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Investor Reactions to Crypto Token Regulation

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Abstract Despite calls for regulation in the crypto utility token market, it is unclear how crypto token investors value current regulatory proposals. We find that on average, investors react negatively to news that increases the likelihood of securities and transparency-related regulation. We also find that this negative reaction is attenuated for tokens rated higher on quality and transparency by intermediaries, those that have higher levels of disclosure, and listed on more liquid exchanges. The observed variation in token transparency and this muted reaction suggest investors perceive disclosure costs to be lower for tokens in more transparent environments, suggesting that transparency matters to investors.

Keywords: Regulation; Transparency; Cryptocurrencies; Crypto tokens; Financial markets

JEL classifications: G10; G18; M41

1. Introduction

Cryptocurrency tokens, or (crypto) tokens for short, have become a popular way for start-up companies to raise capital. 'Utility tokens,' the focus of this study, are a specific type of crypto token that represent a right to use a product or service offered by the issuer. Companies issue these tokens in exchange for capital in a process called an 'initial coin offering,' or ICO. ICOs overtook early stage venture capital funding for tech companies by threefold in 2017 and 2018 (Olsson, 2018) and by the second quarter of 2018, total ICO volume had risen to 45% of total IPO volume (Long, 2018). Although most token issuers usually claim that utility tokens should not be viewed as securities, these tokens are used to raise capital and are subsequently traded post-ICO on various crypto exchanges, and their value largely depends on the success of the token issuer. The similarity of utility tokens to traditional securities has therefore sparked debate about how these tokens should be regulated.

Securities regulators also typically regard utility tokens as similar to traditional securities (SEC, 2017), although much ambiguity exists regarding the classification of these assets. As a result, utility tokens are still largely issued and traded outside of regular financial markets and regulatory frameworks, and most regulators have maintained a cautious approach towards regulating crypto tokens. The lack of a clear regulatory framework has led to increasing concern about investor protection in these markets. For instance, in December 2017, SEC Chairman

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Jay Clayton acknowledged the efficiency-enhancing properties of cryptocurrencies in facilitating capital formation, the primary objective of the SEC (SEC, 2017), and stated it would not actively regulate the ICO market. However, he also issued a warning to investors in this market to be wary of fraudulent crypto token offerings. In April 2019, the SEC's Division of Corporate Finance released guidance for crypto token issuers, although it emphasized that staff-issued guidance should not be seen as legally binding regulation. More recently, the SEC has started to publicize interventions against ICO frauds to raise more awareness of potential scams.[1] The popularity of crypto tokens and the occurrence of ICO frauds in this market suggest that some involvement of regulators may be required (Zetsche et al., 2019).

In this study, we focus on regulatory attempts to enhance the transparency surrounding utility tokens. How investors in crypto tokens weigh the benefits and costs of such efforts is an open question. On the one hand, token holders or investors have several information needs that increased disclosure could help address. For instance, information about the development of the product or service tied to the token is relevant to these holders for assessing the value of the token. In addition, since utility tokens bear a similarity to equity, token investors have a similar demand for information about an issuer's performance and prospects to accurately price tokens. To the extent issuers do not provide these disclosures voluntarily, mandates for increased transparency may help to reduce information asymmetry and adverse selection problems in this emerging market, which investors could perceive as beneficial. For instance, requiring token issuers to register their offerings with securities regulators and comply with mandatory disclosure requirements around and after issuance could increase the amount of price-relevant information available to investors (SEC, 2017).

On the other hand, token investors may not perceive regulation to be necessary. For instance, Bourveau et al. (2022) document that crypto token issuers have incentives to voluntarily disclose information to signal their quality to market participants, reducing the need for disclosure regulation. Several crypto exchanges, such as Coinbase, also voluntarily maintain strict licensing requirements based on a token's intended purpose, the quality of the underlying product technology, team and governance, compliance with applicable law, and market supply and demand for the crypto token (GDAX, 2017). These developments suggest there may be limited incremental benefits to regulation aimed at reducing adverse selection. In addition, it is unclear whether the benefits of (mandatory disclosure) regulation documented for equity markets (Greenstone et al., 2006; Leuz & Wysocki, 2016; Shleifer & Wolfenzon, 2002) apply in the crypto token setting, as tokens do not represent equity shares. Crypto industry participants have also expressed concerns that the costs associated with increased regulation might impede innovation, e.g., by decreasing incentives for risk-taking or that high compliance costs reduce the availability of funds for innovative developments. Because the need for regulation is unclear and these direct and indirect compliance costs could negatively affect token value, investors could also react negatively to events that increase the likelihood of regulation.

We examine investor reactions to regulatory news in the crypto token market to provide empirical evidence on this issue. To align our analyzes with our theoretical arguments above, we focus on news about regulation aimed at increasing transparency by requiring similar disclosures as under traditional securities regulation. We also limit our sampling to news events in countries that have significant crypto token activity, by only including countries with the hundred largest crypto token exchanges in terms of market capitalization. We use an event study approach similar to Zhang (2007), Armstrong et al. (2010) and Joos and Leung (2013) and gather regulation news from Cointelegraph, a leading source of crypto-related news. We identify 15 dates between June 2017 and August 2018 on which regulatory news was announced.

[1] See e.g.: https://www.sec.gov/spotlight/cybersecurity-enforcement-actions.

Using token price data from Coinmarketcap, we document that the overall market reaction to news events that increase the likelihood of regulation is negative. This result is robust to a variety of specifications, including different event- and estimation windows, the exclusion of news events that are not picked up in traditional news media, the exclusion of tokens that are not directly affected by a particular regulatory news event at the country-level, or dropping each individual event and country from the sample. The negative reaction suggests that investors may perceive these regulatory proposals aimed at improving transparency through enhanced disclosure as burdensome or costly. If so, we would expect higher quality and transparent token issuers to experience muted negative reactions to these regulatory proposals, as the costs of such regulations are relatively lower. We conduct several cross-sectional tests to verify this intuition. First, we examine whether the market reaction varies with crypto token characteristics and ICO rating from ICOBench to capture token transparency and quality (Bourveau et al., 2022). We indeed find that the negative reactions are attenuated for crypto tokens with higher expert ratings for their information environment, management team, and underlying business proposition. We find a similar muted market reaction for crypto token issuers that engage more with followers on social media: investors react less negatively to increased regulation news for crypto tokens with a higher ICOBench rating for social media activity around the time of the ICO. Because the ICOBench ratings are static (i.e., only represent token quality at the time of the ICO), we conduct two additional tests based on several measures of token disclosure levels, and the characteristics of the exchanges on which tokens are listed. We find that the negative reaction is attenuated for token issuers with more expansive websites and when tokens are traded on exchanges with higher liquidity scores. In sum, our results suggest that token investors perceive regulation to be costly, but less so for higher quality and more transparent tokens, potentially because investors believe these token issuers are better equipped to navigate the burden of regulatory changes.

Our study provides initial evidence on the perceived costs and benefits of regulation in the cryptocurrency market, which is a relevant and current issue in regulatory and cryptocurrency communities. Although most jurisdictions have maintained a largely hands-off approach to the cryptocurrency market, there is increasing pressure on regulators to clarify their position on cryptocurrencies and to meet regulatory demands with an actionable approach.[2] We stress that our results do not imply that regulation is unnecessary or enhanced transparency does not matter. In fact, the result that token issuers do engage in voluntary disclosures suggests that issuers expect increased transparency to have some benefits. However, the negative market reactions could suggest that investors perceive current regulatory proposals to be costly. Several jurisdictions such as Hong Kong, Singapore, and the UK have initiated regulatory sandboxes for cryptocurrency trading or for FinTech start-ups to test new products and services in restricted settings without having to comply with strict regulatory frameworks that might stifle innovation, which may be an alternative to applying existing regulation to this type of digital assets (Kharpal, 2018).[3]

By focusing on the crypto setting, our study adds to existing literature on the role of information intermediaries and voluntary disclosure in emerging financial markets (e.g., Barton & Waymire, 2004; Bushee & Leuz, 2005; Leuz & Wysocki, 2016). Our cross-sectional analyzes suggest that in the absence of a clear regulatory framework aimed at improving transparency, crypto token experts act as intermediaries: their quality ratings of crypto token characteristics

[2]For instance, in September 2018, over a dozen US Congress members asked the SEC to provide more guidance on how it determines whether cryptocurrencies are investment assets (i.e., subject to SEC regulation) or commodities. In response, in April 2019 the SEC's Division of Corporation Finance published a framework to help crypto issuers assess whether their tokens constitute a securities offering, but cautioned that the framework should not be viewed as an official regulation or statement by the SEC (SEC, 2019). At a global level, the G20 also continues to mention that cryptocurrencies do not pose an immediate risk to financial stability but has stated it remains vigilant (Canepa, 2018).

