our sample contains 47 firms focusing on gambling and betting, a rather homogeneous industry. However, their governance characteristics exhibit significant heterogeneity as is consistent with Rohr and Wright (2018). Some betting facilities issue a token with no other significant rights which can only be used for betting but other firms issuing tokens that allow betting but include cash flow and voting rights. This heterogeneity is the result of issuer's endogenous choice of which type of token is offered to investors.

communicate with market participants (Shleifer and Vishny, 1997). This improved price discovery implies that project information is more quickly imputed into token prices. Our substitution hypothesis predicts that ICOs will have efficient price discovery in the secondary market and that this price discovery will be more efficient if the firm adopts better governance practices.

Our empirical results largely support the predictions of the substitution hypothesis we have listed above. First, we find that 69% of ICO issuers voluntarily adopt at least one governance mechanism and 31% adopt at least two, even without regulatory intervention. ICO issuers are even more likely to adopt governance mechanisms when they are located in a jurisdiction with little or no regulatory scrutiny. We find that the most commonly adopted governance mechanisms for ICOs are voting rights, cash flow rights, managerial token allocation, and lockup agreements.[7]

We also find that firms located in countries with fewer ICO regulations adopt more governance mechanisms. This implies that limited investor protection regulation will promote ICO issuers to voluntarily adopt governance mechanisms which alleviate the conflicts of interest between ICO issuers and token holders. In addition, since sophisticated investors have superior skills in collecting and processing information about an ICO firm, the absence of these investors may undermine the ability of the firm to successfully conduct an ICO (Kim and Verrecchia, 1991). This implies that ICOs with less sophisticated investors are more likely to adopt governance mechanisms to help control moral hazard and information asymmetry problems. Finally, ICO firms with high levels of managerial moral hazard are more likely to adopt governance mechanisms to alleviate the mismatch between manager and token holder incentives. We find that firms with high regulatory ambiguity and less sophisticated investors adopt significantly more governance mechanisms. In addition, firms with high regulatory ambiguity and managerial moral hazard also adopt more governance mechanisms. These findings suggest that ICO issuers voluntarily adopt governance mechanisms which can at least partially substitute for regulatory scrutiny, particularly when the regulatory protection of investors is weak, severe information asymmetry exists between ICO issuers and investors, investors are less sophisticated, and the conflicts of interest between ICO issuers and investors are severe.

Second, we find that firms with greater usage of governance mechanisms correspond with managers exerting greater effort and lower levels of shirking. We utilize four sets of measures for manager effort from their use of Twitter and the modifications of firm software as measured by Github account usage and

[7] While these governance mechanisms are similar to traditional governance mechanisms used for equity holders, it is important to note that the token rights we examine are not identical to traditional shareholder rights. We will discuss this issue in more detail in Section 3.

commits (Howell, Niessner, and Yermack, 2018). These results suggest that the adoption of governance mechanisms enhances managerial incentives to exert effort to develop the product funded by the ICO.

Third, we find that firms with more governance mechanisms as measured by voting rights, cash flow rights, managerial token allocation, and lockups have a significantly higher likelihood for raising capital in the ICO, raising a greater dollar amount, and having a higher likelihood of eventually being listed on an exchange. These governance mechanisms are particularly effective for firms that are unlikely to be restrained by local regulatory authorities in that they have not disclosed their location in their white paper. For these firms, the governance mechanisms are particularly important. In addition, we find that the governance mechanisms and the managerial effort measures tend to work together to drive the firm's success.

Fourth, we find that firms allocating voting rights to managers and adopting lockups have a lower level of underpricing when they issue their tokens. Underpricing is a significant cost in the ICO market amounting to a total loss of $1.9 million for the median firm, which raises $6.1 million in its offering.[8] Issuers adopting strong governance mechanisms may reduce the costs of underpricing by allocating shares to managers, which reduces the average underpricing cost from $1.9 million to $0.5 million. By adopting a lockup agreement, managers can effectively decrease their underpricing to a negligible amount for the average firm. In addition, we find that token returns in the secondary market are uncorrelated with the adoption of voting rights, managerial tokens, and lockups, suggesting that these governance mechanisms are correctly priced in the secondary market for tokens. All these findings suggest that strong governance mechanisms reduce managerial moral hazard problems, as predicted by the substitution hypothesis.

Finally, we demonstrate that strong governance mechanisms can enhance the price discovery function of ICO tokens. We find that for three out of four of our measures of governance, token voting rights, token cash flow rights, and token allocation to managers, there is a positive relationship between residual volatility decline and governance.[9] However, this decline in residual volatility is only statistically significant in the case of voting rights and cash flow rights, suggesting that price discovery is enhanced by allocating voting

[8] It is well known that there are economies of scale in market discipline. For market discipline to be effective in the ICO market, additional costs incurred because of managerial moral hazard (since investors require a risk premium for managerial moral hazard) must be sizable. Our empirical results demonstrate the presence of these sizeable costs in the form of significant underpricing. Furthermore, ICO managers are financially constrained since they are early-stage entrepreneurs, which will make additional costs caused by managerial moral hazard more difficult to bear. Our results suggest that the market for ICOs satisfies the necessary condition for the effective working of market discipline.

[9] A decline in the residual volatility implies that the market is learning about how the token behaves in the market since residual volatility is the portion of token price movement that is unexplained by general movements in cryptocurrency (Black, Jensen, and Scholes, 1972).

rights or token rights to token holders. On the whole, these results show that improved governance not only makes ICOs more successful on average, but also enhances the token's ability to glean important market information about the ICO firm project.

To support a causal interpretation for our overall results, we utilize several time and industry-based instrumental variables and demonstrate that our results are unlikely to be driven by endogeneity. In particular, our results support the interpretation that strong governance mechanisms causally increase the likelihood of token success, increase the total dollar amount raised, and increase the likelihood of a token being listed on a major exchange.

In addition to the implications of our research for the long-term viability of ICOs, our findings also provide important evidence on one of the most fundamental questions in corporate governance. Previous corporate governance studies including Shleifer and Vishny (1997) argue that market forces, which incentivize managers to adopt value-enhancing governance mechanisms, are a key driver in firm governance choices. However, testing this argument is difficult since government regulations are ubiquitous and isolating the effects of manager incentives to voluntarily adopt governance mechanisms from regulatory effects is difficult. ICOs provide a rare opportunity since they are lightly regulated due to their recent development and unique technological features. Also, ICOs provide a useful laboratory to empirically investigate the evolutionary governance theory as suggested by Alchian (1950) and Stigler (1958) by testing whether the ICOs that survive or are successful have optimally adopted value-increasing governance mechanisms.

Our paper augments established lines of research in several important ways and makes significant contributions to the literature. First, we extend the burgeoning ICO literature including Catalini and Gans (2018), Benedetti and Kostovetsky (2018) and Howell, Niessner and Yermack (2018) by examining the role of governance mechanisms in ICOs. Our paper is the first to provide evidence that a non-regulatory mechanism may endogenously arise, alleviating information asymmetry problems.[10] We also extend the ICO token pricing literature by examining the effect of managerial moral hazard and governance on pricing. Previous studies on the pricing of ICOs largely focus on the fundamental productivity of the blockchain-based network (Cong, Li and Wang, 2018) or the ability of crypto tokens to gather a large number of households to trade with each other (Sockin and Xiong, 2018), largely ignoring the effect of the potential conflicts of interest between ICO managers and investors. We expand the perspective of these previous studies. Our results suggest that the likelihood of platform success is significantly influenced by an ICO manager's incentive to work hard, which is in turn driven by governance mechanisms adopted by ICO

[10] How information asymmetry is addressed in the digital word has been thoroughly discussed in the previous literature, but mostly in the context of peer-to-peer lending (Weiss, Pelger and Horsch, 2010; Yan, Yu and Zhao, 2015; Cumming, Lynn, Bhaird and Rosati, 2019).

managers. Thus, our results establish a link between the governance mechanisms of ICO firms and the value of crypto tokens. Second, our paper extends the regulatory literature on ICOs by pointing out that regulators may partially rely on market discipline to facilitate investor protection and efficient allocation of financial resources in the market for ICOs, complementing the enforcement of regulations.[11] Third, our paper extends the corporate governance literature by documenting how governance mechanisms effectively work in a trustless decentralized ecosystem with no certifying entity and no intermediary but only cryptographic peer to peer transactions. Our paper is also one of a few studies which investigate how asymmetric information and incentive problems can be alleviated in the market for ICOs in the absence of a strong regulatory framework. Thus far, this lack of regulation to protect investors and the resulting ICO exposure to fraud and manager shirking has been a serious concern among practitioners and regulators but no study has rigorously explored the economics behind this issue. In addition, our paper is one of a few studies which document how regulation and governance practices interact to alleviate asymmetric information and incentive problems and achieve efficiency in financial resource allocation. Fourth, our paper extends the price discovery literature in two important ways. Where prior papers in this literature (Aggarwal and Conroy, 2000) focus on the role of market makers and centralized price-setting processes or on the role of common factors in determining prices (Gonzalo and Granger, 1995), our paper examines price discovery within the new paradigm of decentralized market making enabled by blockchain technology. In addition, our paper is one of a few studies which investigate how governance improves price discovery.

Our paper proceeds as follows. In section 2 we discuss our sample selection and data sources. In section 3 we discuss our summary statistics. In section 4 we discuss our results followed by a conclusion in section 5.

2. Sample selection

2.1. Data sources

Our sample of initial coin offerings comes from four main on-line sources with additional supplemental data gleaned from additional sources. We begin our sample from icotracker.com which provides 567 ICOs. We then add data from icorating.com adding 175 ICOs, coinmarketcap.com adding 262 ICOs, and coinschedule.com adding 25 ICOs. We double check that none of our tokens are duplicates among the four samples. This yields a final sample of 1,029 ICOs between August 2015 and December 2017.

Since we wish to include information about the offerings themselves, we read through each white paper and gather data about the characteristics of the offering. Our first choice for obtaining white papers

[11] For an in-depth discussion of the regulatory literature on ICOs, see Maume and Fromberger (2018), Hacker and Thomale (2018), Hacker (2017), and Robinson (2018).

is from the firm's own web site. We attempt to access the earliest version of their white paper to ensure that our data collection is current at the time the firm issues its ICO. Some firms have changed their web sites after a successful ICO and other firms no longer have operating web sites, having removed their white papers after an unsuccessful ICO. While we do not believe this delisting bias has a significant effect on our dataset since we began collecting our data in October 2017, we discuss this data challenge in the next section of the paper. When we cannot obtain the white paper from the firm's web site, we check the following web sites, in this order: cryptocoincharts.info/ico-completed; KickICO.com; icorating.com; and the Internet archive at archive.org/web. The Internet Archive in particular is useful for collecting white papers for token offering firms that are no longer listed on the Internet. Some tokens such as FUNCoin do not allow users from IP addresses within the US to access their web site or white paper. Therefore, we do not include these ICOs in our sample. In addition, we are careful to avoid tokens that use names from prior tokens. For instance, there are at least two tokens called "Bankcoin" issued, one in 2016 raising $5 million from the web site bankcoin.global and another one in 2017 raising $1 million from the web site of bankcoin.io. Since there is no unique way to identify a token and our data collection comes from many sources, we delete both observations to ensure that we are not confusing the data of one token with another.

We use the industry classification of coinschedule.com when a token is listed on this web site. If an issue is not listed on this web site, we classify the token into the industries of coinschedule.com using information from the white papers. We also examine the firm's disclosure information regarding its legal structure, eliminating any issuers that are classified as not-for-profits.

In addition, for some of our tests, we use token pricing data that comes from coinmarketcap.com. Coinmarketcap.com uses a web crawler to gather data through an API from 6,740 cryptocurrency markets between October 2015 and December 2017. The data from coinmarketcap uses a trading volume weighted average of all prices from each exchange that can be accessed by API. Only exchanges which charge a fee are included in calculations to ensure that volumes are really trading and are not being manipulated by traders.

We also use secondary sources to obtain data about the use of each of the tokens. To gather the information about the success of tokens and the dollar amount raised, we utilize coinschedule.com, smithandcrown.com, icobazaar.com, and tokendata.io. In addition, we obtain online information about the user community for each token. This is important to ensure that the tokens are actively being used and/or traded in the marketplace. We obtain this data from github.com and Twitter.com.

It is important to note that our sample size is significantly smaller than some other papers in the literature such as Benedetti and Kostovetsky (2018) due to the increased data requirements for our study.

Specifically, our collection of historical white papers leads us to a sample size of about half their sample. Fortunately, we are unlikely to face any survivorship bias after November 2017 since this is the time when we begin collecting white papers for active token offerings. Our final sample includes 1,019 ICO firms issuing tokens between October 2015 and December 2017.

2.2. Data survivorship bias and backfill bias

To ensure the robustness of our data collection and our overall results, we conduct a battery of additional tests of the data. Our data collection began in October 2017 so therefore all data collected before this point in time is subject to data survivorship and backfill bias, similar to other papers requiring data to survive past the ICO date. However, since we actively began collecting data in October 2017, data on ICOs after this time period, accounting for 64% of our sample, is not subject to this survivorship and backfill bias problem. All our major results hold, even after eliminating the 36% of our sample that is subject to the data survivorship bias problem.

3. Summary statistics

3.1. Sample characteristics

In Table 1 we report the distribution of our ICO sample over time. It is important to note two things from Table 1. First, the sample is heavily skewed toward the end of 2017 with most of the sample coming from the last three months of 2017. However, this concentration of our sample in this time period does not adversely impact our analysis since the time-series dimension of our data is of limited use in our analyses. In addition, the distribution of the data makes the use of a year-month fixed effect of limited practicality due to the limited sample size before these five months. Instead, we rely on cross-sectional analysis which provides consistent estimates for the purposes of our research. Finally, in the last column of Table 1 we report the overall proceeds raised by the ICOs. We find that the overall cumulative dollar amount raised by the ICOs in our sample is $5.8 billion, slightly smaller than the $6 billion figure widely circulated in the media for the amount raised by ICOs in 2017. Our smaller overall size is due to our additional data requirements in terms of issuers being required to have an available white paper.