[3]See e.g.: https://www.fca.org.uk/firms/regulatory-sandbox.

provide information that investors find relevant as evidenced by their mitigated reactions to regulatory news for higher rated crypto tokens. Investors also seem to value the extent of disclosures both during and after an ICO, suggesting an important role for voluntary disclosure in this nascent market. Our results complement those of Bourveau et al. (2022), who find that crypto token issuers with a better disclosure and information environment have a higher likelihood of successfully completing the offering, and have a lower subsequent crash risk, illiquidity, and volatility in secondary markets. Howell et al. (2020) also find that post-ICO success is related to disclosure and other quality signals. We provide additional evidence to support the conclusion that investors indeed value voluntary disclosure by documenting that the negative reactions to regulation are attenuated by transparency in the predicted direction. Finally, we add to Auer and Claessens (2018), who study the market reactions of the largest cryptocurrencies such as bitcoin to regulatory events. Our study focuses on utility tokens, because it allows us to provide evidence on the value of transparency-enhancing regulation in the cryptocurrency setting. Since the fundamental value of currency-like cryptocurrencies is unclear, or argued to be zero (Cheah & Fry, 2015), it is unclear why transparency and disclosure about the underlying issuer matters. In contrast, the value of utility tokens is arguably linked to the underlying value of the token issuer, making the potential value of transparency more apparent. This focus allows us to provide more detailed evidence on the perceived benefits and costs of transparency in the utility token setting.

2. Setting and Predictions

2.1. Utility Tokens and Utility Token Markets

Crypto tokens are crypto assets that can act as an investment instrument but also also as a medium of exchange. Crypto tokens run on an existing blockchain, while cryptocurrencies, such as Bitcoin or Ethereum, have their own blockchain. There are two types of crypto tokens: 'utility tokens,' which represent the right to use a product, service or protocol at the company that issued the tokens, and 'security tokens,' which represent ownership rights and a claim on future cash flows. Utility tokens are issued through a process called an 'Initial Coin Offering' (ICO), which is similar to an IPO. A company releases a whitepaper with details of the ICO and investors can transfer other cryptocurrencies or fiat currency to the company to receive issued tokens on the day of token distribution. Security tokens are issued through a process called a 'tokenized IPO.' In most countries, tokenized IPOs are regulated under the traditional securities regulation framework, while ICOs are not.[4] In this study, we therefore only consider utility tokens to investigate the impact of transparency-related regulatory news.

After distribution, utility tokens are publicly tradable on cryptocurrency exchanges and can be exchanged for other cryptocurrencies, crypto tokens, or fiat currencies (Chod & Lyandres, 2022). Utility tokens are usually not listed on all exchanges, but when a utility token is listed on multiple exchanges, prices can vary by exchange.[5] Once tokens are distributed after issuance,

[4]E.g., in the EU under Regulation (EU) 2017/1129 (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32017R1129), and in the U.S. under the Securities Acts of 1933 and 1934 (https://www.investor.gov/introduction-investing/investing-basics/role-sec/laws-govern-securities-industry).

[5]For our study, we use the price that is provided by Coinmarketcap, which is the volume weighted average of all market pair prices reported for the cryptoasset on all exchanges: https://support.coinmarketcap.com/hc/en-us/articles/360015968632-How-are-prices-calculated-on-CoinMarketCap-.

exchanges decide (sometimes following the request of the company or founders of a cryptocurrency) whether to list the utility token and this process varies among exchanges.[6] For instance, Coinbase, one of the biggest cryptocurrency exchanges, decides on the (de-)listing of cryptocurrencies using a strict framework (GDAX, 2017). In contrast, BitForex requires much less information and is less transparent about its specific requirements upfront (BitForex, 2019).[7]

Our empirical tests rely on the assumption that investors rationally weigh the costs and benefits of regulating non-regulated utility tokens and incorporate this assessment into utility token prices. However, a common concern about assets in the cryptocurrency market is that they are speculative and mostly traded by retail investors, calling into question the validity of this assumption. Due to the anonymous nature of crypto assets and the lack of regulation requiring disclosure of holdings, it is impossible to get a full overview of investors in utility tokens. However, anecdotal and survey evidence suggests the presence of sophisticated investors in this market (PwC, 2019) and that 22% of institutional investors already have exposure to crypto assets (Fidelity, 2019). Although some studies document speculative, bubble-like periods for Bitcoin and other currency-like cryptocurrencies (e.g., Cheah & Fry, 2015; Cheung et al., 2015; Corbet et al., 2018), other articles also suggest a degree of efficiency in these markets. Bhambhwani et al. (2019) document that fundamental characteristics of cryptocurrencies significantly explain variation in their prices and Pieters and Vivanco (2017) find that variation in exchange-level regulations predictably affect the prices of cryptocurrencies. Auer and Claessens (2018) investigate intraday price movements of Bitcoin in response to regulation news and find that the price of Bitcoin quickly and efficiently reacts positively (negatively) to the release of favorable (unfavorable) regulation news. Hence, we assume that token markets exhibit some degree of efficiency and investors are able to rationally react to the implications of potential regulation.

2.2. Regulatory Landscape

ICOs and utility token issuers emerged in a largely unregulated landscape, in which they do not have to comply with the strict registration and disclosure requirements for regular securities offerings (Bourveau et al., 2022; Global Legal Research Center, 2018). This exemption is mostly due to the ambiguity surrounding the classification of utility tokens, making it unclear which regulatory framework applies. As described in the previous section, issuers often argue that their tokens represent a service, good, or obligation for their company rather than an ownership claim, and therefore should not be viewed as securities. However, the value of utility tokens often depends on the performance of the token issuer, as demand for a token increases with the success of the issuing company (Conley, 2017). Therefore, securities regulators such as the U.S. SEC argue that despite issuers' claims, many utility tokens should be treated as securities that are subject to the securities regulation and that offerings should be 'accompanied by the important disclosures, processes and other investor protections that our securities laws require' (SEC, 2017). Despite the SEC's view and warnings, the regulator has been reluctant to enforce or mandate registration or increased disclosure. Rather, the SEC has taken a case-by-case approach and initially only acted against egregious cases of misrepresentation.[8] Although more recently, the SEC has increased its scrutiny of ICO and token issuers, it has yet to uniformly

[6]See: https://www.bitforex.com/en/tokenListing/introduce and https://support.bitforex.com/hc/en-us/articles/360015527192.

[7]Our data also suggest that Coinbase is indeed more selective in listing cryptocurrencies. Coinmarketcap reports 20 cryptocurrencies listed on Coinbase and 100 listed on BitForex.

[8]For our sample period of 2017–2018, the SEC undertook 22 ICO-related enforcement actions (see https://www.sec.gov/spotlight/cybersecurity-enforcement-actions) while ICOBench reported 415 U.S. ICOs in this period (see https://icobench.com/icos).

require crypto platforms to register or hold all ICOs to a similar disclosure standard as regular securities offerings. This trend is also observed in many other countries (Global Legal Research Center, 2018). ICOs and token issuers remain largely unregulated, leaving investors to rely on voluntary disclosures and information intermediaries to reduce information asymmetries in this market (Bourveau et al., 2022).

2.3. Predictions

We focus on regulatory proposals that address concerns about the lack of transparency of utility tokens and issuers, which inhibits investors' ability to adequately assess the fundamental value of a cryptocurrency (Zetsche et al., 2019). Utility token holders or investors likely have two types of information needs. First, these token holders are interested in product- or service-specific information, as a utility token can be viewed as a prepayment for access to an issuer's product or service that is often still under development. Some of this information is provided in the white paper at the time of an ICO, but post-ICO product development updates are useful to these investors for assessing the likelihood of redeeming and value of the token. Second, utility token investors are likely generally interested in going-concern-related aspects of the issuer itself, such as their financial prospects and managerial competence. Unlike a regular product or service, utility tokens are traded post-issuance where their value depends largely on the success and potential of the underlying business. Both information needs are likely (partly) met through enhanced disclosures as required by traditional securities regulation, such as periodic disclosure of financial and other material value-relevant information. Hence, even though utility tokens do not represent an ownership stake in the issuer, their information needs overlap with those of regular capital market participants.

This view is echoed in securities regulators' calls for utility token issuers to comply with usual registration and disclosure requirements for securities offerings, which would increase the amount of information available to investors and allow for a more informed investment decision (SEC, 2018). In particular, securities regulators have called for increased transparency of the token issuer during the ICO *and* in subsequent periodic disclosures. More stringent ICO disclosure requirements likely benefit investors by reducing adverse selection between a potential token investor and the firm during the initial offering, while periodic disclosures reduce information asymmetries between investors in subsequent trading. Although much of the public debate surrounds disclosure during an ICO, news about enhanced securities regulation proposals typically also include increased requirements for transparency post-ICO. For instance, the SEC's 2017 DAO report clarifies that 'DAO tokens are securities under the Securities Act of 1933 ("Securities Act") and the Securities Exchange Act of 1934 ("Exchange Act").' While the former applies to disclosure requirements around the initial offering, the latter regulates periodic subsequent disclosures.[9] We emphasize this point, since we examine investor reactions to issued tokens. Any observed market reaction to securities regulation news events are therefore more likely related to calls for increased transparency *post*-ICO, which go hand-in-hand with disclosure requirements around the time of the ICO.

Whether token investors react positively or negatively to such transparency-increasing regulations is an open question. Empirical evidence from traditional capital market settings suggests that increased disclosure is associated with positive capital market effects such as higher liquidity and a lower cost of capital (see e.g., Leuz & Wysocki, 2016, for an overview, although they also note many issues with this literature that prevent one from drawing unambiguous conclusions). Following this line of thought, we would expect to observe a positive market reaction to news

[9]See: https://www.sec.gov/litigation/investreport/34-81207.pdf.

events that increase the perceived likelihood of transparency regulation, due to reduced risk of trading in such tokens. However, it is not clear ex ante that these potential benefits will materialize. First, token issuers may have incentives to voluntarily take measures to protect investors, reducing the need for regulation (Leuz & Wysocki, 2016). Bourveau et al. (2022) find that in the absence of regulation in the ICO setting, issuers with a better disclosure and information environment have a higher likelihood of successfully completing the offering, and have a lower crash risk, illiquidity, and volatility in secondary markets. Howell et al. (2020) also find that post-ICO success is related to disclosure, credible commitment to the project, and other quality signals. These studies suggest that token issuers have incentives to voluntarily disclose information and credibly signal their quality to market participants. Similarly, Barton and Waymire (2004) find that in the pre-securities regulation era, financial reporting quality was higher for firms whose managers had incentives to supply higher quality disclosures, and that such firms experienced a smaller stock price decline during the 1929 stock market crash.

Second, although studies find benefits to voluntary disclosure, it is unclear whether mandatory disclosure yields similar outcomes. Although prior work in the context of equity markets suggests some benefits to disclosure regulation (Leuz & Wysocki, 2016), these results may not directly translate to the crypto token market. Increased transparency may reduce uncertainty about firm value or the discounted liquidating cash flow on which equity holders have a claim, which in turn lowers the discount rate of the liquidating cash flow and increases firm's stock price (see e.g., Lambert et al., 2007; Verrecchia, 2001). In addition to reducing uncertainty, disclosure regulation affects firm value by influencing managers' decisions and the distribution of future cash flows (Greenstone et al., 2006), or by reducing the cash flows that managers can appropriate (Shleifer & Wolfenzon, 2002). However, as explained earlier, since utility tokens do not grant voting or cash flow rights to the holder, the link between increased transparency and token value is less clear. The lack of voting rights also impairs crypto token investors' ability to directly discipline or replace management, or to motivate management to act in the interest of crypto token holders. Hence, securities regulation aimed at enhancing the transparency of tokens may be less beneficial given the lack of redress for utility token issuers beyond selling the token. In sum, due to the differences between traditional equity securities and utility tokens, we cannot assume that the identified benefits of mandated disclosure in equity markets also hold in the crypto token market.

Third, even if mandating disclosure results in the benefits discussed above, it is unclear whether they outweigh the costs of regulation. Although investors do not directly bear these compliance costs, token issuers and other crypto industry participants commonly raise the concern that disclosure regulations divert issuers' resources away from product development and innovation towards regulatory compliance (Rooney, 2018). For example, in New York State, companies operating with cryptocurrency are required to obtain a BitLicense, which also includes providing detailed financial data about their operations.[10] Companies that have attempted to apply for these licenses have reported costs between US$50,000 and US$100,000, and initially, few companies were able to successfully obtain a BitLicense (Perez, 2015; Wieczner, 2018). As innovative activities are likely vital to token issuers' longer-term success and growth, especially since these issuers are often developing or start-up companies, the lack of sufficient funds will negatively affect the value of these issuers. Given the direct and indirect costs that regulation imposes and the lack of clear arguments for the benefits of regulation in the crypto token setting, investors may not react, or react negatively to events that increase the likelihood of regulation.

Note that to observe a market reaction, these news events should affect current demand for crypto tokens. We believe this assumption is plausible. First, our events only include news events that clarify regulators' stance on crypto tokens (e.g., the SEC's statement that DAO

[10] See: https://www.dfs.ny.gov/system/files/documents/2021/04/financial_statement.pdf.

tokens should be considered as securities subject to securities laws on July 25, 2017), which could have immediate regulatory implications and therefore may also affect current demand for crypto tokens. Second, with respect to news events relating to future transparency regulation, prior studies find market reactions to news about regulation that has not yet been implemented (e.g., Armstrong et al., 2010; Joos & Leung, 2013; Zhang, 2007) whereas Daske et al. (2008) find that markets anticipate the potential cost of capital and equity valuation effects of mandatory IFRS adoption. Auer and Claessens (2018) also find that prices of cryptocurrencies such as bitcoin, respond predictably to regulatory news. For tokens, news that relates to future regulation may affect investors' perceptions of token issuers' incentives and their ability to innovate. If investors believe that regulation hampers innovation and therefore the value of the product or service underlying the token, this belief should also be reflected in current demand for tokens and lead to a change in current prices.

Finally, we stress that an overall positive or negative market reaction to regulatory events should not be interpreted as support for or against increased transparency mandates. Rather, our interest is to gain insight into whether token investors' reactions to regulatory proposals are in line with theoretical predictions on the potential costs and benefits of increased transparency in the crypto token setting. Such evidence allows us to better understand the role of transparency in crypto markets and whether token investors incorporate the potential value implications of these regulatory proposals in their trading decisions. It also allows us to gauge the extent of transparency among tokens absent regulation, which sheds some light on the potential effects of mandates. We are therefore mainly interested in the cross-sectional analyzes relating variation in token transparency and quality to token investors' reaction to regulatory news events.