In Table 2 we separate our sample by industry, using the coinschedule.com industry classification scheme for our firms. In addition, we align each ICO industry with a CRSP/COMPUSTAT industry, using the four digit SIC codes for the nearest industry. Two examples of our industry classification of ICOs are Data Storage and Governance and Legal. We classify ICOs in Data Storage as SIC code 7374, the SIC code for Dropbox. We classify ICOs in the Governance and Legal industry as SIC code 8111, Legal services. We find that the three most common industries represented in our sample are Trading and Investing (12%),

Payments (10%), and Infrastructure (10%). Our summary results by industry show that our firms are fairly evenly distributed across the many industries in our sample.

In Table 3 we report our major summary statistics for variables of interest and control variables in our regressions. Kaal (2018) reports on eight main blockchain and cryptocurrency regulations by geographical location. We use the number of cryptocurrency regulations by country as our first measure of the regulatory regime strictness since countries with more regulations are likely to have more strict regulations. Kaal (2018) finds eight countries with at least four of the eight main regulations applying to cryptocurrencies in place. We classify these jurisdictions as strict from a regulatory perspective. For the firms disclosing their location, our main sample is dominated by ICOs from the US (18%), Russia (7%), Singapore (5%), and Switzerland (3%). We find that 26% of the sample firms are in a strict regulatory regime based on the classification of Kaal (2018).We then report the regulatory disclosure and the regime for each ICO firm. We find that 43% of ICOs disclose no location or regulatory regime, greatly increasing their regulatory uncertainty. We create an indicator variable for firms reporting no location and call this regulatory ambiguity.

Since we are interested in the interactions between investors and the ICO markets, we collect several measures of investor sophistication and market development. We first calculate the country-specific investor sophistication as the total investment market size divided by country GDP.[12] This measure is high for countries where the capital market is important relative to its total economic output, a good proxy for investor sophistication. We can generate this measure for the 580 ICOs in our sample which disclose their geographical location. In addition, we measure investor sophistication by the presence of retail investors and their ability to purchase the ICO tokens. Some issuers only allow only accredited investors to purchase their tokens, according to the definition of SEC Rule 506 Regulation D. We find that 96% of the sample allows purchases by non-accredited retail investors.

Next we report the managerial moral hazard measures. We find that 13% of our ICO sample firms do not disclose the CEO's name and 86% do not provide the name of their chief counsel. Disclosing the CEO name is important because issuers that choose not to disclose the CEO name are signaling to the market that they do not wish to expose the CEO's reputation to scrutiny and otherwise provide information which might help regulators in a future case against the firm. Likewise, a firm with a chief counsel disclosed is signaling to the market that the reputation of the chief counsel is important in the value of the firm. In addition, such a disclosure suggests that legal issues are important to the issuer.

[12] OECD investor statistics on country GDP can be obtained at https://www.oecd-ilibrary.org/finance-and-investment/oecd-institutional-investors-statistics_2225207x.

Finally, we report the general characteristics of the ICOs which will serve as control variables. We also report information about employee disclosure, finding that 63% of ICOs disclose their employee information. The average number of employees for these firms is 9. In addition, 29% of ICO firms disclose information about their board with an average board size of 4 directors.[13] The average white paper length, a measure of disclosure quality is 24 pages.

3.2. ICOs and governance characteristics

The purpose of our paper is to examine the governance characteristics of a broad cross-section of ICO firms, reporting detailed information about the voting rights, token allocation, and lockup agreements utilized to help regulate the operations of the firm.[14]

In Table 4.A we find that 20% of the firms in our sample have voting rights allocated to the tokens. However, it is important to note that these voting rights are not synonymous with the voting rights for equity ownership in a firm. They are mostly restricted rights which require the management to consult token holders if they make substantial changes to the platform or otherwise modify the tokens issued by the firm. Since most of the ICOs in our sample are not corporations, there is no formal board voting provided by token ownership. While these voting rights are not identical to equity voting rights, they still reduce managerial moral hazard by reducing manager ability to pursue his own interests. In addition, as Chod and Lyandres (2018) discuss, these voting rights may reduce the Myers (1977) debt overhand problem.

We find that 27% of tokens either have explicit cash flow rights or some promise of cash flow rights contingent upon future profits. These cash flow rights are similar to dividends in that they may be paid at the discretion of managers. However, token holders cannot be considered residual claimants in the sense of an equity holder. Still, these cash flow rights will reduce managerial discretion and help to alleviate moral hazard problems.

We find that the average percent of tokens allocated to the management of the firm is 7.74%. As described in the introduction, this allocation provides incentive alignment between managers and token holders. We find that in 17% of cases, tokens have lockup agreements, ensuring that management does not simply sell their token positions as soon as there is token liquidity. The aforementioned results suggest that governance mechanisms are prevalent even in the absence of regulations requiring their adoption, contrary to the common belief that there are no protections for ICO investors.

[13] For corporate issuers, the directors would have legal responsibilities as in a corporation, but since 80% of ICOs are set up as partnerships, the directors disclosed here would serve an advisory role.

[14] In addition to the governance characteristics we actively investigate here, we have considered others such as the presence of a chief counsel on the board or the board size. Many of these either provide insignificant results, or appear to be driven by idiosyncratic firm characteristics with little or no systematic component to their adoption.

We are particularly interested in understanding how governance evolves in the absence of formal regulation, the core of the substitution hypothesis. As shown in Table 3 we find that 43% of our sample does not disclose a geographical location for the ICO, implying that there is significant regulatory ambiguity for these tokens. In particular, it is unclear what regulator might have authority or how that authority might be enforced if the home-country of the token is not disclosed. In these cases of regulatory ambiguity, the governance mechanisms in place within the token likely become particularly important since they allow the firm to protect token holder interests without resorting to formal regulatory authority. Therefore, we expect ICOs with regulatory ambiguity to adopt a significantly higher number of governance mechanisms to help protect token holder interests.

In Table 4.B we report that in the case of ICOs with significant regulatory ambiguity, 23% of ICOs have voting rights allocated to token holders, 8.6% of tokens are allocated to managers, and 19% of tokens have lockup agreements, on average. In contrast, where there is no regulatory ambiguity, 18% of ICOs have voting rights allocated to token holders, 7.2% of tokens are allocated to managers, and 16% of tokens have lockup agreements, on average. Importantly, the firms with regulatory ambiguity always utilize governance mechanisms to a greater extent than firms with no regulatory authority, a difference that is statistically significant for all our measures except for the presence of a lockup agreement. These results imply that when governance mechanisms are particularly valuable due to the absence of clear regulatory authority, these governance mechanisms are adopted more readily. Likewise, it may be that these adopted governance mechanisms may reduce the need for firm regulation since incentive problems and information asymmetry may be alleviated through these mechanisms.

4. Empirical results

4.1. The determinants of firm governance in ICOs

Since our motivation involves determining what is driving firms to adopt certain governance practices, we now turn to a multivariate regression framework to investigate how firms choose their governance structures. We control for common firm disclosure information such as whether the firm discloses employees and how many they employ, whether or not board information is disclosed and the board size, and the firm's white paper length. Controlling for these covariates is important since it allows us to find the main drivers of governance practice. The main idea of the substitution hypothesis is that firms in a less strict regulatory environment are more likely to adopt more governance mechanisms. We test this idea now.

We begin in Table 5.A by examining the determinants of voting rights allocated to tokens. In model 1 we regress an indicator variable taking a value of one if the token has voting rights onto our controls plus a count variable for the number of regulations in the home country of the ICO. We find a negative and

significant result, suggesting that voting rights are less likely if a firm has many alternative regulations that help alleviate other governance concerns. Note that this regression can only be run for the 580 ICOs where we know their location. In model 2 we regress an indicator for voting rights onto an indicator taking a value of one if the firm's home country is not disclosed, a variable we call regulatory ambiguity. We find that firms with regulatory ambiguity have a higher likelihood of granting voting rights for their tokens. Consistent with the substitution hypothesis, these findings suggest that managers may voluntarily adopt governance mechanisms in two particular situations: when there is weak regulation and when the mechanisms are valuable.

In models 3 and 4 we use two measures of investor sophistication, the total investment market as a percent of GDP (model 3) and an indicator taking a value of one if the firm allows retail as well as accredited investors (model 4). The presence of retail investors implies that on average, the investor sophistication should be lower as suggested by Barber and Odean (2013). In model 3 we find that countries with more sophisticated investors are less likely to grant voting rights and in model 4 firms that allow retail (less sophisticated) investors adopt more voting rights. This implies that governance can be a substitute for sophisticated investors in maintaining a well-run firm. In models 5-6 we use two measures of managerial moral hazard: if the firm does not disclose the CEO's name or the firm does not have a legal counsel on the management team. In both cases, if the firm has these higher levels of managerial moral hazard, the firm is significantly more likely to allocate voting rights. Thus, models 1-6 demonstrate that firms with less regulation, firms with less sophisticated investors, and firms with higher managerial moral hazard are more likely to adopt voting rights to help mitigate these concerns. In addition, when a country has very weak governance, issuers react more sensitively to the potential for inventive problems in the decision to adopt voting rights.

The core prediction of the substitution hypothesis is that good governance can at least partially replace regulation to ensure ICO firms are run well. To test this idea, in models 7-9 we interact the regulatory ambiguity measure with either investor sophistication (model 7) or measures of managerial moral hazard (models 8-9). We choose not to report the interaction with the country-level investor sophistication because we can only observe country-regulations for 580 ICOs. In two out of three cases, we find that when there is regulatory ambiguity in addition to less sophisticated investors or high managerial moral hazard, the likelihood of voting rights adoption increases significantly. This finding demonstrates that these drivers of governance practice may have additive effects in the adoption of voting rights, consistent with the substitution hypothesis.

In Table 5.B we repeat our tests using cash flow rights as the dependent variable. We largely find an insignificant relationship between the allocation of cash flow rights and the regulation, investor

sophistication, and managerial moral hazard. The two exceptions are for country-level sophistication and the absence of a chief counsel on the management team. We find that issuers with more sophisticated investors are less likely to adopt cash flow rights and issuers with no chief counsel on the board are more likely to adopt cash flow rights. These results are consistent with the substitution hypothesis. Taken as a whole, however, our results suggest that cash flow rights are significantly less likely to serve as effective governance mechanism compared to voting rights.

In Table 5.C we repeat our analyses from Table 5.A using the allocation of managerial tokens as the dependent variable. This governance mechanism is an alternative method to align managerial interests to those of token holders. We find in Table 5.C models 1-6 that firms with more regulatory certainty, lower investor sophistication, and higher managerial moral hazard all allocate a significantly higher proportion of tokens to managers. The one exception is firms that do not disclose the CEO name where the higher percentage of tokens allocated to managers is not statistically significant, although the coefficient sign is consistent with our prior tests. In models 7-9 we interact our measure for regulatory ambiguity with our measure for less sophisticated investors and two measures for managerial moral hazard and find in all three cases that firms allocate more tokens to managers. These results are consistent with the substitution hypothesis, and show that managerial token allocation is an important mechanism to align interests between managers and token holders. Further, issuers tend to voluntarily adopt governance mechanisms particularly when governance mechanisms are valuable and when regulation is weak.

In Table 5.D we examine the determinants of token lockup agreements. These lockups help to reduce the possibility that managers will sell their tokens quickly and eliminate any incentives they have to work on their token projects. Lockup agreements for ICOs are analogous to the case of IPOs where it is common to lock the shareholdings of managers for 6 to 12 months. Once again, we repeat our major analyses examining the regulatory regime, investor sophistication, and managerial moral hazard in models 1-6. While our results are somewhat weaker than for voting rights and managerial token allocation, we find that firms are significantly more likely to utilize lockup agreements if the firm has regulatory ambiguity or high managerial moral hazard. Likewise, when we examine the interaction between regulatory ambiguity and investor sophistication or moral hazard risk, we find that the firm is significantly more likely to utilize a lockup agreement. On the whole, these results support the substitution hypothesis. Our results suggest that voting rights, managerial tokens, and lockup agreements are utilized to provide better governance in the absence of strong regulations. Likewise, these mechanisms are significantly more common when governance mechanisms are valuable, that is, when investor sophistication is low and when managerial moral hazard is high. Finally, interactions between regulatory uncertainty and investor sophistication and regulatory uncertainty and managerial moral hazard provide strong support for the idea that the adoption of

governance mechanisms are more sensitive to their need when regulation is weak. This also implies that issuers' incentive to optimally allocate these governance mechanisms is stronger when regulation is weak. Therefore, market processes may partially substitute for regulation since they incentivize issuers to voluntarily adopt governance mechanisms when these mechanisms are valuable.

4.2. Governance and Managerial effort

In Table 6 we examine various measures for managerial effort in the development of the token platform. Examining this issue is important since the risk that issuers shirk (or pursue their private benefits) after an ICO is a significant concern. Where the common belief about ICOs is that they are unregulated and therefore have no ability to motivate managers to exert effort, we find evidence that a significant portion of ICO managers exert effort to make their firms successful.

Our measures of effort come from the promotional and disclosure activities undertaken by the manager. Specifically, we measure the use of Twitter by the firm to provide updates of firm activities and find in Table 6 that 63% of our sample firms utilize Twitter. Second, we examine the number of Tweets by the firm after the ICO occurs and find that the average firms Tweets 103 times after ICO issuance. We also examine the use of Github since this platform allows firms to share and disclose version releases of their software. We find that 11% of our sample firms utilize Github. In addition, for the subset of firms that utilized Github, we track the number of versions of software disclosed by the Github users, called Github commits. While we recognize that these are not perfect proxies with effort, they should have a positive correlation with manager effort. In addition, after a firm issues its ICO, it seems highly unlikely that a manager who intends to shirk and provide no effort whatsoever would nevertheless provide updates concerning the firm through Twitter or use Github to improve its software.