3. Methodology & Data

To gauge how investors perceive regulation, we conduct an event study around the dates of news that relates to the likelihood of transparency regulation in the cryptocurrency market, following e.g., Zhang (2007), Armstrong et al. (2010) and Joos and Leung (2013). We explain our research design in the following sections.

3.1. News Events Coding

We compile our sample of transparency regulation news events by reviewing all regulatory news articles related to cryptocurrencies from Cointelegraph, one of the biggest cryptocurrency news-platforms, between August 8, 2013 and September 1, 2018.[11] Auer and Claessens (2018) use news from Reuters, but our informal discussions with blockchain-practitioners reveal that cryptocurrency market participants primarily use more industry-specific news sources, i.e., cryptocurrency and blockchain-oriented news platforms.

Our search of Cointelegraph yields 1009 potential regulatory news articles, i.e., the articles Cointelegraph tags as regulatory news. First, each author independently coded a test sample of 100 articles to agree on whether a news article represents a change in the likelihood of regulation. We focus on news that relates to a concrete action that leads to an increased likelihood of regulation, or actions/statements by regulators that clarify whether cryptocurrencies are subject to a certain existing rule. After agreeing on a coding scheme, each author again separately coded each news item and compared the coding after completion. Disagreements in coding were then resolved through discussion among the author team. Table 1 provides an overview of our event

[11] August 8, 2013 is the date of the first article on CoinTelegraph.

Table 1. Event and sample selection

Panel A: Event selection

	N
All items	1009
– Non-news items	– 589
– Non-regulation news items	– 204
= All regulation news items	216
– Regulation news items from countries without a top 100 crypto-exchange	– 54
– Non-transparency regulation news items	– 128
– Non-securities regulation news items	– 19
= Transparency regulation news events	15

Panel B: Sample selection

	Tokens	N
All cryptocurrencies on Coinmarketcap, Apr. 28, 2013–Sep. 1, 2018	1886	849,152
– No market data on any event date (keep only event days)	– 100	– 831,827
– No market cap., market cap. < US $10,000, and/or price < US $0.001	– 393	– 4028
– Extreme *CAR* due to data error	– 0	– 2
– No ICOBench data, not a utility token	– 938	– 9594
= 'Market Reaction' sample (Table 2)	455	3701
– No *Expert Rating* data	– 140	– 1283
= 'Role of Rating' sample (Tables 6 and 7)	315	2418
'Role of Rating' sample	315	2418
– No disclosure data (any of the variables missing)	– 63	– 671
= 'Role of Disclosure' sample (Table 8)	252	1747
'Role of Rating' sample	315	2418
– No exchange data (any of the variables missing)	– 86	– 647
= 'Role of Exchanges' sample (Table 9)	229	1771

Note: This Table presents an overview of the events and sample selection procedures. Panel A reconciles the number of all regulatory news items identified on Cointelegraph with those included in our event study. We exclude news items that do not represent news, are unrelated to securities regulation focused on enhancing transparency, or are news items from countries that are minor players in the cryptocurrency market (based on the existence of a large cryptocurrency exchange). Panel B shows how the four different test samples reconcile with all listed cryptocurrencies on Coinmarketcap. We present the sample selection in number of unique crypto tokens ('Tokens') and crypto token trading date observations ('N').

selection procedure. We first exclude articles that are unrelated to regulation ('non-regulation news items') or without news value ('non-news items'), e.g., summary and clarification articles, background stories, and analyzes. Next, we exclude news articles about (regulators in) countries without a sizable cryptocurrency market, which we define as countries that do not have a top 100 cryptocurrency exchange in terms of market capitalization and trading volume (see Table A2 in Appendix A for an overview). We then exclude news articles about regulations that are not aimed at increasing transparency for cryptocurrencies. Lastly, given the focus of our arguments on the effects of transparency about a token's prospect, we exclude news articles that are not about regulation in the context of securities regulation, e.g., regulation aimed at increasing transparency of trades on exchanges. We also take care to verify the date of news articles by checking the original sources referenced in Cointelegraph, where available. After cross-checking these news items manually with sources on LexisNexis, we find that 12 of our 15 articles are also mentioned by traditional, international news outlets. Our final sample comprises 15 news items that correspond to 15 unique dates (i.e., news events). We discuss each of these events as well as checks for potential confounding events in more detail in Appendix B.

3.2. Crypto Token Return Data

We gather crypto token market data from Coinmarketcap. This website has data on open, close, high and low prices, trading volume, and market capitalization, for a total of 1886 coins and tokens starting April 28, 2013. When a cryptocurrency is listed on multiple exchanges, Coinmarketcap presents cryptocurrency prices as the volume-weighted average of all cryptocurrency exchange prices. Coinmarketcap sums the volume across all exchanges as the total trading volume. We exclude crypto tokens that have a close-price lower than 0.001 (one tenth of a cent), because their return series is affected by rounding errors on Coinmarketcap. We also exclude tokens that have missing market capitalization data or a market capitalization lower than US $10,000, because data for these tokens are relatively difficult to verify by Coinmarketcap due to their 'exotic' nature (Kakushadze, 2018).

To ensure the accuracy of the price data, we investigate the returns time-series of any tokens for which the return on a given day is in the 1st or 99th percentile of all tokens in the cross-sectional sample. Within these percentiles, we first check the most extreme tails of our return distributions, i.e., returns exceeding 10,000 (99) percent daily increases (decreases). Although these return thresholds may seem extreme compared to other asset markets, they are more common in the more volatile cryptocurrency market, especially from 2015 to early 2018. We find that most of the extreme positive returns are due to Coinmarketcap providing an incorrect closing price. We resolve these errors by replacing the closing price with the opening price of the subsequent day when the return is in the 99th percentile. Next, to gain more confidence in the data of the remaining extreme negative and positive returns, we cross-check our Coinmarketcap data with price data from CoinGecko, another major provider of cryptocurrency prices. Except for two observations, the remaining extreme returns appear to be correct and we delete these two observations. Finally, we manually adjust the price series of Xaurum to account for an 8000-for-1 split on August 22, 2016 for which Coinmarketcap did not account.

Consequently, our final sample for the market reaction tests consists of 455 unique crypto tokens. Panel B of Table 1 presents an overview of the crypto token sample selection, as well as the final samples for the other tests.

3.3. Event Study Design

Similar to e.g., Zhang (2007), Armstrong et al. (2010) and Joos and Leung (2013), we conduct an event study around the dates of regulation news. We use a two-day event-window, defined as $t \in [0;+1]$, where $t = 0$ is the event date or the date of the regulation news.[12] We define the market reaction to regulation news as CAR_i, the two-day cumulative abnormal return of a crypto token i over the event-window as:

$$\begin{aligned} CAR_i &= \sum_{t=0}^{+1} = AR_{i,t} \\ &= \sum_{t=0}^{+1} R_{i,t} - E[R]_{i,t}, \end{aligned} \tag{1}$$

where $AR_{i,t}$ is defined as the abnormal return of the crypto token i at time t, $t \in [0;+1]$, where $t = 0$ is the event date. As such, abnormal return is the difference between the observed daily return $R_{i,t}$ and the expected daily return $E[R]_{i,t}$, defined as the mean daily return in an 80-day

[12]Our inferences are unchanged if we use the following event-windows: $[0;+2]$, $[0;+3]$, $[-1;+1]$, $[-2;+2]$ and $[-3;+3]$ (results untabulated).

non-event estimation window centered on the news event.[13] Because regulation news affects the cryptocurrency market as a whole, we do not use a market model to calculate abnormal returns. Additionally, because the occurrence of other regulatory events in the estimation window likely affects the expected return, we exclude these specific event dates from the estimation window. Dropping these dates means that whereas the estimation period is always 80 trading days, it does not always span 80 consecutive calendar days around the event. However, our results for the mean market reaction tests are statistically similar when these event dates are not removed from the estimation window.