In Table 7.A we examine how manager effort is related to the governance mechanisms we specifically explore in our paper. We utilize a multivariate regression setting to show the influence of ICO governance mechanisms on manager effort after the ICO occurs. We find that post-ICO manager effort as measured by Twitter use, the number of tweets, and the use of Github are all positively related to our key governance variables of voting rights, managerial token allocation, and lockup agreements. In the eight regressions involving the Twitter measures, we find that there is a positive coefficient in six cases and the relationship is statistically significant in four cases. This result implies that shirking is lower when firms adopt strong governance provisions such as voting rights and lockup agreements. In Table 7.B we examine our Github usage measures. We find that for six of the measures, there is a positive relationship between better governance and managerial effort as measured by the use of Github and Github commits. In addition, in three of these cases, the results are statistically significant. Specifically, voting rights, managerial token

allocations, and lockup agreements seem to lead to higher managerial effort as measured by Github usage. These results imply that not only do ICO issuers adopt more governance mechanisms when they need them, but these mechanisms bind the manager behavior and help to reduce managerial shirking. In effect, the managers choose the governance mechanisms the firm will adopt, binding their own behavior and creating an environment where the firm is able to get ICO funding because of this binding effect.

In untabulated tests, we also examine the interactions between our governance mechanisms and the regulatory environment of the ICOs. We find that manager effort is not greater in the absence of strong regulation when these governance mechanisms are present. These results suggest that managerial effort is driven not by regulation per se, but by the governance mechanisms alone.

4.3. Measures of ICO success

We now examine the ex post performance of the ICO firms. We recognize that manager effort could be driving ICO success although there may be many other drivers through the governance mechanisms. The results we have reported thus far imply that governance mechanisms can be significant determinants for ICO success. We create three specific proxies for ICO success: an indicator for if the firm is successful in raising capital, the actual amount of capital raised, and an indicator variable taking a value of one if the firm is listed on an exchange within 12 months of the ICO. In our overall sample, we find that 47% of the ICOs in our sample are successful, the average successful firm raises $6.1 million, and 38% of ICO firms are listed on an exchange within one year. In Table 8.A - 8.D we separate our major measures of ICO success into firms with high governance characteristics and low governance characteristics. In 8.A, for instance, we compare the success of firms with versus without voting rights. Our univariate tests show that firms that allocate voting rights are significantly more likely to raise capital, raise more capital, and are more likely to be listed on an exchange. In each case, we find that the difference in outcome variables between firms with versus without voting rights is significant at the 5% level or better. In Table 8.B we find that there is not a significant difference between firms with versus without cash flow rights. However, similar to the voting rights results, we find that firms with above the median token allocation to management (Table 8.C) and for firms with lockups (Table 8.D) have better success in their ICO. In each case, we find a higher likelihood of success by all three measures, often significantly higher, if the firm has higher levels of governance. These results confirm our prediction that more governance mechanisms tend to lead to a higher likelihood of ICO success.

In Table 9.A we examine the determinants of ICO success, measured as an indicator variable taking a value of one if the firm successfully raises money in its ICO. We use a similar approach to the studies of Howell, Niessner, and Yermack (2018) and Adhami, Giudici, and Martinazzi (2018) in determining our

empirical approach. We examine the impact of key governance measures in models 1-4. Specifically, we find that the presence of voting rights, managerial token allocations, and the use of lockup agreements are all significantly related to the success of a firm, as measured by the firm's ability to raise capital. These results are consistent with our conjecture that certain governance characteristics adopted by the ICO firms result in a higher likelihood of ICO success, as suggested by the substitution hypothesis.

An important implication of the substitution hypothesis, is that in cases of limited regulation, governance may serve a more important role than otherwise. Firms that are heavily regulated due to being located in a jurisdiction with a high likelihood of regulatory involvement are less likely to need strong internal governance mechanisms to succeed. We therefore use our regulatory ambiguity indicator and interact this variable with the presence of strong governance mechanisms to determine if governance and regulation are substitutes. We first begin by adding an indicator for regulatory ambiguity and find that the likelihood of success declines significantly when there is regulatory ambiguity. For instance, the coefficient for regulatory ambiguity of -0.32 suggest that if a firm goes from being regulated in the US markets to not disclosing its location, the likelihood of being a successful ICO declines by 32%. When we examine the interaction between regulatory ambiguity and governance, we find in models 5-8 that in every case, in the absence of strong regulation, firms are more likely to be successful when they have strong governance. This finding supports the idea that traditional governance may partially substitute for regulatory scrutiny. Combined with our previous results, we find evidence that when regulation is weak, issuers are more sensitive to the needs for strong governance in the adoption of governance mechanisms and the adoption of governance mechanisms more strongly contribute to the ICO success when regulation is weak.

In Table 9.B and 9.C we repeat our analyses using different measures of ICO success, specifically, the dollar amount raised in cryptocurrencies and the listing of an ICO on an exchange within one year of the ICO. We then repeat our main analyses. The results are similar to and consistent with the previous results, supporting the substitution hypothesis. In each case, the general trend is that governance mechanisms increase the likelihood of ICO success. But in particular, the results are strongest when there is weak regulation.

We then examine the interplay between governance and manager effort in the success of ICOs. We cannot definitively show causality for these tests, particularly in light of our earlier observations that governance is helping to increase managerial effort by our measures. Our point is not that governance only causes manager effort which results in a higher likelihood of success, but rather to document that one mechanism of increased ICO performance associated with good governance is through manager effort. In Table 10.A we run a multivariate regression with an indicator variable for the likelihood of success of the ICO as the dependent variable and various manager effort measures as independent variables. We find that

firms with a Twitter account, firms that Tweet more, and firms with a Github account are all more likely to be successful. In addition, for the 120 firms that utilize Github in our sample, firms with more Github Commits (versions of their software) have a higher likelihood of success as well, albeit not significantly so. Finally, in Table 10.A model 5 we repeat all our analyses with our managerial effort measures plus our governance measures. While the Twitter account indicator turns negative, this is due to the interaction between the Twitter account measure and the number of Tweets since these two measures are highly (positively) correlated. As previously discussed, identification in this regression is difficult in this context but generally shows that firms with more manager effort result in a higher likelihood of success and firms with more governance have the same effect. This implies that the impact of improved governance on ICO performance likely works through the manager effort mechanism described as well as through other mechanisms as well.

We repeat similar analyses in Tables 10.B and 10.C utilizing the proceeds of the ICO and the likelihood of the firm being listed on an exchange within one year and find similar results. In general, firms with better governance and more manager effort are more likely to be successful.

4.4. Endogeneity, the adoption of governance characteristics, and ICO performance

Our results thus far have shown strong support for the substitution hypothesis. We find that there is a strong and positive relationship between ICO firm adoption of governance mechanisms and firm performance in terms of its ability to raise capital, the amount of capital raised, and the listing of the firm on an exchange. In particular, these results are strongest when there is a limited amount of regulation for the firm. However, these relationships need not be causal. Other important covariates such as the investment in human capital or information asymmetry may be captured by the number of employees or the white paper length, respectively. Still, there may be other unobservable factors that drive both governance and ICO success. To control for other characteristics which may be driving the positive relationship between governance and ICO success, we conduct a battery of additional tests. First, we examine the major regressions on a month-by-month basis, to ensure that there is no time-based driver of our results. For instance, one could argue that ICOs prior to October 2017 were of high quality and after these ICOs demonstrated the feasibility of raising capital through this mechanism, later low-quality ICOs entered the market (Khanna, Noe, and Sonti, 2008). We find that our results are robust to the splitting of the sample as well as to the inclusion of monthly indicator variables. This makes it unlikely that our results are driven by a time-dependent variable. Likewise, we include industry dummy variables in our major regressions and find very similar results. These tests, along with the inclusion of control variables for human capital and information asymmetry causes us to conclude that our results are unlikely to be driven by observable endogenous variables.

However, many unobservable factors such as high quality management, board reputation, or high quality backers of the firm could be positively correlated with both firm governance and firm success. Since these factors are not observable, they may lead to inappropriate causal interpretations of our results. To more precisely determine the identification of our regressions, we now rely on an instrumental variables approach.

Our key outcome of interest, and therefore our second-stage dependent variable is an indicator variable taking a value of 1 if the firm is successful in raising capital in the ICO and zero otherwise. This regression is important because if the firm does not raise capital, it cannot be considered successful. To show a causal relationship between voting rights and ICO success, we develop several instrumental variables from the prior literature. First, it is clear that some industries value voting rights more heavily than others. In industries where voting rights are more highly valued, firms are more likely to split the firm's voting rights by using multiple classes of shares. Therefore, we use the percent of public firms in the same industry as the ICO firm with dual class structure as our first instrumental variable. Our second instrument depends on the ordering of ICOs. Firms within the same geographical region may be more likely to adopt one kind of governance structure than firms from another region simply because of the network effect from other firms (Karpoff, Schonlau, and Wehrly, 2017). We use the voting rights adoption of prior local ICOs to determine future ICO adoption of voting rights since the ordering of ICOs is unlikely to be endogenous. We therefore repeat our regression specification from Table 9. A model 1 using these two instrumental variables in a 2SLS framework. Table 11 model 1a shows that in the first stage the instruments are all significant at the 5% level or 1% level. In addition, the first stage F-statistic for the instruments is 40.27 showing that there is no weak instruments problem since the Stock and Yogo (2005) critical value is 19.93. In the second stage (model 1b), we find that even after controlling for the endogeneity of voting rights associated with the tokens, there still remains a strong positive and significant relationship between voting rights and the likelihood of ICO success. In addition, the coefficient is similar in size to the OLS coefficient (0.244 compared to the OLS 0.157) indicating no problems with weak instruments. On the whole, these results support a causal interpretation for the positive relationship between voting rights and ICO likelihood.

For instruments related to cash flow rights, we utilize a similar argument in selecting our instrumental variables. Specifically, we use the percent of firms in the ICO industry with dividends as well as the average cash flow rights of prior local ICOs. Since industries with high dividends are more likely to have high cash flow rights, these instruments should meet the relevance requirement. In Table 11 model 2a we find a positive and significant relationship between firm adoption of cash flow rights and our instrumental variables. In addition, the F-statistic to test our instruments is 21.50, above the critical value for weak instruments. In model 2b, the second stage regression we find a positive but insignificant relationship

between ICO likelihood and cash flow rights. This finding is consistent with our OLS results from Table 9. We cannot rule out that cash flow rights increase the likelihood of ICO success, but our results do not strongly support such an interpretation.

We do not tabulate results for managerial token allocation. Although we have utilized many potential instrumental variables and were able to find some causal support for our results, we were not able to find an instrumental variable that met the weak instruments criteria of Stock and Yogo (2005). Therefore, rather than tabulate results that have a weak instruments problem, we interpret our OLS managerial token allocation / ICO success results with caution.

We then move on to lockup agreements as our final governance mechanism. Since firm R&D is an investment in the future value of the firm, any industry with high R&D should necessarily have a higher level of interest in the long-term health of the firm. We collect data from public firms from COMPUSTAT to determine the median R&D by industry, and then use the public firm break points to determine if the ICO is in a high R&D industry. Therefore, we use as our final instrumental variable an indicator for ICOs in industries with above the median R&D. In addition, we use the adoption of lockup agreements for local firms in prior ICOs as an instrumental variable. We find in Table 11 model 3a that these instruments are statistically significant in the first stage regression and the model meets the criterion for not having a weak instruments problem with an F-statistic of 47.26 where the Stock and Yogo (2005) critical value is 19.93. In the second stage regression, we find that the likelihood of ICO success is significantly related to the use of a lockup agreement at the 1% level supporting a causal interpretation of our overall results.

While causal interpretations are often difficult, we feel that the novel nature of our findings and the importance of studying the governance of firms in this context greatly outweigh the need for perfect identification. Our results support a causal interpretation but we are careful to note that our instrumental variables being largely based on both industry-specific information and prior ICO information may cause correlations with firm industry. Therefore, there remains room for alternative interpretations of our findings.

4.5. Managerial moral hazard and ICO Underpricing

Thus far, we have focused on the universe of initial coin offerings from our sample. However, a subset of the ICO firms go on to not only raise funds, but to eventually be listed on a major exchange. These exchanges allow liquidity that enhances a firm's ability to glean market information about the value of the tokens being sold. Thus, we move now to a subset of firms to examine specific firm measures that can only be observed for firms that raise money in an ICO plus are subsequently listed on an exchange where publicly listed prices are disclosed.

Successful ICOs have a listed price as well as the number of tokens sold based on their ICO filings. In addition, we utilize data from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com to gather information about the offer price of the ICOs. When firms have discounts to their ICO offer price (which is fairly common) we calculate an average price of offering since early investors often get a discount from the overall offer price compared to later investors. We then utilize this offer price along with the first listing price as reported by coinmarketcap.com to calculate the underpricing of the ICO firms.

The underpricing of the ICO in our context is the percent difference from the ICO purchase price to the first listed price on a public exchange. Similar to the IPO case, we find significant skewness in the underpricing of ICOs with a median of 31.84% and a mean of over 4 million %.[15] This underpricing far exceeds the historical IPO underpricing of 17.8% provided by Jay Ritter.[16] Therefore, this excessive underpricing in the ICO market relative to IPOs must be explained by the high level of information asymmetry either between informed and uninformed investors (Rock, 1986) or between issuers and market participants (Welch, 1989). The fact that ICO underpricing is so much larger than IPO underpricing implies that information asymmetry and agency problems between the issuer and purchaser of the tokens are driving the underpricing (Welch, 1989). We therefore use the measure of underpricing as a direct measure of the agency costs which cannot be overcome through certification by an underwriter, bonding or other traditional mechanisms.

We find a lower level of underpricing compared to Benedetti and Kostovetsky (2018) likely because they have a sample of lower quality ICOs on average since they are not concerned with observing information about governance, for instance. Our sample is smaller and requires firms to disclose a white paper, meaning that our sample on average will be larger ICOs and contain higher quality ICOs. Thus, where our sample is about 330 ICOs, their sample consists of 523 ICOs with many of their observations being of firms who do not disclose their white papers and are thus, of very low quality. Where our sample median underpricing is 32%, their average is 246%. We also calculate underpricing as log(first listing price/ offer price) to alleviate concerns about skewness.