Market reactions to regulation news events are correlated in the cross-section, which violates the independence assumption of the test statistics and may overestimate the significance of abnormal returns if we run our analyzes at the crypto token level (Brown & Warner, 1980, 1985). We therefore cluster the standard errors at the event- and crypto token-level.

4. Results

We first document the overall market reaction to all transparency regulation news events. We then examine whether these reactions vary across the quality and transparency of crypto tokens.

4.1. Mean Market Reactions

Table 2 shows the cumulative abnormal return for each transparency regulation news events and across all events.

We find a significantly negative average cumulative abnormal return *CAR* around 12 of the 15 transparency regulation news events for all crypto tokens in our sample. Across all events, the mean abnormal market reaction is also significantly negative, namely −5.20% (t-statistic = −2.56). Overall, our results suggest that on average investors perceive increased regulation to be costly.

We conduct several tests to ensure that the cumulative abnormal returns capture market reactions to transparency regulation news. First, as our events often concern country-specific regulatory news, we repeat the tests using only crypto tokens traded on an exchange in the specific country of a regulation news item. We use crypto token listing data from Coinmarketcap and manually collect the country of incorporation/registration for all crypto exchanges mentioned on Coinmarketcap. Overall, the results in the 'Exchange-Country Sample' columns in Panel A of Table 3 are similar to our main tests, and the mean reaction across events is stronger at −10.30% (t-statistic = −4.39). Second, we limit our news event sample to only include news articles that are also covered by traditional media. We search LexisNexis for mentions of the news articles reported by Cointelegraph and verify that 12 (out of 15) events are also reported by traditional, international news outlets (e.g., Bloomberg, Reuters).[14] The 'Traditional Media Covered Sample' columns in Panel A of Table 3 reports an average cumulative abnormal return of −5.88% (t-statistic = −2.79) for the reduced sample of news items with traditional media mentions, which is similar to our main result. Third, to limit the possibility that the event window returns are driven by factors unrelated to regulation news, we conduct a placebo test in which we conducts

[13] Our inferences are unchanged if we use a 40, 120, 160 or 200-day estimation window, and if the estimation window ends before the event window (results untabulated).

[14] The following events (numbers) are not covered by traditional, international news outlets: 'Canada Looking To Classify Digital Currencies As Securities' (number 4), 'US: Republican, Democrat Officials Calling For Crypto Regulation In Rare Show Of Unity' (number 8), 'ICOs Can "Prove Their Legitimacy" Under New Crowdfunding Rules, Says EU Lawmaker' (number 15).

Table 2. Overview of news events and market reactions

Event	Date	Event headline	Country	Market reaction		
				# Tokens	*CAR*	*t*-stat.
1	Jun. 13, 2017	*'SEC is Still Eyeing to Regulate the ICO Market'*	US	40	−0.074***	−3.80
2	Jul. 25, 2017	*'SEC Deals Blow To ICOs: DAO Tokens Are Securities, Subject to Securities Laws'*	US	71	−0.154***	−13.00
3	Aug. 1, 2017	*'Singapore Clarifies ICO Token Regulation, Follows US'*	Singapore	73	0.041***	2.52
4	Aug. 24, 2017	*'Canada Looking To Classify Digital Currencies As Securities'*	Canada	88	0.029	1.41
5	Sep. 7, 2017	*'Digital Currencies, ICO-Based Tokens Are Securities, Says Kiwi Finance Regulator'*	New Zealand	93	−0.096***	−7.05
6	Feb. 11, 2018	*'Gibraltar To Introduce "World's First" ICO Regulations'*	Gibraltar	246	−0.007	−0.58
7	Feb. 14, 2018	*'Canadian Stock Exchange Launches "Fully-Regulated" Token Platform, "Unlike" ICOs'*	Canada	249	0.116***	10.90
8	Feb. 19, 2018	*'US: Republican, Democrat Officials Calling For Crypto Regulation In Rare Show Of Unity'*	US	255	−0.057***	−5.45
9	Mar. 7, 2018	*'US: Cryptocurrency Trading Platforms Must Be Registered With SEC'*	US	284	−0.187***	−21.77
10	Mar. 13, 2018	*'Thailand's SEC To Release Crypto Market Regulatory Framework In March'*	Thailand	295	−0.125***	−12.74
11	May 14, 2018	*'Thailand: Legal Framework For Cryptocurrencies Comes Into Force'*	Thailand	361	−0.020***	−2.56
12	May 21, 2018	*'Thai SEC Holds Focus Group to Clarify New Crypto, ICO Regulations'*	Thailand	371	−0.087***	−11.73
13	Jul. 5, 2018	*'Thai Regulator Confirms July Start Date for Regulated ICOs'*	Thailand	409	0.002	0.36
14	Jul. 20, 2018	*'Ukrainian Financial Stability Council Supports Regulatory Concept for Cryptocurrencies'*	Ukraine	421	−0.035***	−5.32
15	Aug. 10, 2018	*'ICOs Can "Prove Their Legitimacy" Under New Crowdfunding Rules, Says EU Lawmaker'*	Global	445	−0.104***	−10.31
		Mean market reaction		3701	−0.052***	−2.56

Note: This Table presents an overview of the 15 transparency regulation news events between January 1st, 2017 and December 31st, 2018, which are the focus of this study, and the market reaction to each event and on average across all events. For the market tests, we cluster standard errors at the event- and crypto token-level. *, **, and *** denote statistical significance at the two-tailed 10, 5, and 1% level, respectively.

Table 3. Robustness of market reaction tests

Panel A: Univariate results using different samples

		Exchange-country sample			Traditional media covered sample		
Event	Date	# Tokens	CAR	*t*-stat.	# Tokens	CAR	*t*-stat.
1	Jun. 13, 2017	32	−0.067***	−2.95	40	−0.074***	−3.80
2	Jul. 25, 2017	59	−0.155***	−11.22	71	−0.154***	−13.00
3	Aug. 1, 2017	27	0.046***	3.08	73	0.041***	2.52
4	Aug. 24, 2017	12	0.029	1.33			
5	Sep. 7, 2017				93	−0.096***	−7.05
6	Feb. 11, 2018				246	−0.007	−0.58
7	Feb. 14, 2018	17	0.124***	4.12	249	0.116***	10.90
8	Feb. 19, 2018	207	−0.054***	−4.43			
9	Mar. 7, 2018	235	−0.185***	−19.91	284	−0.187***	−21.77
10	Mar. 13, 2018	13	−0.132***	−9.11	295	−0.125***	−12.74
11	May 14, 2018	15	−0.029	−1.33	361	−0.020***	−2.56
12	May 21, 2018	15	−0.141***	−13.22	371	−0.087***	−11.73
13	Jul. 5, 2018	15	0.006	0.40	409	0.002	0.36
14	Jul. 20, 2018				421	−0.035***	−5.32
15	Aug. 10, 2018	367	−0.105***	−9.10			
	Mean market reaction	1014	−0.103***	−4.39	2752	−0.059***	−2.79

Panel B: Regression results

		Daily return	
		(1)	(2)
	Constant (Average Daily Return)	0.007***	0.007***
		(90.08)	(91.14)
	Event	−0.025***	
		(−15.02)	
Event Number	*Date*		
1	Jun. 13, 2017		0.070***
			(3.34)
2	Jul. 25, 2017		−0.137***
			(−10.95)
3	Aug. 1, 2017		0.046***
			(3.69)
4	Aug. 24, 2017		0.027**
			(2.11)
5	Sep. 7, 2017		0.006
			(0.43)
6	Feb. 11, 2018		−0.064***
			(−11.15)
7	Feb. 14, 2018		0.097***
			(13.95)
8	Feb. 19, 2018		0.029***
			(5.13)
9	Mar. 7, 2018		−0.108***
			(−18.75)
10	Mar. 13, 2018		−0.011**
			(−2.19)
11	May 14, 2018		−0.010**
			(−2.02)
12	May 21, 2018		−0.027***
			(−5.96)
13	Jul. 5, 2018		−0.013***
			(−2.90)

(*Continued*).