Utilizing the prior IPO literature, we propose that underpricing and especially excessive underpricing is a good proxy for agency problems (Loughran and Ritter, 2002). We examine the impact of good firm governance on ICO underpricing since governance is thought to at least partially alleviate agency problems in our context. To this end, in Table 12.A-12.D we examine the relationship between governance and underpricing. We find in these univariate results that the relationship is not clear in most cases. The one exception is for the allocation of tokens to managers. We find a strong and significant relationship

[15] For comparisons between ICOs and IPOs, see Sanchez (2017).
[16] https://site.warrington.ufl.edu/ritter/files/2018/07/IPOs2017Underpricing.pdf

between ICO underpricing and the allocation of tokens to management. We also find a weaker relationship between lockup agreements and underpricing, with firms having lockup agreements being associated with lower underpricing. On the whole, this suggests that allocating tokens to managers and using lockups may help to alleviate some of the agency costs of ICO firms.

In multivariate regression results in Table 13 we regress underpricing on control variables plus the governance characteristics of interest in our paper. We find that underpricing is significantly lower when the firm allocates tokens to managers and when the firm utilizes lockup agreements. The magnitude of underpricing is such that at the median, the underpricing cost with proceeds of $6.1 million and underpricing of 32% results in a loss of $1.9 million. However, if the firm has allocates shares to management, the coefficients in Table 13 suggest that the value lost from underpricing is only $0.5 million and with a lockup agreement, this lost value from underpricing almost completely disappears. On the whole, this suggests that at least for some of our governance measures of interest, firms utilizing these measures can reduce their underpricing.

4.6. ICO Price Discovery

The empirical results we have documented thus far suggest one important point. To the extent that an efficiently functioning secondary market can compensate for a lack of regulation, the mechanism of raising capital through ICOs may survive despite the asymmetric information and incentive problems typical for firms using this mechanism. Our substitution hypothesis suggests that self-imposed governance mechanisms may enhance the efficiency of price discovery in the secondary market for crypto tokens. Therefore, for the subset of ICOs with sufficient information to determine firm prices and returns, we examine the ability of firm governance to impact price discovery. [17]

We begin by utilizing a market model approach to determine the appropriate level of price discovery. We believe that all ICO prices are set according to two sources of risk: risks from the market for cryptocurrencies and risks from the individual firm. The market for cryptocurrencies is influenced by technological issues with Blockchain technology, regulatory issues impacting all cryptocurrencies, the ability of firms to hire workers in this highly specialized technical industry, and many other issues common to all ICOs. Risks from these kinds of issues cannot be addressed through good ICO firm governance since

[17] There are several reasons why governance mechanisms may enhance price discovery in the secondary market for cryptocurrencies. First, solid governance mechanisms reduce uncertainties caused by managerial moral hazard and allow the secondary market to quickly impute information into the underlying asset. With more severe managerial moral hazard, managers have strong incentives to distort information disclosure to benefit themselves, hurting the reliability of information. Second, some governance mechanisms including voting rights require managers to disclose information regularly, which enhances price discovery in the secondary market for cryptocurrencies. Third, solid governance mechanisms may lead to active participation of more investors, which further enhances price discovery.

the governance structure of a firm cannot change these "market" concerns. To control for these common cryptocurrency issues, we utilize a market model from the finance literature. Specifically, we take the daily returns from each individual ICO firm and regress these daily returns onto the daily returns on Ethereum.

$$(1)\quad R_t = \alpha + \beta\, R_{Eth\,t} + \varepsilon_t$$

This "market model" approach allows us to calculate an abnormal return for each individual ICO firm, α, the level of market risk, β, as well as, ε the residual volatility of the ICO. Our model is akin to a reduced form Gonzalo and Granger (1995) model where there is one common factor for each ICO firm: the return of Ethereum. While we could empirically utilize the Bitcoin prices for the market model, we find that Ethereum explains a significantly higher percentage of the volatility of each ICO compared to Bitcoin. Also, since most of the tokens that we are examining utilize Ethereum as their platform base, it makes the most sense to utilize Ethereum as our market index measure.

For each firm, we run the market model regression in equation (1) for the whole period over which the token has price data available. This allows us to examine the stability of the market model residuals over time.[18] If there is learning about the risks of an individual token that is idiosyncratic then as the market learns about the token and risk is reduced, we expect to see the standard deviation of ε decline over time. As an example of this, Figure 1 documents the market model residuals of STORJ token from its first listing on an exchange to 12 months later. The market model residuals tabulated in Figure 1 are representative of the tokens in our sample, where there appears to be a regular decline in idiosyncratic risk as the tokens trade on an exchange.

In Table 14.A we report the median alpha and beta from the market model regressions for our ICO tokens. We find that the median intercept is a statistically significant -1.59% with a median beta of 0.90. Both of these figures are statistically significant at the 1% level and suggest that the market model explains the abnormal returns to a large extent. We find that the median R^2 of the market model is 16.4% suggesting that there is substantial idiosyncratic volatility for cryptocurrencies.

In Table 14.B we report the median daily volatility for our ICO firms, the median Ethereum daily volatility, and the median market model residual volatility. We report medians since means are highly skewed although our results are similar using means rather than medians. As the data shows, there is a

[18] As an additional test, we repeat our analyses calculating the market model monthly. This allows us to calculate the alpha and beta for each firm every month and thus, vary the intercept and beta estimates. Our results are qualitatively similar using this technique. Note that by running a market model over the life of our tokens, we implicitly assume a constant beta and alpha for the time over which we have returns. By calculating the market model allowing the alpha and beta to vary month-by-month in the robustness test, we ensure that this assumption of stability is not driving our declines in the residuals of our tokens.

substantial decline in the token volatility at the 1% level from the time the token first lists on an exchange to several months later. There is also a decline in Ethereum volatility which is significant at the 10% level using some specifications. We then use our market model estimates and daily data for each individual token to calculate the firm's return volatility every month generating the market model residual σ. We report these results for each 30 day month from the time the token first lists on an exchange until 12 months later. Note in the table that there is a survivorship issue since only 287 tokens out of a total of 386 tokens listed on an exchange survive on the exchange for one year. Therefore, to avoid this survivorship bias, we conduct most of our multivariate regressions at the 4 month level, allowing us to include 3 lagged monthly observations in our regressions.

If the market learns new information about the firm's project as managers execute their business plans, as new information is revealed about the firm, and as the market trades the tokens, then the market model residual should decline significantly over time. However, since the focus of our paper is on the governance of ICOs, we are particularly interested in the ability of governance to enhance learning regarding the value of the tokens. As such, we plot monthly residual standard deviations for firms with versus without our four key governance mechanisms in Figure 2. Specifically, in Figure 2.A we compare firms with voting rights to firms without voting rights, finding that voting rights lead to larger declines in residual volatility (the difference in these residual standard deviations are statistically significant in months 4-8). We find very similar declines between firms with and without cash flow rights in Figure 2.B with no differences being statistically significant. In Figure 2.C we report the residual standard deviation over time for firms allocating tokens to management versus not allocating tokens to management and find similar declines between the two groups. Finally, for lockup agreements in Figure 2.D we find that firms with lockup agreements have a larger decline in market model residual volatility, a difference which is statistically significant in month 3, month 5, month 9, and month 10.

On the whole, Figure 2 is suggestive that there may be important differences in the decline in market model residuals for firms with versus without important governance mechanisms. To determine if results are robust to the inclusion of controls for ICO characteristics, we now repeat our analyses using a multivariate regression setting. In Table 15 we run a regression with the month 4 market model residual standard deviation as the dependent variable. After controlling for the month 1, 2, and 3 residual standard deviation as well as other factors that may be associated with ICO volatility, we examine the impact of governance. We find that for three out of four of our measures of governance: token voting rights, token cash flow rights, and token allocation to managers, we find a negative relationship between residual volatility decline and governance. However, this decline in residual volatility is only statistically significant in the case of voting rights and cash flow rights, suggesting that price discovery is best assisted by allocating

voting rights or cash flow rights to token holders. On the whole, these results show that governance rights not only make ICOs more successful on average, but they also enhance the token's ability to glean important market information about the ICO firm project. This price discovery is a key benefit of initial coin offerings over other sources of capital such as non-equity-based crowd sourcing, venture capitalists, or angel investors. In short, ICOs that adopt better governance practices are better able to support the firms in the future. This also suggests another channel through which governance mechanisms enhance value and ICO success – by improving price discovery (efficiency of the secondary market).

5. Conclusions

In this paper, we empirically examine whether the market for ICOs in a limited regulatory environment can alleviate asymmetric information and incentive problems through self-imposed governance mechanisms. Despite the unique benefits of crypto tokens, ICO markets may not be viable in the absence of regulatory intervention without alleviating asymmetric information and incentive problems.

We propose what we call the substitution hypothesis which states that market forces incentivize ICO issuers to voluntarily adopt governance mechanisms which effectively bind their behavior as a substitute for regulatory involvement. Since voluntarily adopted governance mechanisms reduce managerial moral hazard, the existence of these governance mechanisms leads to lower underpricing, better ex-post performance, higher ICO success and more efficient price discovery in the secondary market. We find comprehensive evidence which supports this hypothesis.

Our findings are important in several ways. First, our results suggest that ICOs may be a viable method of financing, particularly if firms adopt certain governance mechanisms. The adoption of these governance mechanisms is driven by market forces and can substitute for regulatory involvement. This implication of our results contrasts with the popular belief that the market for ICOs is an unregulated method of raising capital exposed to large fraud and manager shirking risk, which will prevent its long-term survival. Second, our results suggest an important policy recommendation for ICO regulators. Regulators must pay close attention to the issue of how the introduction of new regulation affects ICO manager incentives to alleviate asymmetric information and incentive problems. Our substitution hypothesis suggests that ICO manager incentives to invest in governance mechanisms may decline if the government imposes strict regulations on the market for ICOs. Thus, our paper suggests that regulators may partially rely on market discipline to control a significant portion of the moral hazard problem in the market for ICOs. For instance, government regulators should focus on educating investors concerning the benefits of strong governance mechanisms for ICOs. Third, our results shed light on an important question in corporate governance which has had limited research in the extant literature. Specifically, Shleifer and Vishny (1997) and Stein (2003) argue that, when asymmetric information and incentive problems are severe, curative forces endogenously arise through the mechanism of market dynamics. Even though this issue has a fundamental importance in the

corporate governance literature, testing it is very difficult since the effects of market forces and the effects of external regulation are hard to separate. In the past, governance practices have been mandated by regulatory authorities, directly impacting all firms. ICOs provide a rare opportunity to test the endogenous adoption of governance mechanisms since ICOs are lightly regulated due to their recent development and unique technological features. Also, ICOs provide a useful laboratory to empirically investigate the evolutionary governance theory as suggested by Alchian (1950) and Stigler (1958) by testing whether the ICOs that survive or are successful have optimally adopted value-increasing governance mechanisms. Thus, our findings have important implications for ICO issuers, regulators, and corporate governance researchers.

References

Adhami, Saman, Giudici, Giancarlo, and Martinazzi, Stefano, 2018, Why do businesses go crypto? An empirical analysis of initial coin offerings, forthcoming, Journal of Economics and Business.

Aggarwal, Reena, and Conroy, Pat, 2000, Price discovery in initial public offerings and the role of the lead underwriter, Journal of Finance 55:6, pp 2903-2922.

Aghion, Philippe, and Bolton, Patrick, 1992, An incomplete contracts approach to financial contracting, Review of Economic Studies 59:3, pp 473-494.

Alchian, Armen A., 1950, Uncertainty, evolution and economic theory, Journal of Political Economy 58, pp. 2111-221.

Baker, Malcolm, and Gompers, Paul, 2000, Executive Ownership and Control in Newly Public Firms: The Role of Venture Capitalists, Unpublished working paper, Harvard University.

Baker, Malcolm, and Gompers, Paul, 2003, The Determinants of Board Structure at the Initial Public Offering, Journal of Law and Economics 46, pp 569-598.

Barber, Brad, and Odean, Terrance, 2013, The Behavior of Individual Investors, in Handbook of Economics of Finance, Volume 2, 2013, edited by George Constatinides, Hilton Harris, and Rene Stulz, Elsevier Publishing.

Benedetti, Hugo and Kostovetsky, Leonard, 2018, Digital tulips? Returns to investors in initial coin offerings, Boston College working paper.

Black, Fischer, jense4n, Michael, and Scholes, Myron, 1972, The capital asset pricing model: Some empirical Tests, in Studies in the Theory of Capital Markets, ed., Michael Jensen, New York, Praeger.

Gilson, R. J. and Black, B. S., 1998, Venture Capital and the Structure of Capital Markets: Banks Versus Stock Markets, Journal of Financial Economics 47, pp. 243-277.

Catalini, Christina, and Gans, Joshua S., 2017, Some simple economics of the blockchain, MIT working paper.

Catalini, Christina, and Gans, Joshua S., 2018, Initial coin offerings and the value of crypto tokens, MIT working paper.

Chod, Jiri, and Lyandres, Evgeny, 2018, A theory of ICOs: Diversification, agency, and information asymmetry, Boston College working paper.

Cong, Linn William, Li, Ye, and Wang, Neng, 2018, Tokenomics: Dynamic adoption and valuation, University of Chicago working paper.

Cummins, M., Lynn, T., Mac an Bhaird, Ciaran and Rosati, P., 2018, Addressing Information Asymmetries in Online Peer-to-Peer Lending, Disrupting finance: Fintech and strategy in the 21st century, Palgrave Studies in Digital Business & Enabling Technologies, Palgrave Pivot.

Gilson, Ronald J., Black, Bernard, 1998, Journal of Financial Economics 47, pp 243-277.

Gompers, P., & Lerner, J. (2004). The venture capital cycle. MIT Press.

Gonzalo, Jesus, and Granger, Clive, 1995, Estimation of common long-memory components in cointegrated systems, Journal of Business and Economic Statistics 13:1, 27-35.

Hart, Oliver, 1995, Firms, contracts, and financial structure, New York: Oxford University Press, USA.

Hart, Oliver, 2001, Financial contracting, Journal of Economic Literature 39: 4, pp 1079-1100.

Howell, Sabrina T., Niessner, Marina, and Yermack, David, 2018, Initial coin offerings: Financing growth with cryptocurrency token sales, New York University working paper.

Kaal, Wulf A., 2018, Initial coin offerings: The top 25 jurisdictions and their comparative regulatory responses, University of Saint Thomas Law School working paper.

Kaplan, Steven N., and Stromberg, Per, Financial contracting theory meets the real world: An empirical analysis of venture capital contracts, Review of Economic Studies 70:2, pp 281-315.

Karpoff, Jonathan M., Schonlau, Robert J., and Wehrly, Eric W., 2017, Review of Financial Studies 30:7, pp 2359-412.

Khanna, Naveen, Noe, Tom, and Sonti, Ramana, 2008, Good IPOs drive in bad: Inelastic banking capacity in hot markets), Review of Financial Studies 25:2, pp 1873-1906.

Kim, Oliver, and Verrecchia, Robert, E., 1991, Trading volume and price reactions to public announcements, Journal of Accounting Research 29, pp. 302-321.

Leboeuf and Schwienbacher, 2018, Crowdfunding as a new financing tool, in The Economics of Crowdfunding: Startups, portals, and investor behavior, Ed by Cumming and Hornuf, Palgrave Maxmillan, pp 11-28.

Lee, D. K. C. and Low, Linda, 2018, Inclusive Fintech: Blockchain, Cryptocurrency and ICO, World Scientific Publishing Co.

Li, Jiasum, and Mann, William, 2018, Initial coin offering and platform building, UCLA working paper.

Lipusch, Nikolaus, 2018, Initial coin offerings: A paradigm shift in funding disruptive innovation, University of Kassel working paper.

Loughran, Tim, and Ritter, Jay, 2002, Why Don't Issuers get Upset about Leaving Money on the Table in IPOs? Review of Financial Studies 15, 413-443.Maume, Philipp, and Fromberger, Mathias, 2018, Regulation of initial coin offerings: Reconciling US and EU securities laws, TUM School of Management working paper.

Myers, Stewart, 1977, Determinants of corporate borrowing, Journal of Financial Economics 5 pp147-175.

Nanda, Kajole, and Kaur, Mandeep, 2016, Financial inclusion and human development: A cross-country evidence, Management and Labor Studies 41: 2, pp 127-153.

Robinson, Randolph, 2018, The new digital wild west: Regulating the explosion of initial coin offerings, University of Denver working paper.

Rock, Kevin, 1986, Why new issues are underpriced, Journal of Financial Economics 15, pp 187-212.

Rohr, Jonathan, and Wright, Aaron, 2017, Blockchain-based token sales, initial coin offerings, and the democratization of public capital markets, Cardoza Legal Studies Research Paper No. 527.

Sahlman, William A., 1990, The structure and governance of venture-capital organizations, Journal of Financial Economics 27:2, pp 473-521.

Sanchez, David Cerazo, 2017, An optimal ICO mechanism, Calctopia working paper.

Shleifer, Andrei, and Vishney, Robert W., 1997, A survey of corporate governance, Journal of Finance 52:2, pp 737-783.

Sockin, Michael, and Xiong, Wei, 2018, A model of cryptocurrencies, University of Texas working paper.

Stein, Jeremy C., 2003, Agency, information and corporate investment, Handbook of the Economic of Finance, Edited by G.M. Constantinides, M. Harris and R. Stulz, Elsevier Science B. V.

Stigler, George J., 1958, The economies of scale, Journal of Law and Economics 1, pp 54-71.

Stock, James, and Yogo, M., 2005, Testing for weak instruments in linear IV regression, In: Andrews DWK Identification and Inference for Econometric Models. New York: Cambridge University Press. pp. 80-108.

Strausz, Roland, 2017, A theory of crowdfunding: A mechanism design approach with demand uncertainty and moral hazard, American Economic Review 107: 6, 1430-1476.

Weiss, G. N. F., Pelger, K., and Horsch, A., 2010, Mitigating adverse selection in P2P lending: Empirical evidence from Prosper.com.

Welch, Ivo, 1989, Seasoned offerings, imitation costs, and the underpricing of initial public offerings, Journal of Finance 44:2, pp 421-449.

Yan, J., Yu, W., and Zhao, J. L., 2015, How signaling and search costs affect information asymmetry in P2P lending: The economics of big data, Financial Innovation 1(1), pp.1-19.

Yermack, David, 2017, Corporate governance and blockchains, Review of Finance 21:1, pp 7-31.

Table 1. Initial coin offerings over time

This table shows the number of initial coin offerings by year and month from October 2015 – December 2017. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com.

Month	N	Percent of sample	Value $ millions
Oct-15 - Mar-16	3	0.3%	10.8
Apr-16	1	0.1%	6.7
May-16	1	0.1%	0.0
Jun-16	2	0.2%	3.6
Jul-16	1	0.1%	2.1
Aug-16	1	0.1%	2.0
Sep-16	2	0.2%	16.1
Oct-16	5	0.5%	12.4
Nov-16	5	0.5%	11.7
Dec-16	7	0.7%	5.8
Jan-17	2	0.2%	2.2
Feb-17	7	0.7%	11.2
Mar-17	8	0.9%	8.8
Apr-17	14	1.4%	111.0
May-17	22	2.2%	256.3
Jun-17	33	3.3%	434.2
Jul-17	32	3.1%	288.4
Aug-17	79	7.8%	357.8
Sep-17	130	12.5%	672.7
Oct-17	191	19.9%	1,280.2
Nov-17	178	13.8%	661.0
Dec-17	313	30.4%	758.0
Total sample	1,029	100.0%	5,819.4

Table 2. Initial coin offering industrial classification

This table shows the number of initial coin offerings by industry from October 2015 – December 2017. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com.

ICO Industry Name	N	Percent of sample	Comparable SIC code	SIC description
Art & Music	13	1.27%	7389	Business services, not elsewhere classified
Banking-Finance	21	2.06%	6020	Commercial banks
Commerce & Advertising	24	2.33%	7310	Advertising
Commodities	24	2.25%	0100	Agricultural production
Communications	16	1.57%	4812	Cellular and other wireless communications
Content Management	38	3.72%	7374	Comp. processing and data prep. & services
Data Storage	10	0.88%	7374	Comp. processing and data prep. & services
Drugs & Healthcare	23	2.25%	8071	Medical laboratories
Energy & Utilities	8	0.78%	4931	Electrical and other services
Events & Entertainment	25	2.45%	7990	Misc. amusement & rec. services
Finance	69	6.76%	6200	Security and commodity brokers
Finance-Insurance	10	0.98%	6311	Life insurance
Finance-Venture Capital	5	0.49%	6726	Closed end fund management
Gambling & Betting	54	5.29%	7011	Hotels and motels
Gaming & VR	47	4.60%	7372	Prepackaged software
Governance & Legal	22	2.15%	8111	Legal services
ICO Market	19	1.86%	6211	Security brokers and dealers
Identity & Reputation	13	1.27%	6282	Investment advice
Infrastructure	99	9.70%	7374	Comp. processing and data prep. & services
Local development	3	0.29%	6552	Land subdividers and development
Machine Learning & AI	14	1.37%	7374	Comp. processing and data prep. & services
Machine Sharing	7	0.69%	7374	Comp. processing and data prep. & services
Marijuana	6	0.59%	2111	Cigarettes
Mining	12	1.18%	7374	Comp. processing and data prep. & services
Not-for-profit Fundraising	14	1.37%	7389	Fundraising on a contract or fee basis
P2Plending	10	0.98%	6159	Investment Companies, small business
Payments	105	10.28%	6199	Finance services
Personal Services	10	0.98%	7200	Personal Services
Real Estate	31	3.04%	6512	Real estate operators, non-residential buildings
Recruitment	8	0.78%	7361	Employment agencies
Social Network	43	4.21%	7374	Comp. processing and data prep. & services
Software	15	1.47%	7372	Prepackaged software
Supply & Logistics	13	1.27%	4731	Arrangement or transportation of freight
Trading & Investing	122	11.95%	6722	Management investment offices, open end fund
Transport	18	1.76%	4512	Air transport, scheduled
Travel & Tourism	12	1.18 %	4700	Transportation services
Total	1,029	100.00%		

Table 3. ICO firm sample characteristics

This table shows the summary characteristics of initial coin offerings for the total sample from October 2015 – December 2017. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com.

Panel A. Firm characteristic	N	Mean	10th percentile	50th percentile	90th percentile
Regulatory regime					
Regulatory count (number of laws)	580	0.76	0	0	2
Strict regulatory regime (indicator)	1,029	0.26	0.00	1.00	1.00
Strict Regulatory Countries					
Australia (indicator)	1,029	0.01	0.00	0.00	0.00
Canada (indicator)	1,029	0.02	0.00	0.00	0.00
China (indicator)	1,029	0.01	0.00	0.00	0.00
Germany (indicator)	1,029	0.01	0.00	0.00	0.00
Gibraltar (indicator)	1,029	0.01	0.00	0.00	0.00
Sweden (indicator)	1,029	0.01	0.00	0.00	0.00
United Kingdom (indicator)	1,029	0.03	0.00	0.00	0.00
United States (indicator)	1,029	0.18	0.00	0.00	0.00
Other countries					
Russia (indicator)	1,029	0.07	0.00	0.00	0.00
Singapore (indicator)	1,029	0.05	0.00	0.00	0.00
Switzerland (indicator)	1,029	0.03	0.00	0.00	0.00
Other countries (indicator)	1,029	0.30	0.00	0.00	1.00
Regulatory ambiguity (indicator)	1,029	0.43	0.00	0.00	1.00
Investor Sophistication					
Country-level investor sophistication	580	0.64	0.00	1.02	1.19
Allows retail investors (indicator)	1,029	0.96	1.00	1.00	1.00
Managerial moral hazard					
No CEO name disclosed (indicator)	1,029	0.13	0.00	0.00	1.00
No Chief counsel (indicator)	1,029	0.86	0.00	1.00	1.00
Control variables					
Employee info disclosed (indicator)	1,029	0.63	0.00	1.00	1.00
Number of employees	650	9.02	3.00	7.00	16.00
Board disclosure (indicator)	1,029	0.29	0.00	0.00	1.00
Board size	301	4.48	2.00	4.00	9.00
White paper length (pages)	1,029	24.15	8.00	22.00	43.00

Table 4. ICO firm governance characteristics

This table shows the summary characteristics of initial coin offerings for the total sample from October 2015 – December 2017. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. *, **, and *** indicates that the difference in the figures for successful versus unsuccessful offerings is statistically significant.

Panel A. Summary statistics for ICO governance characteristics

	Mean	**Median**	**Standard deviation**
Measure of firm governance			
Token voting rights (indicator)	0.20	0.00	0.40
Cash flow rights (indicator)	0.27	0.00	0.45
Management token allocation	7.74%	0.00%	11.54%
Lockup agreement in place (indicator)	0.17	0.00	0.38

Panel B. Univariate tests of ICO governance characteristics by token voting rights

	Regulatory ambiguity	**No regulatory ambiguity**	**t-test of difference (p-value)**
Measure of firm governance			
Token voting rights (indicator)	0.23	0.18	2.16**
			(0.03)
Cash flow rights (indicator)	0.24	0.29	1.80*
			(0.07)
Management token allocation	8.60%	7.20%	1.93*
			(0.06)
Lockup agreement in place (indicator)	0.19	0.16	1.37
			(0.17)

Table 5. Determinants of Governance Features

This table reports the coefficients from a multivariate regression model examining the determinants cash flow rights and voting rights for initial coin offerings from October 2015 – December 2017. The dependent variable takes a value of 1 if the firm have voting rights (panel a) or cash flow rights (panel b) and zero otherwise. Standard errors clustered by month are reported below the coefficients. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. *, **, and *** indicate significance at the 10%, 5%, and 1% level.

Panel A. Determinants of token voting rights

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Regulatory Regime									
Regulatory count (number of laws)	-0.023*								
	(0.023)								
Regulatory ambiguity (indicator)		0.061***					0.067***	0.029	0.074
		(0.020)					(0.019)	(0.018)	(0.068)
Investor sophistication									
Country-level investor sophistication			-0.074**						
			(0.035)						
Allows retail investors				0.173***			0.175***		
(indicator)				(0.036)			(0.041)		
Managerial moral hazard									
No CEO name disclosed (indicator)					0.140***			0.020	
					(0.041)			(0.049)	
No chief counsel (indicator)						0.052**			0.060**
						(0.022)			(0.028)
Interaction Terms									
Allows retail investors							0.136***		
x Regulatory ambiguity							(0.045)		
No CEO name disclosed								0.220**	
x Regulatory ambiguity								(0.099)	
No chief counsel									-0.019
x Regulatory ambiguity									(0.079)
Other control variables									
Employee info disclosed (indicator)	-0.064***	-0.064***	-0.064**	-0.060***	-0.064***	-0.061***	-0.029**	-0.033**	-0.055***
	(0.017)	(0.017)	(0.028)	(0.015)	(0.017)	(0.014)	(0.013)	(0.016)	(0.015)
Number of employees	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.001	0.001

	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Board info disclosed (indicator)	0.073**	0.073**	0.072	0.063**	0.073**	0.071**	0.070**	0.072***	0.070**
	(0.033)	(0.033)	(0.056)	(0.030)	(0.033)	(0.032)	(0.029)	(0.030)	(0.030)
Number board members	0.008	0.008	0.010	0.009	0.008	0.008	0.007	0.007	0.007
	(0.009)	(0.009)	(0.007)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)
White paper length (pages)	0.001	0.002***	0.002**	0.002***	0.002***	0.002***	0.003***	0.003***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Intercept	0.156***	0.156***	0.184***	-0.017	0.156***	0.103***	-0.097**	0.237***	0.062**
	(0.040)	(0.040)	(0.033)	(0.035)	(0.040)	(0.026)	(0.037)	(0.048)	(0.028)
N	580	1,029	580	1,029	1,029	1,029	1,029	1,029	1,029
R^2	3.61	3.22	4.27	3.65	3.89	2.86	5.48	5.18	3.43