Table 3. Continued.

Panel B: Regression results			
		Daily return	
		(1)	(2)
14	Jul. 20, 2018		−0.056***
			(−11.24)
15	Aug. 10, 2018		−0.077***
			(−15.04)
	N	80,839	80,839
	No. of Crypto Tokens	455	455
	R^2	0.016	0.016
	Crypto Token FE	Yes	Yes

Note: This Table presents the robustness results of the market reaction tests. Panel A presents the market reaction to each event and on average across all events using two different samples. The 'Exchange-Country Sample' limits the sample of crypto tokens per news event to those that are traded on an exchange in the specific country of the regulation news event. The 'Traditional Media Covered Sample' limits the sample to those events that are also covered by traditional, international media outlets covered by LexisNexis (e.g., Bloomberg, Reuters) Panel B regresses the daily crypto token return for the entire sample period on an event dummy equal to one if the date corresponds to a transparency regulation event, and zero otherwise, and on an indicator for each date. For the market tests, we cluster standard errors at the event- and crypto token-level. For the regression, we include crypto token fixed effects and cluster standard errors at the crypto token-level. *, **, and *** denote statistical significance at the two-tailed 10, 5, and 1% level, respectively.

100 draws of 15 non-event dates between January 1st, 2017 and September 1st, 2018. We find that the mean of the distribution of cumulative abnormal returns for these placebo events is 0.007 with a standard error of 0.0023, which is significantly different and in the opposite direction of the market returns on regulation news dates.[15] Fourth, instead of univariate tests of the mean market reaction on event dates, we also regress daily token returns for the entire sample period on an event dummy equal to one if the date corresponds to a transparency regulation event, and zero otherwise, including token fixed effects and clustering standard errors at the token level. We present these results in Panel B of Table 3 and find a significantly negative coefficient for the event indicator of −0.025 (t-statistic = −15.02), and market reactions to the individual events consistent with the results in Table 2. Fifth, to ensure our results are not driven by any individual country, token or event, we repeat these analyzes and exclude each country, token or event consecutively in each estimation. These results are statistically and economically similar to those documented in Table 2 (untabulated).

4.2. Cross-Sectional Variation in Market Reactions

Next, we examine whether the perceived costs and benefits of transparency regulation differ across crypto token characteristics. We focus primarily on measures of crypto token quality and transparency, following our theoretical arguments in Section 2. If the previously documented negative market reactions reflect investor concerns about the costs of transparency regulations, we expect a less negative reaction for crypto tokens of higher quality, and with a higher degree of transparency absent regulation. We expect that transparency regulation is less costly for such issuers as they are already more transparent, or more efficient or competent in dealing with new

[15]When we restrict the non-event dates period to match our event period even more closely, i.e., June 1st, 2017 till September 1st 2018, we find an average abnormal market reaction of 0.005 with an standard error of 0.002.

regulatory requirements. These predictions are in line with Bourveau et al. (2022) and Howell et al. (2020), who find that (post-)ICO success is linked to dimensions such as disclosure and management team experience at the time of the ICO. In short, the costs of increased transparency regulation are likely to be lower for more transparent and higher quality crypto tokens, resulting in a less negative reaction to transparency regulation news.

Like Bourveau et al. (2022), we use ratings data from ICOBench to gauge the quality of crypto tokens and several measures of disclosure activity, such as the firm's website and social media activity, to capture their transparency. We first describe the ICOBench ratings data and analyzes in more detail in the next section and then describe the analyzes using disclosure and exchange data.

4.2.1. The role of ICOBench ratings

ICOBench is a crowd-based ratings platform that provides independent assessments of a crypto token's quality and transparency at the time of the ICO. The ICOBench page for a token issue provides an overview of the ICO, links to social media, and an overview of ratings. The overall rating or *Total Rating* is based on the weighted average of the algorithmically calculated *Benchy Rating* and on the *Expert Rating*, which is based on cryptocurrency/blockchain experts' assessments. The *Benchy Rating* is available for all crypto tokens that host an ICO and are included on ICOBench. This rating is an algorithmic assessment of management quality, transparency about the ICO, presence on social media, and the underlying product or service. It is based on information publicly provided in the application of the ICO to ICOBench, the ICO whitepaper, and elsewhere online. In practice, the *Benchy Rating* is the weighted average of four subcomponents (*Team Info. Score*, *ICO Info. Score*, *Product Info. Score* and *Social Media Score*). These subcomponent scores are based on a check list including, e.g., whether the ICO has a whitepaper online, whether the hard-cap and soft-cap are mentioned, and whether the teams provide LinkedIn accounts and full names. The weighting in the overall *Benchy Rating* is based on the number of items on the check list for each subcomponent. ICOBench expresses the subcomponent scores as percentages, but transforms the weighted average *Benchy rating* to a score between 0 and 5. We provide more details in Table A1 in Appendix A.

An *Expert Rating* is based on assessments by (ICOBench-designated) cryptocurrency and blockchain experts of a token issuer's management team (*Team Rating*), its strategy and investments (*Vision Rating*), and the product maturity and usefulness (*Product Rating*). These scores range from 1 (lowest) to 5 (highest). The weight placed on an individual expert's assessment in the overall *Expert Rating* depends on the tenure of the expert on ICOBench, their total number of ratings, and the completeness of the expert's profile. The weight of the *Benchy Rating* in the *Total Rating* decreases with the number of *Expert Ratings*. *Expert Ratings* are only available for half of the ICOs on ICOBench (2828 of 5149). If this *Expert Rating* is missing, the *Total Rating* is equal to the *Benchy Rating*. As Panel B of Table 1 shows, we restrict the sample of the ICOBench ratings tests to those ICOs for which all ratings are available to facilitate comparison across tests. This yields a restricted sample of 2418 observations, while the univariate sample comprises 3701 observations.[16]

Table 4 provides descriptive statistics at the token-event level for the variables in our cross-sectional analyzes. Consistent with our previous analyzes, the average and median abnormal reaction to regulatory news is negative. Table 5 also suggests that experts incorporate different or additional information into their assessments of a crypto token: the Spearman (Pearson) correlation between *Benchy Rating* and *Expert Rating* is 0.48 (0.03). The relatively low correlation

[16]The mean market reaction for this restricted sample is −0.052, with a *t*-statistic of −2.61, similar to the reaction for the full sample in Table 2

Table 4. Descriptive statistics

Variable	N	Mean	S.D.	Min.	Q1	Med.	Q3	Max.
CAR	2418	− 0.052	0.177	− 0.790	− 0.142	− 0.064	0.008	2.284
Size	2418	16.563	1.877	11.595	15.365	16.587	17.783	21.317
Supply	2418	18.182	2.138	11.528	16.856	18.383	19.674	23.627
Total Rating	2418	3.242	0.772	0.800	2.900	3.400	3.800	4.700
Benchy Rating	2418	3.053	0.743	0.700	2.800	3.200	3.500	4.800
Expert Rating	2418	3.630	1.054	1.000	3.167	3.933	4.367	5.000
Benchy rating components								
Team Score	2418	0.445	0.240	0.000	0.500	0.500	0.500	1.000
ICO Info. Score	2418	0.951	0.116	0.170	1.000	1.000	1.000	1.000
Product Info. Score	2418	0.673	0.213	0.000	0.600	0.800	0.800	1.000
Social Media Score	2418	0.522	0.206	0.000	0.380	0.530	0.690	0.940
Expert rating components								
Team Rating	2418	3.635	1.154	1.000	3.000	4.000	4.400	5.000
Vision Rating	2418	3.765	1.090	1.000	3.200	4.000	4.500	5.000
Product Rating	2418	3.489	1.108	1.000	3.000	3.700	4.200	5.000
Disclosure Variables								
Website Size (unlogged)	1747	183,136	387,068	1655	44,302	100,642	203,160	8,098,158
Website Size	1747	11.376	1.292	7.631	10.764	11.584	12.236	14.340
GitHub	1747	0.652	0.476	0.000	0.000	1.000	1.000	1.000
Total GitHub Changes	1747	5.117	5.050	0.000	0.000	4.942	9.650	14.474
Total Tweets	1747	5.744	1.183	0.693	5.252	5.814	6.540	7.875
Total Replies	1747	4.177	1.484	0.000	3.466	4.357	5.124	6.917
Exchange variables								
Exchange Volume	1771	20.999	2.409	14.041	20.955	21.810	22.375	23.987
Exchange Liquidity	1771	5.937	0.671	1.099	5.916	6.055	6.236	6.488
Exchange Visits	1771	13.556	1.611	7.563	12.647	13.722	14.647	16.595
Exchange #Cryptos	1771	5.528	0.731	2.303	5.388	5.614	5.943	6.721

Note: This Table presents the descriptive statistics for the variables used in the cross-sectional analyzes. The variables are defined in the Appendix A1.

suggests that these two ratings may capture different dimensions of an ICO, and we therefore also analyze the effect of both ratings separately in addition to *Total Rating*.

We also provide descriptive statistics for the underlying scores that make up the *Benchy Rating*. As mentioned earlier, *Benchy Rating* is based on the amount of available information about the management team (*Team Info. Score*), the ICO (*ICO Info. Score*), the underlying product (*Product Info. Score*) and the extent to which a company communicates with its users or investors via social networks (*Social Media Score*). Table 4 shows that the median crypto token company provides all relevant details surrounding an ICO (median *ICO Info. Score* is 1.00), which is unsurprising as it only captures whether companies have reported basic details such as the ICO start and end dates, the number of tokens for sale, and the ICO price. There is more variation in the availability of information about the underlying product or business and the management team. There is also significant variation in a company's *Social Media Score*, because this measure not only captures the existence of (social) communication channels, but also accounts for activity on these channels. The correlations between these scores in Table 5 are also relatively low, suggesting that they do not seem to capture a single underlying construct. We also observe significant variation in the distributions of the components of Expert Rating, and that they are highly correlated (around 0.8).

Table 5. Correlation matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	*CAR*		− 0.04	− 0.07*	0.06*	0.08*	− 0.01	0.04	0.02	0.05*	0.06*	0.01	− 0.02	− 0.01	− 0.03	− 0.01	− 0.02	0.01	0.05	0.03	− 0.03	0.01	0.00
2	*Size*	− 0.06*		0.33*	0.11*	0.03	0.37*	− 0.12*	0.01	− 0.15*	0.22*	0.36*	0.35*	0.29*	0.47*	0.18*	0.52*	− 0.07*	− 0.05	0.06*	0.12*	0.15*	0.30*
3	*Supply*	− 0.07*	0.42*		0.10*	0.09*	0.06*	0.05	− 0.07*	0.08*	0.08*	0.09*	0.00	0.06*	0.19*	0.18*	0.19*	0.09*	0.17*	0.11*	0.11*	0.04	0.11*
4	*Total Rating*	0.01	0.16*	0.27*		0.77*	0.43*	0.49*	0.31*	0.52*	0.61*	0.42*	0.35*	0.39*	0.16*	0.05	0.14*	0.21*	0.19*	0.31*	0.01	0.12*	0.04
5	*Benchy Rating*	0.01	0.11*	0.21*	0.91*		0.03	0.63*	0.35*	0.61*	0.79*	0.07*	0.00	0.01	0.05	0.00	0.02	0.13*	0.17*	0.37*	− 0.08*	0.13*	0.00
6	*Expert Rating*	0.00	0.42*	0.33*	0.73*	0.48*		0.05	0.03	− 0.05	0.10*	0.91*	0.91*	0.93*	0.35*	0.15*	0.36*	0.18*	0.04	− 0.06*	0.14*	0.05	0.13*
7	*Team Score*	− 0.02	0.07*	0.13*	0.59*	0.67*	0.32*		0.10*	0.39*	0.26*	0.09*	0.07*	0.00	− 0.06*	− 0.06*	− 0.05*	0.07*	0.11*	0.14*	− 0.01	0.01	− 0.12*
8	*ICO Info. Score*	0.01	− 0.23*	− 0.07*	0.32*	0.31*	0.11*	0.06*		0.21*	0.18*	− 0.03	0.02	0.05	− 0.05	0.02	− 0.11*	0.07*	0.10*	0.09*	− 0.12*	− 0.02	− 0.09*
9	*Product Info. Score*	0.00	− 0.04*	0.16*	0.64*	0.69*	0.37*	0.35*	0.14*		0.30*	0.02	− 0.11*	− 0.07*	− 0.04	− 0.02	− 0.08*	0.13*	0.20*	0.18*	− 0.08*	− 0.02	− 0.16*
10	*Social Media Score*	0.02	0.25*	0.21*	0.71*	0.78*	0.40*	0.30*	0.07*	0.33*		0.12*	0.07*	0.10*	0.16*	0.04	0.15*	0.10*	0.11*	0.36*	0.02	0.19*	0.13*
11	*Team Rating*	0.00	0.38*	0.32*	0.73*	0.51*	0.94*	0.34*	0.14*	0.39*	0.41*		0.78*	0.74*	0.42*	0.23*	0.40*	0.21*	0.06*	− 0.02	0.13*	0.07*	0.12*
12	*Vision Rating*	− 0.01	0.41*	0.32*	0.70*	0.46*	0.95*	0.32*	0.05*	0.35*	0.38*	0.84*		0.79*	0.27*	0.09*	0.31*	0.11*	0.00	− 0.05	0.14*	0.05	0.13*
13	*Product Rating*	0.00	0.38*	0.30*	0.65*	0.39*	0.94*	0.24*	0.12*	0.29*	0.34*	0.81*	0.85*		0.28*	0.09*	0.28*	0.14*	0.04	− 0.09*	0.13*	0.03	0.12*
14	*Exchange Volume*	− 0.07*	0.47*	0.25*	0.20*	0.16*	0.27*	0.03	− 0.04*	0.07*	0.23*	0.33*	0.20*	0.23*		0.69*	0.83*	0.39*	0.00	0.10*	0.10*	0.16*	0.22*
15	*Exchange Liquidity*	0.02	0.20*	0.14*	0.07*	0.00	0.17*	− 0.06*	− 0.08*	− 0.02	0.07*	0.18*	0.14*	0.17*	0.46*		0.54*	0.51*	− 0.02	− 0.02	0.10*	0.14*	0.15*
16	*Exchange Visits*	− 0.03	0.44*	0.26*	0.12*	0.05*	0.27*	0.00	− 0.12*	− 0.04*	0.16*	0.31*	0.22*	0.22*	0.66*	0.46*		0.34*	− 0.02	0.08*	0.13*	0.18*	0.23*
17	*Exchange #Cryptos*	− 0.03	0.11*	0.14*	0.20*	0.18*	0.17*	0.11*	0.05*	0.16*	0.13*	0.25*	0.07*	0.16*	0.55*	0.45*	0.57*		0.03	0.15*	− 0.02	0.06*	0.04
18	*Website Size*	0.04	0.03	0.15*	0.23*	0.20*	0.09*	0.12*	0.08*	0.24*	0.12*	0.10*	0.11*	0.06*	0.00	0.08*	0.06*	0.06*		0.04	0.02	0.09*	0.02
19	*GitHub*	0.01	0.07*	0.09*	0.38*	0.40*	0.11*	0.17*	0.07*	0.21*	0.45*	0.13*	0.14*	0.05*	0.15*	0.01	0.17*	0.12*	0.04		0.00	0.04	0.01
20	*Total GitHub Changes*	− 0.02	0.16*	0.13*	0.07*	0.01	0.21*	0.04*	− 0.14*	− 0.02	0.06*	0.21*	0.21*	0.17*	0.09*	− 0.05*	0.13*	− 0.05*	0.03	0.09*		0.01	− 0.02
21	*Total Tweets*	0.01	0.24*	0.19*	0.21*	0.22*	0.22*	0.15*	0.02	0.02	0.27*	0.23*	0.20*	0.19*	0.09*	0.11*	0.05*	− 0.01	0.12*	0.02	0.01		0.75*
22	*Total Replies*	− 0.01	0.30*	0.22*	0.10*	0.10*	0.18*	0.09*	0.01	− 0.07*	0.16*	0.19*	0.14*	0.18*	0.15*	0.14*	0.15*	0.06*	0.03	− 0.02	0.00	0.79*	

Note: This Table presents the correlation matrix for the variables used in the cross-sectional analyzes. Pearson (Spearman) correlations are below (above) the diagonal. The variables are defined in the Appendix A1. * denotes statistical significance at the two-tailed 5% level.