Panel B. Determinants of cash flow rights									
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Regulatory Regime									
Regulatory count (number of laws)	-0.029								
	(0.018)								
Regulatory ambiguity (indicator)		-0.048					-0.062	0.044*	-0.079
		(0.029)					(0.056)	(0.025)	(0.055)
Investor sophistication									
Country-level investor sophistication			-0.088**						
			(0.024)						
Allows retail investors				-0.001			-0.021		
(indicator)				(0.056)			(0.057)		
Managerial moral hazard									
No CEO name disclosed (indicator)					0.010			0.039	
					(0.008)			(0.075)	
No chief counsel (indicator)						0.031**			-0.070
						(0.009)			(0.059)
Interaction Terms									
Allows Non-accredited investors							0.014		
x Regulatory ambiguity							(0.047)		
No CEO name disclosed								-0.037	
x Regulatory ambiguity								(0.060)	
No chief counsel									0.038
x Regulatory ambiguity									(0.066)
Other control variables									
Employee info disclosed (indicator)	-0.124	-0.022	-0.128	-0.017	-0.014	-0.021	-0.022	-0.019	-0.026
	(0.074)	(0.048)	(0.077)	(0.046)	(0.045)	(0.046)	(0.048)	(0.047)	(0.048)
Number of employees	0.003	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Board info disclosed (indicator)	0.121*	0.040	0.124*	0.041	0.042	0.038	0.040	0.041	0.039
	(0.052)	(0.047)	(0.049)	(0.048)	(0.048)	(0.047)	(0.048)	(0.048)	(0.047)
Number board members	-0.015*	-0.008	-0.015*	-0.008	-0.008	-0.008	-0.008	-0.008	-0.007
	(0.006)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)

White paper length (pages)	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Intercept	0.342***	0.277***	0.364***	0.251***	0.244***	0.310***	0.298***	0.269***	0.342***
	(0.048)	(0.034)	(0.058)	(0.060)	(0.024)	(0.044)	(0.064)	(0.033)	(0.050)
N	580	1,029	580	1,029	1,029	1,029	1,029	1,029	1,029
R^2	2.59	0.58	3.20	0.30	0.31	0.52	0.58	0.62	0.79

Panel C. Determinants of managerial token allocation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Regulatory Regime									
Regulatory count (number of laws)	-0.011**								
	(0.005)								
Regulatory ambiguity (indicator)		0.018***					-0.031	0.016***	-0.004
		(0.005)					(0.023)	(0.005)	(0.009)
Investor sophistication									
Country-level investor sophistication			-0.025**						
			(0.012)						
Allows retail investors				0.027***			-0.002		
(indicator)				(0.014)			(0.014)		
Managerial moral hazard									
No CEO name disclosed (indicator)					0.010			-0.005	
					(0.008)			(0.010)	
No chief counsel (indicator)						0.031**			0.021**
						(0.009)			(0.009)
Interaction Terms									
Allows Non-accredited investors							0.055**		
x Regulatory ambiguity							(0.021)		
No CEO name disclosed								0.026**	
x Regulatory ambiguity								(0.011)	
No chief counsel									0.027***
x Regulatory ambiguity									(0.007)
Other control variables									
Employee info disclosed (indicator)	0.015*	0.029***	0.014*	0.027***	0.027***	0.028***	0.027***	0.030***	0.030
	(0.008)	(0.007)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)
Number of employees	0.000	0.000	0.000	-0.001	-0.001	0.000	-0.001	0.001	0.000
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Board info disclosed (indicator)	0.002	0.002	0.014	0.000	0.000	0.002	0.000	0.072***	0.002
	(0.014)	(0.014)	(0.019)	(0.000)	(0.000)	(0.014)	(0.000)	(0.030)	(0.013)
Number board members	0.003	0.003	0.002	0.003	0.003	0.003	0.003	0.007	0.003

	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.009)	(0.002)
White paper length (pages)	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Intercept	0.051***	0.046***	0.053***	0.018	0.042***	0.013	0.033**	0.033***	0.011
	(0.011)	(0.011)	(0.015)	(0.016)	(0.006)	(0.011)	(0.017)	(0.006)	(0.010)
N	580	1,029	580	1,029	1,029	1,029	1,029	1,029	1,029
R^2	4.57	4.02	4.89	3.67	3.44	4.24	4.77	5.18	5.01

Panel D. Determinants of token lockup agreements

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Regulatory Regime									
Regulatory count (number of laws)	-0.002								
	(0.019)								
Regulatory ambiguity (indicator)		0.057*					-0.119	0.042	-0.050
		(0.030)					(0.094)	(0.033)	(0.077)
Investor sophistication									
Country-level investor sophistication			-0.012						
			(0.042)						
Allows Non-accredited investors				0.003			-0.098		
(indicator)				(0.044)			(0.063)		
Managerial moral hazard									
No CEO name disclosed (indicator)					0.072***			0.011	
					(0.025)			(0.031)	
No chief counsel (indicator)						-0.028			-0.074
						(0.045)			(0.055)
Interaction Terms									
Allows Non-accredited investors							0.188**		
x Regulatory ambiguity							(0.080)		
No CEO name disclosed								0.110**	
x Regulatory ambiguity								(0.055)	
No chief counsel									0.124*
x Regulatory ambiguity									(0.072)
Other control variables									
Employee info disclosed (indicator)	-0.011	0.009	-0.012	0.002	0.015	0.001	0.015	0.021	0.007
	(0.041)	(0.027)	(0.041)	(0.030)	(0.007)	(0.028)	(0.007)	(0.007)	(0.024)
Number of employees	0.003	0.002	0.003	0.001	0.001	0.001	0.001	0.001	0.002
	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.003)
Board info disclosed (indicator)	0.081**	0.050	0.082*	0.050	0.053	0.049	0.053	0.053	0.051
	(0.040)	(0.033)	(0.041)	(0.000)	(0.000)	(0.034)	(0.000)	(0.000)	(0.032)
Number board members	-0.001	-0.001	-0.006	-0.001	0.003	-0.001	0.003	0.003	-0.001
	(0.000)	(0.005)	(0.007)	(0.005)	(0.002)	(0.005)	(0.002)	(0.002)	(0.005)

White paper length (pages)	0.005***	0.006***	0.005***	0.006***	0.006***	0.006***	0.006***	0.006***	0.06***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Intercept	-0.006	-0.026	-0.001	0.004	-0.014	0.035	-0.014	-0.038**	0.038
	(0.044)	(0.016)	(0.051)	(0.057)	(0.023)	(0.033)	(0.023)	(0.017)	(0.042)
N	580	1,029	580	1,029	1,029	1,029	1,029	1,029	1,029
R^2	7.90	7.70	7.93	7.15	7.51	7.21	8.02	8.26	8.08

Table 6. Measures of manager effort

This table reports information regarding firm web site, Twitter, and Github usage for initial coin offerings from October 2015 – December 2017. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. We collect Twitter for the 30 days after the offering by web crawling through snapbird.org. This allows us to download up to 3500 tweets which is far more than any of the ICO firms issue before, during, and after their ICO. We collect data on Github usage and Github Commits by searching through Github to find the usage by the firm.

Manager effort summary statistics

	N	**Mean**	**Median**	**Standard deviation**
Twitter account (indicator)	1,028	0.63	1.00	0.48
Number of tweets ICO	1,029	103.14	23.0	178.00
Github use (indicator)	1,028	0.11	0.00	0.32
Github Commits	120	4.88	4.94	2.60

Table 7. Determinants of post-ICO Manager effort

This table reports information regarding firm web site, Twitter, and Github usage for initial coin offerings from October 2015 – December 2017. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. We collect Twitter for the 30 days after the offering by web crawling through snapbird.org. This allows us to download up to 3500 tweets which is far more than any of the ICO firms issue before, during, and after their ICO. We collect data on Github usage and Github Commits by searching through Github to find the usage by the firm. The dependent variable is the number of Tweets by the firm after the ICO (models 1-3), the log number of tweets (models 4-6), and the existence of a Github account (models 7-9) for the firm.

Panel A. Determinants of manager effort on Twitter

	(1) Twitter account	(2) Twitter account	(3) Twitter account	(4) Twitter account	(5) Log (1+Tweets)	(6) Log (1+Tweets)	(7) Log (1+Tweets)	(8) Log (1+Tweets)
Governance characteristics								
Voting rights (indicator)	0.039**				0.322**			
	(0.013)				(0.097)			
Cash flow rights (indicator)		-0.042				-0.244		
		(0.032)				(0.155)		
Managerial token allocation			0.078				0.356	
			(0.102)				(0.821)	
Lockup (indicator)				0.164***				0.736***
				(0.032)				(0.147)
Firm and project quality								
Employee info disclosed (indicator)	0.074**	0.071*	0.069**	0.071*	0.197	0.172	0.167	0.174
	(0.036)	(0.036)	(0.034)	(0.036)	(0.117)	(0.112)	(0.105)	(0.110)
Number of employees	0.004***	0.004**	0.004**	0.004***	0.037**	0.038***	0.038**	0.037***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.010)	(0.010)	(0.010)	(0.009)
Board info disclosed (indicator)	0.031	0.036	0.034	0.026	0.263*	0.294*	0.284*	0.248
	(0.045)	(0.044)	(0.045)	(0.047)	(0.121)	(0.122)	(0.126)	(0.140)
Number board members	0.001	0.001	0.001	0.002	0.046*	0.047*	0.048*	0.049*
	(0.002)	(0.003)	(0.003)	(0.002)	(0.019)	(0.019)	(0.019)	(0.018)
White paper length (pages)	0.002	0.002	0.002	0.001	0.011	0.012	0.012	0.008
	(0.001)	(0.001)	(0.001)	(0.002)	(0.007)	(0.007)	(0.007)	(0.007)
Intercept	0.489***	0.505***	0.491***	0.494***	1.352***	1.463***	1.386***	1.397***
	(0.027)	(0.028)	(0.026)	(0.030)	(0.140)	(0.141)	(0.119)	(0.142)
N	1,029	1,029	1,029	1,029	1,029	1,029	1,029	1,029
R^2	3.15	3.20	3.08	4.57	14.43	11.61	12.56	14.47

Panel B. Determinants of manager effort on Github

	(1) Github account	(2) Github account	(3) Github account	(4) Github account	(5) Github Commits	(6) Github Commits	(7) Github Commits	(8) Github Commits
Governance characteristics								
Voting rights (indicator)	0.025				1.131**			
	(0.021)				(0.521)			
Cash flow rights (indicator)		-0.043				0.293		
		(0.027)				(0.228)		
Managerial token allocation			-0.094				4.728***	
			(0.070)				(1.218)	
Lockup (indicator)				0.080**				0.036
				(0.032)				(0.436)
Firm and project quality								
Employee info disclosed (indicator)	0.064**	0.062**	0.065**	0.062**	-0.970	-0.942	-0.991	-0.959
	(0.027)	(0.025)	(0.027)	(0.025)	(0.664)	(0.709)	(0.709)	(0.703)
Number of employees	0.005***	0.005***	0.005***	0.005***	0.011	0.007	0.011	0.009
	(0.001)	(0.001)	(0.001)	(0.001)	(0.026)	(0.025)	(0.023)	(0.024)
Board info disclosed (indicator)	0.030	0.033	0.032	0.028	1.431	1.369	1.582*	1.425
	(0.033)	(0.032)	(0.034)	(0.033)	(1.016)	(0.959)	(0.894)	(1.001)
Number board members	-0.001	-0.001	-0.001	-0.001	-0.191*	-0.180*	-0.223**	-0.190*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.110)	(0.095)	(0.084)	(0.098)
White paper length (pages)	-0.001	-0.001	-0.001	-0.001*	0.023	0.021	0.021	0.021
	(0.001)	(0.001)	(0.001)	(0.001)	(0.015)	(0.015)	(0.016)	(0.016)
Intercept	0.063**	0.077**	0.071***	0.066**	4.564***	4.830***	4.553***	4.894***
	(0.018)	(0.022)	(0.018)	(0.018)	(0.472)	(0.558)	(0.638)	(0.569)
N	1,029	1,029	1,029	1,029	120	120	120	120
R^2	3.15	3.88	3.64	4.34	8.60	5.31	9.38	5.12

Table 8. Ex post measures of ICO success

This table shows the variables measuring success of the ICO for initial coin offerings for the total sample from October 2015 – December 2017. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. *, **, and *** indicates that the difference in the figures low governance versus high governance ICOs is statistically significant.

Panel A. Univariate tests of ICO success measures by token voting rights			
	Low governance ICOs No token voting rights	**High governance ICOs** Token voting rights	**t-test of difference (p-value)**
Measure of firm success			
Firms raised capital (indicator)	0.43	0.60	4.34***
			(0.00)
Log capital raised ($ millions)	6.24	9.14	5.03***
			(0.00)
Listed on exchange (indicator)	0.36	0.45	2.47**
			(0.01)
Panel B. Univariate tests of ICO success measures by token cash flow rights			
	Low governance ICOs No token cash flow rights	**High governance ICOs** Token cash flow rights	**t-test of difference (p-value)**
Measure of firm success			
Firms raised capital (indicator)	0.47	0.46	0.12
			(0.90)
Log capital raised ($ millions)	6.86	6.73	0.26
			(0.80)
Listed on exchange (indicator)	0.39	0.34	1.58
			(0.11)
Panel C. Univariate tests of ICO success measures by managerial token allocation			
	Low governance ICOs Below median management tokens	**High governance ICOs** Above median management tokens	**t-test of difference (p-value)**
Measure of firm success			
Firms raised capital (indicator)	0.41	0.53	3.93***
			(0.00)
Log capital raised ($ millions)	5.94	7.89	4.14***
			(0.00)
Listed on exchange (indicator)	0.37	0.38	0.48
			(0.63)

Panel D. Univariate tests of ICO success measures by lockup agreements (indicator)

	Low governance ICOs	**High governance ICOs**	**t-test of difference**
	No lockup agreement	Lockup agreement	**(p-value)**
Measure of firm success			
Firms raised capital (indicator)	0.43	0.65	5.57***
			(0.00)
Capital raised ($ millions)	6.16	10.05	6.36***
			(0.01)
Listed on exchange (indicator)	0.35	0.52	4.45***
			(0.00)

Table 9. Determinants of ICO success based on governance

This table shows the variables measuring success of the ICO for initial coin offerings for the total sample from October 2015 – December 2017. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. The dependent variable takes a value of 1 if the firm is successful in raising funds for its ICO and zero otherwise (Panel A), the log(1+ICO proceeds) (Panel B), and an indicator taking a value of one if the ICO is listed on an exchange and zero otherwise (Panel C). Standard errors clustered by month are reported below the coefficients. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. *, **, and *** indicate significance at the 10%, 5%, and 1% level.

Panel A. Determinants of ICO success

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Governance characteristics								
Voting rights (indicator)	0.157***				0.049			
	(0.032)				(0.050)			
Cash flow rights (indicator)		-0.006				-0.080*		
		(0.034)				(0.042)		
Managerial token allocation			0.380*				0.297	
			(0.212)				(0.275)	
Lockup (indicator)				0.187***				0.095**
				(0.029)				(0.036)
Regulatory regime								
Regulatory ambiguity (indicator)					-0.318***	-0.290***	-0.292***	-0.306***
					(0.024)	(0.031)	(0.026)	(0.021)
Voting rights x regulatory ambiguity					0.270***			
					(0.088)			
Cash flow rights x						0.146**		
Regulatory ambiguity						(0.056)		
Managerial token allocation x							0.401*	
Regulatory ambiguity							(0.222)	
Lockup x regulatory ambiguity								0.249**
								(0.071)
Firm and project quality								
Employee info disclosed (indicator)	0.097**	0.087**	0.077***	0.086**	0.067**	0.051	0.042	0.052*
	(0.027)	(0.027)	(0.023)	(0.028)	(0.030)	(0.031)	(0.026)	(0.028)
Number of employees	0.006	0.006	0.006	0.006*	0.005	0.005*	0.005*	0.005*
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Board info disclosed (indicator)	-0.155*	-0.144*	-0.144*	-0.153**	-0.159**	-0.139**	-0.145**	-0.153**
	(0.064)	(0.064)	(0.060)	(0.060)	(0.063)	(0.063)	(0.059)	(0.063)
Number board members	0.012	0.013	0.012	0.013*	0.015*	0.015*	0.014*	0.015*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
White paper length (pages)	0.003**	0.004***	0.004***	0.003***	0.003**	0.003***	0.003***	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Intercept	0.282***	0.308***	0.289***	0.305***	0.454***	0.476***	0.449***	0.475***
	(0.057)	(0.057)	(0.060)	(0.058)	(0.056)	(0.057)	(0.065)	(0.056)
N	1,029	1,029	1,029	1,029	1,029	1,029	1,029	1,029
R^2	6.75	5.19	5.93	7.03	14.43	11.61	12.56	14.47

Panel B. Determinants of ICO proceeds

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Governance characteristics								
Voting rights (indicator)	2.659***				1.292*			
	(0.517)				(0.732)			
Cash flow rights (indicator)		-0.187				-1.230		
		(0.500)				(0.740)		
Managerial token allocation			5.490*				5.377	
			(3.012)				(3.861)	
Lockup (indicator)				3.053***				2.006***
				(0.465)				(0.570)
Regulatory regime								
Regulatory ambiguity (indicator)					-4.492***	-4.138***	-3.980***	-4.294***
					(0.362)	(0.535)	(0.416)	(0.362)
Voting rights x regulatory ambiguity					3.509**			
					(1.357)			
Cash flow rights x						2.036**		
Regulatory ambiguity						(1.004)		
Managerial token allocation x							3.319	
Regulatory ambiguity							(3.100)	
Lockup x regulatory ambiguity								3.015**
								(1.210)
Firm and project quality								
Employee info disclosed (indicator)	1.482***	1.306***	1.165***	1.302**	1.056**	0.796	0.690	0.820*
	(0.455)	(0.460)	(0.398)	(0.465)	(0.488)	(0.518)	(0.430)	(0.465)
Number of employees	0.112*	0.115*	0.118*	0.111*	0.091*	0.100*	0.101**	0.097**
	(0.062)	(0.062)	(0.059)	(0.056)	(0.051)	(0.051)	(0.047)	(0.045)
Board info disclosed (indicator)	-2.354**	-2.166*	-2.177*	-2.326**	-2.413**	-2.094*	-2.193**	-2.325**
	(1.107)	(1.118)	(1.060)	(1.052)	(1.109)	(1.103)	(1.046)	(1.085)
Number board members	0.199*	0.219*	0.204	0.223*	0.239*	0.239*	0.232*	0.251*
	(0.118)	(0.127)	(0.122)	(0.115)	(0.122)	(0.129)	(0.129)	(0.127)
White paper length (pages)	0.070***	0.075***	0.072***	0.057***	0.061***	0.068***	0.063***	0.047***
	(0.013)	(0.013)	(0.012)	(0.012)	(0.014)	(0.015)	(0.013)	(0.012)
Intercept	3.444***	3.902***	3.609***	3.833***	5.879***	6.301***	5.808***	6.232***
	(0.753)	(0.744)	(0.813)	(0.776)	(0.778)	(0.803)	(0.924)	(0.796)
N	1,029	1,029	1,029	1,029	1,029	1,029	1,029	1,029
R^2	9.33	7.37	8.05	9.53	16.12	13.15	13.88	16.06

Panel C. Determinants of listing on an exchange

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Governance characteristics								
Voting rights (indicator)	0.088***				0.024			
	(0.029)				(0.049)			
Cash flow rights (indicator)		-0.054				-0.093*		
		(0.044)				(0.047)		
Managerial token allocation			0.207				0.188	
			(0.151)				(0.178)	
Lockup (indicator)				0.172***				0.116*
				(0.028)				(0.067)
Regulatory regime								
Regulatory ambiguity (indicator)					-0.170***	-0.155***	-0.149***	-0.167***
					(0.031)	(0.025)	(0.026)	(0.024)
Voting rights x regulatory ambiguity					0.157**			
					(0.071)			
Cash flow rights x						0.076		
Regulatory ambiguity						(0.047)		
Managerial token allocation x							0.154	
Regulatory ambiguity							(0.188)	
Lockup x regulatory ambiguity								0.148
								(0.103)
Firm and project quality								
Employee info disclosed (indicator)	-0.020	-0.027	-0.031	-0.026	-0.036	-0.046	-0.049	-0.045
	(0.041)	(0.041)	(0.039)	(0.037)	(0.043)	(0.043)	(0.039)	(0.037)
Number of employees	0.008**	0.009**	0.009**	0.008***	0.008**	0.008**	0.008***	0.008***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
Board info disclosed (indicator)	-0.099	-0.091	-0.093	-0.101*	-0.101	-0.088	-0.093	-0.101
	(0.061)	(0.060)	(0.060)	(0.059)	(0.061)	(0.059)	(0.058)	(0.060)
Number board members	0.010*	0.011	0.010*	0.011*	0.012**	0.011*	0.011*	0.012**
	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
White paper length (pages)	0.000	0.001	0.000	0.000	0.000	0.000	0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Intercept	0.328***	0.355***	0.332***	0.340***	0.419***	0.445***	0.414***	0.433***
	(0.064)	(0.066)	(0.067)	(0.063)	(0.073)	(0.075)	(0.074)	(0.066)
N	1,029	1,029	1,029	1,029	1,029	1,029	1,029	1,029
R^2	2.58	2.31	2.29	3.71	4.90	4.24	4.20	6.07

Table 10. Determinants of ICO success and proceeds based on manager effort and governance

This table shows the variables measuring success of the ICO for initial coin offerings for the total sample from October 2015 – December 2017. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. The dependent variable takes a value of 1 if the firm is successful in raising funds for its ICO and zero otherwise (Panel A), the log(1+ICO proceeds) (Panel B), and an indicator taking a value of one if the ICO is listed on an exchange and zero otherwise (Panel C). Standard errors clustered by month are reported below the coefficients. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. *, **, and *** indicate significance at the 10%, 5%, and 1% level.

Panel A. Determinants of ICO success

	(1)	(2)	(3)	(4)	(5)
Manager effort					
Twitter account (indicator)	0.212***				-0.080**
	(0.021)				(0.034)
Log(1+ Tweets)		0.073***			0.078***
		(0.007)			(0.011)
Github account			0.245***		0.071
			(0.042)		(0.151)
Github commits				0.033	0.019
				(0.020)	(0.024)
Governance characteristics					
Voting rights (indicator)					0.127***
					(0.028)
Cash flow rights (indicator)					0.004
					(0.022)
Managerial token allocation					0.291*
					(0.151)
Lockup (indicator)					0.105***
					(0.032)
Firm and project quality					
Employee info disclosed (indicator)	0.072***	0.074***	0.071**	0.070	0.070**
	(0.022)	(0.025)	(0.026)	(0.124)	(0.027)
Number of employees	0.005	0.004	0.005	0.001	0.003
	(0.004)	(0.003)	(0.004)	(0.002)	(0.003)
Board info disclosed (indicator)	-0.151**	-0.165**	-0.152**	-0.277**	-0.186***
	(0.070)	(0.071)	(0.063)	(0.119)	(0.060)
Number board members	0.013*	0.010	0.013*	0.027	0.008
	(0.007)	(0.007)	(0.008)	(0.018)	(0.006)
White paper length (pages)	0.003**	0.003**	0.004***	0.002	0.002**
	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)
Intercept	0.202**	0.204***	0.290***	0.487*	0.190**
	(0.058)	(0.051)	(0.058)	(0.208)	(0.032)
N	1,029	1,029	1,029	120	1,029
R^2	9.26	14.87	7.58	7.83	18.69

Panel B. Determinants of ICO proceeds

	(1)	(2)	(3)	(4)	(5)
Manager effort					
Twitter account (indicator)	3.313***				-1.377**
	(0.332)				(0.549)
Log(1+ Tweets)		1.165***			1.262***
		(0.126)			(0.199)
Github account			3.974***		0.969
			(0.643)		(2.219)
Github commits				0.585*	0.342
				(0.289)	(0.339)
Governance characteristics					
Voting rights (indicator)					2.184***
					(0.459)
Cash flow rights (indicator)					-0.040
					(0.331)
Managerial token allocation					3.982**
					(1.946)
Lockup (indicator)					1.798***
					(0.449)
Firm and project quality					
Employee info disclosed (indicator)	1.072**	1.104**	1.060***	1.970	1.079**
	(0.385)	(0.437)	(0.412)	(1.672)	(0.446)
Number of employees	0.102*	0.071	0.097	0.033	0.057
	(0.060)	(0.056)	(0.065)	(0.031)	(0.049)
Board info disclosed (indicator)	-2.286*	-2.505**	-2.299**	-4.452**	-2.858**
	(1.212)	(1.228)	(1.095)	(2.158)	(1.091)
Number board members	0.216*	0.164	0.225*	0.454	0.140
	(0.123)	(0.118)	(0.129)	(0.296)	(0.101)
White paper length (pages)	0.067***	0.061***	0.079***	0.042	0.047**
	(0.015)	(0.016)	(0.012)	(0.052)	(0.013)
Intercept	2.216**	2.221**	3.591***	5.859*	2.080**
	(0.760)	(0.645)	(0.770)	(2.689)	(0.697)
N	1,029	1,029	1,029	120	1,029
R^2	9.26	18.17	10.14	10.44	22.73

Panel C. Determinants of ICO listing on major exchange

	(1)	(2)	(3)	(4)	(5)
Manager effort					
Twitter account (indicator)	0.223***				-0.117***
	(0.042)				(0.040)
Log(1+ Tweets)		0.082***			0.095****
		(0.011)			(0.014)
Github account			0.220***		-0.031
			(0.049)		(0.097)
Github commits				0.038*	0.032**
				(0.021)	(0.015)
Governance characteristics					
Voting rights (indicator)					0.057**
					(0.024)
Cash flow rights (indicator)					-0.037
					(0.030)
Managerial token allocation					0.104
					(0.094)
Lockup (indicator)					0.103**
					(0.040)
Firm and project quality					
Employee info disclosed (indicator)	-0.042	-0.040	-0.039	-0.073	-0.039
	(0.039)	(0.038)	(0.038)	(0.192)	(0.037)
Number of employees	0.008**	0.005*	0.008**	0.006***	0.005*
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Board info disclosed (indicator)	-0.100	-0.116*	-0.100	-0.062	-0.131**
	(0.065)	(0.065)	(0.060)	(0.151)	(0.059)
Number board members	0.011*	0.007	0.011*	-0.008	0.006
	(0.006)	(0.005)	(0.006)	(0.025)	(0.004)
White paper length (pages)	0.000	-0.000	0.001	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)
Intercept	0.231**	0.227**	0.327***	0.420*	0.252***
	(0.064)	(0.063)	(0.062)	(0.192)	(0.063)
N	1,029	1,029	1,029	120	1,029
R^2	6.84	14.81	4.10	7.71	17.53

Table 11. Determinants of ICO success controlling for endogeneity

This table shows the variables measuring success of the ICO for initial coin offerings for the total sample from October 2015 – December 2017. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. The dependent variable takes a value of 1 if the firm is successful in raising funds for its ICO and zero otherwise. Standard errors clustered by month are reported below the coefficients. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. *, **, and *** indicate significance at the 10%, 5%, and 1% level.

	1a	1b	2a	2b	3a	3b
	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage
First stage instrumental variables						
Industry dual class shares	0.991***					
	(0.113)					
Prior local ICOs with voting rights	0.615**					
	(0.303)					
Industry dividend payouts			2.694***			
			(0.438)			
Prior local ICOs with cash flow rights			0.358**			
			(0.184)			
High R&D industry					0.106***	
					(0.027)	
Prior local ICOs with lockup agreements					0.471***	
					(0.055)	
Instrumented governance characteristics						
Voting rights (indicator)		0.244*				
		(0.140)				
Cash flow rights (indicator)				0.013		
				(0.170)		
Lockup (indicator)						0.693***
						(0.152)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
Test for weak instruments	40.27		21.50		47.26	
Stock- Yogo weak ID critical value	19.93		19.93		19.93	
N	1,029	1,029	1,029	1,029	1,029	1,029
R^2		6.27		5.16		1.16

Table 12. Underpricing by governance characteristics

This table shows the variables measuring success of the ICO for initial coin offerings for the total sample from October 2015 – December 2017. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. For a firm to be included in the sample, we must be able to get both and offer price and an exchange listing price. Underpricing is defines as the natural logarithm of the first public price minus the natural logarithm of the offer price for the ICO. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. *, **, and *** indicate significance at the 10%, 5%, and 1% level.

Panel A. Univariate underpricing by token voting rights			
	Low governance ICOs	**High governance ICOs**	**t-test / z-test of difference**
	No token voting rights	Token voting rights	**(p-value)**
Measure of firm success			
Underpricing mean	29.97%	58.26%	0.81
			(0.42)
Underpricing median	27.41%	37.47%	1.04
			(0.30)
Panel B. Univariate underpricing by token cash flow rights			
	Low governance ICOs	**High governance ICOs**	**t-test / z-test of difference**
	No token cash flow rights	Token cash flow rights	**(p-value)**
Measure of firm success			
Underpricing mean	40.93%	26.72%	0.41
			(0.68)
Underpricing median	31.57%	13.61%	0.17
			(0.87)
Panel C. Univariate underpricing by managerial token allocation			
	Low governance ICOs	**High governance ICOs**	**t-test / z-test of difference**
	No managerial token allocation	Managerial token allocation	**(p-value)**
Measure of firm success			
Underpricing mean	81.52%	-2.37%	2.77***
			(0.01)
Underpricing median	44.73%	17.13%	1.95*
			(0.05)
Panel D. Univariate underpricing by lockup agreement			
	Low governance ICOs	**High governance ICOs**	**t-test / z-test of difference**
	No lockup agreement	Lockup agreement	**(p-value)**
Measure of firm success			
Underpricing mean	43.84%	22.18%	1.31
			(0.19)
Underpricing median	36.16%	9.25%	1.83*
			(0.07)

Table 13. Determinants of underpricing based on governance

This table shows the variables measuring success of the ICO for initial coin offerings for the total sample from October 2015 – December 2017. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. For a firm to be included in the sample, we must be able to get both and offer price and an exchange listing price. The dependent variable is the natural logarithm of the first public price minus the natural logarithm of the offer price for the ICO. Standard errors clustered by month are reported below the coefficients. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. *, **, and *** indicate significance at the 10%, 5%, and 1% level.

	(1)	(2)	(3)	(4)
Governance characteristics				
Voting rights (indicator)	0.102			
	(0.275)			
Cash flow rights (indicator)		-0.112		
		(0.262)		
Managerial token allocation			-3.343***	
			(0.821)	
Lockup (indicator)				-0.501*
				(0.293)
Firm and project quality				
Employee info disclosed (indicator)	0.062	0.053	0.184	0.068
	(0.393)	(0.404)	(0.396)	(0.382)
Number of employees	0.020**	0.020*	0.017*	0.019**
	(0.010)	(0.010)	(0.009)	(0.009)
Board info disclosed (indicator)	-0.440	-0.430	-0.489	-0.458
	(0.448)	(0.436)	(0.389)	(0.426)
Number board members	-0.004	-0.004	0.005	-0.006
	(0.026)	(0.023)	(0.030)	(0.024)
White paper length (pages)	-0.003	-0.003	-0.004	0.000
	(0.010)	(0.010)	(0.010)	(0.010)
Intercept	0.320	0.370	0.617	0.382
	(0.534)	(0.575)	(0.508)	(0.532)
N	330	330	330	330
R^2	0.010	0.97	3.41	1.48

Table 14. Post-ICO token volatility

This table shows the variables measuring success of the ICO for initial coin offerings for the total sample from October 2015 – December 2017. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. For a firm to be included in the sample, we must be able to get an exchange listing price. The volatility is calculated as the raw standard deviation of daily returns and the market model residual regresses the daily returns onto the returns of Ethereum, calculating the standard deviation of the residuals using the following model for each individual ICO:

$$R_t = \alpha + \beta R_{Eth\,t} + \varepsilon_t$$

The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. *, **, and *** indicate significance at the 10%, 5%, and 1% level.

Panel A. ICO market model characteristics				
	N	**Median alpha (z-statistic)**	**Median beta (z-statistic)**	**R^2 (z-statistic)**
	386	-1.59%	0.90	0.164
		(17.00***)	(15.86***)	(1.18)
Panel B. ICO and Ethereum volatility and market model estimates after market listing				
	N	**Median daily ICO return σ**	**Median daily Ethereum return σ**	**Median daily market model residual σ**
Day 1-30	386	19.27%	5.83%	18.27%
Day 31-60	385	13.93%	6.50%	13.23 %
Day 61-90	381	13.30%	6.89%	12.31%
Day 91-120	374	13.17%	5.83%	11.65%
Day 121-150	360	11.19%	5.10%	10.21%
Day 151-180	344	10.88%	5.37%	10.02%
Day 181-210	322	10.82%	5.10%	9.60%
Day 211-240	287	10.28%	4.92%	9.12%
Day 241-270	261	9.77%	4.65%	8.46%
Day 271-300	208	9.28%	4.62%	8.38%
Day 301-330	153	8.74%	4.64%	7.72%
Day 331-360	122	8.30%	4.62%	7.13%

Table 15. Determinants of Post-ICO token price discovery

This table shows the variables measuring success of the ICO for initial coin offerings for the total sample from October 2015 – December 2017. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. For a firm to be included in the sample, we must be able to get an exchange listing price. The volatility is calculated as the market model residual regressing the daily returns onto the returns of Ethereum, calculating the standard deviation of the residuals using the following model for each individual ICO:

$$R_t = \alpha + \beta R_{Eth\,t} + \varepsilon_t$$

The dependent variable is the standard deviation of the market model residual calculated in month 4 of the token trading life. Standard errors clustered by month are reported below the coefficients. The sample is obtained from icotracker.com, icorating.com, coinmarketcap.com, and coinschedule.com. *, **, and *** indicate significance at the 10%, 5%, and 1% level.

	(1)	(2)	(3)	(4)
Governance characteristics				
Voting rights (indicator)	-0.036*			
	(0.019)			
Cash flow rights (indicator)		-0.065**		
		(0.027)		
Managerial token allocation			-0.094	
			(0.098)	
Lockup (indicator)				0.045
				(0.034)
Market model lagged residual σ				
Month -1 σ	0.798***	0.799***	0.796***	0.800***
	(0.084)	(0.081)	(0.083)	(0.082)
Month -2 σ	-0.080	-0.080	-0.080	-0.081
	(0.051)	(0.051)	(0.050)	(0.049)
Month -3 σ	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Firm and project quality				
Employee info disclosed (indicator)	-0.033	-0.039	-0.032	-0.036
	(0.039)	(0.037)	(0.038)	(0.039)
Number of employees	0.001	0.001	0.000	0.001
	(0.001)	(0.000)	(0.001)	(0.000)
Board info disclosed (indicator)	-0.019	-0.015	-0.022	-0.022
	(0.013)	(0.010)	(0.015)	(0.015)
Number board members	0.000	-0.001	-0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.002)
White paper length (pages)	-0.001	-0.001	-0.001	-0.001
	(0.000)	(0.001)	(0.000)	(0.001)
Intercept	0.094*	0.102*	0.094*	0.085*
	(0.038)	(0.039)	(0.041)	(0.037)
N	374	374	374	374
R^2	88.48	88.60	88.46	88.50

Figure 1. This figure shows the daily market model residuals from STORJ token calculated using the following market model.

$$R_t = \alpha + \beta R_{Eth\,t} + \varepsilon_t$$

Market model residuals, ε_t are plotted every day for the first year the token is publicly traded.

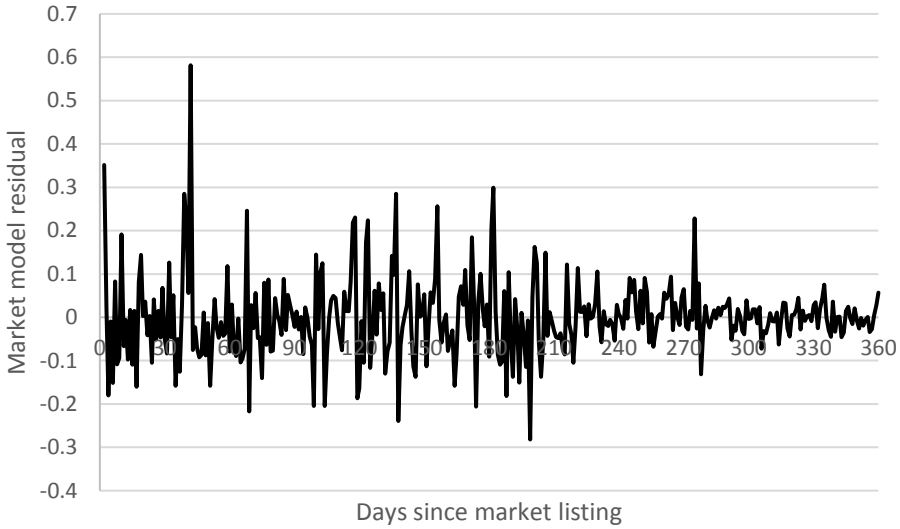
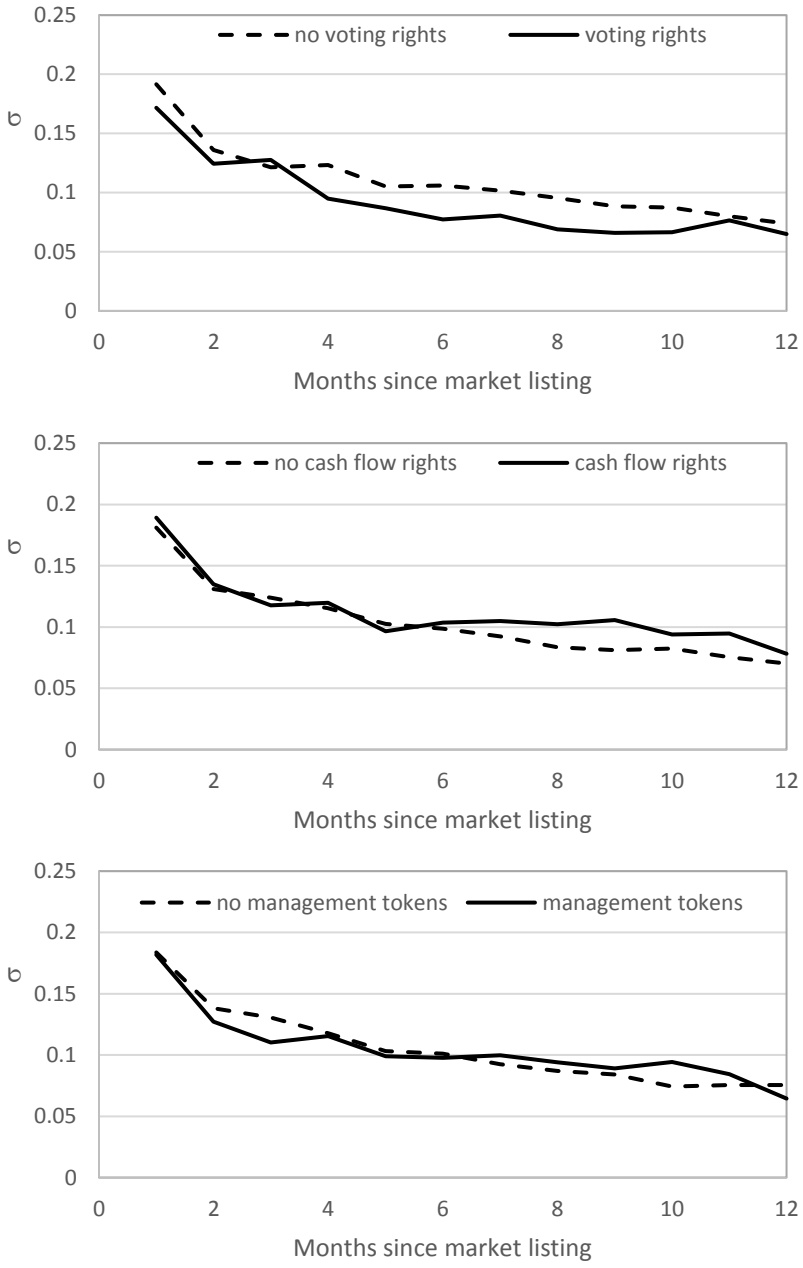
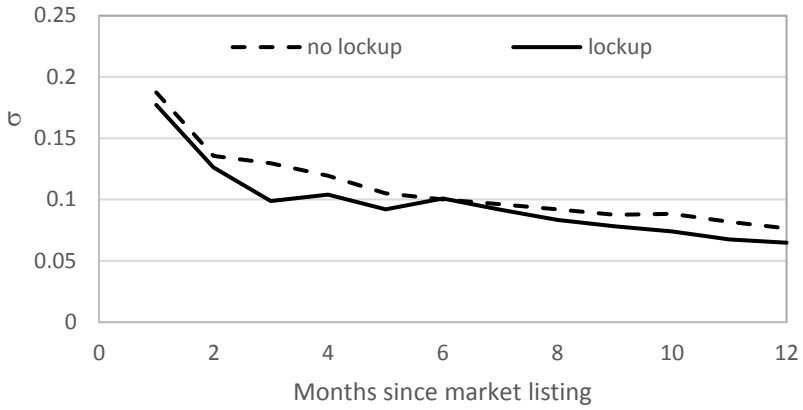


Figure 2. This figure shows the monthly standard deviation of daily market model residuals for all tokens calculated using the following market model.

$$R_t = \alpha + \beta R_{Eth\,t} + \varepsilon_t$$

Market model residual standard deviations, are plotted every month for the first year the token is publicly traded.




0.25
0.2
0.15
0.1
0.05
0
σ
no lockup
lockup
0
2
4
6
8
10
12
Months since market listing