To assess how crypto token ratings affect the market reaction to regulation news, we estimate the following model:

$$CAR_{i,t} = \alpha + \beta_1 Rating_i + \beta_2 Size_{i,t} + \beta_3 Supply_{i,t} + Platform\ Fixed\ Effects_i + Event\ Fixed\ Effects_t + \varepsilon_{i,t}, \quad (2)$$

where *Rating* equals the Total Rating of a crypto token *i*, the *Benchy Rating*, the *Expert Rating*, or the scores underlying the *Benchy Rating*. As explained above, we expect the coefficient on the ratings variables to be positive, i.e., we expect investors to react less negatively to regulatory news for higher quality crypto tokens. We also control for crypto token size, supply and platform fixed effects, to capture differences in market micro-structure that likely affect returns.[17] We include event fixed effects to control for differences in *CAR* across events, ensuring that the only variation in CAR is cross-sectional.[18] The dependent variable *CAR* is the cumulative abnormal return around the regulation news event, i.e., the sum of the mean-adjusted crypto token return over the two-day event-window.

Table 6 presents the ratings regression results. We find that *Total Rating* is significantly associated with *CAR* in the predicted direction. Because *Total Rating* comprises the automated *Benchy Rating* as well as the *Expert Rating* if available, we separately examine the relation between *CAR* and these two subcomponents of the rating. Like the aggregate *Total Rating*, *Benchy Rating*, which is purely based on an algorithmic assessment of a crypto token's whitepaper and other available information, is significantly associated with the market reaction to transparency regulation news in the predicted positive direction. Because the correlations between the subcomponents of the *Benchy Rating* are relatively low, we include them jointly in the regression in Column (3) in order to assess which subcomponent drives this result. We find that only *Social Media Score* is significantly associated with *CAR*: all else equal, a one standard deviation increase in this score results in a 1.3% point less negative market reaction to regulation news.[19] Because this variable captures the extent to which a crypto token company communicates with potential investors during the ICO period, this result suggests that investors expect more transparent crypto tokens, or those with better disclosure policies to be less affected by news concerning increased transparency regulation, because they are potentially less affected by regulatory efforts aimed at increasing the transparency of crypto tokens. This result is consistent with our prediction that investors expect regulatory costs to be lower for more transparent crypto tokens.

Next, we examine the effect of *Expert Rating* on market reactions to transparency regulation news. Table 7 shows that *Expert Rating* and its components are all significantly related to *CAR* in the predicted direction. The results indicate that investors view regulation to be less costly for crypto tokens that have a more competent management team (*Team Rating*), a clearer business strategy (*Vision Rating*), and a more mature product (*Product Rating*). These results also suggest that experts incorporate information into their ratings that investors perceive to be valuable, but which is not captured by the automated assessments provided by the underlying components of the *Benchy Rating*. Furthermore, because these three components do not appear to capture the disclosure activity on social media, we also include *Social Media Score* and *Expert Rating* in the same regression to assess whether they capture separate constructs. The results in Column

[17] The platforms are: Bitshares, Counterparty, Ethereum, NEM, NEO, Nubits, Qtum, Stellar, Ubiq, Waves, or a proprietary platform. Different platforms are built with different protocols that affect how transactions are settled, which applications can be built on the platform, and how the supply of the token is arranged (Chod & Lyandres, 2022; Johan & Pant, 2019).

[18] Because event fixed effects subsume any controls at the event level, we do not include Bitcoin returns in this estimation. However, results are similar if we drop the fixed effects and control for Bitcoin or Ethereum return.

[19] We calculate this effect as follows: 0.206 (standard deviation of *Social Media Score*) $\times$ 0.061 (coefficient) = 0.013.

Table 6. Role of *Total Rating* and *Benchy Rating*

		CAR		
	Prediction	(1)	(2)	(3)
Total Rating	+	0.017**		
		(2.28)		
Benchy Rating	+		0.012**	
			(2.24)	
Team Info. Score	+			0.004
				(0.36)
ICO Info. Score	+			−0.008
				(−0.23)
Product Info. Score	+			−0.008
				(−0.24)
Social Media Score	+			0.061***
				(4.47)
Size	?	−0.012***	−0.011***	−0.011***
		(−4.14)	(−3.32)	(−3.53)
Supply	?	−0.003	−0.002	−0.003
		(−1.74)	(−1.46)	(−1.63)
N		2418	2418	2418
No. of Crypto Tokens		315	315	315
No. of Events		15	15	15
R^2		0.191	0.190	0.191
Platform FE		Yes	Yes	Yes
Event FE		Yes	Yes	Yes

Note: This Table presents the coefficients (*t*-statistics in parentheses) for the analyzes of the effect of *Total Rating* and *Benchy Rating* on market reactions to transparency regulation news events. The variables are defined in the Appendix A1. We cluster standard errors at the event- and crypto token-level and include crypto token platform- and event fixed effects. *, **, and *** denote statistical significance at the two-tailed 10, 5, and 1% level, respectively.

(5) show that both variables are significant, suggesting that experts' assessment of the crypto token and the extent of communication with investors measure different dimensions of perceived crypto token quality.

Our analyzes with the ratings data reveal that cryptocurrency/blockchain experts' confidence in a crypto token's business strategy, management team and core product, as well as the extent of disclosure via social media at the time of the ICO, mitigate the negative reaction to regulation news. These results hint at investors expecting lower costs of disclosure mandates for higher quality and already transparent tokens. In short: both token quality and transparency appear to matter. In the next sections, we perform additional tests to gauge the transparency effect further.

4.2.2. The role of disclosure

One drawback of the ICOBench data is that it captures dimensions, such as disclosure, at the time of the ICO, rather than at the time of a news event. To counter this concern, we use various measures of a crypto token issuer's disclosure activity to more precisely capture transparency at the time of a news event.

Because there is no mandated disclosure for crypto tokens in the sample period, we focus on three measurable channels of voluntary disclosure following prior literature: corporate websites, product information, and social media interaction. Boulland et al. (2021) propose a standardized measure of voluntary disclosure based on the quantity of information on 'rms' websites. We use the WebArchive Wayback Machine to find the website size on the closest date to the event

Table 7. Role of *Expert Rating*

		CAR				
	Prediction	(1)	(2)	(3)	(4)	(5)
Expert Rating	+	0.013***				0.010***
		(2.64)				(2.28)
Team Rating	+		0.012***			
			(3.28)			
Vision Rating	+			0.009*		
				(1.92)		
Product Rating	+				0.010***	
					(2.47)	
Social Media Score	+					0.047***
						(3.70)
Size	?	−0.013***	−0.012***	−0.012***	−0.012***	−0.013***
		(−4.32)	(−4.12)	(−4.21)	(−3.78)	(−4.75)
Supply	?	−0.002	−0.002	−0.002	−0.002	−0.003
		(−1.39)	(−1.40)	(−1.27)	(−1.38)	(−1.75)
N		2418	2418	2418	2418	2418
No. of Crypto Tokens		315	315	315	315	315
No. of Events		15	15	15	15	15
R^2		0.191	0.192	0.190	0.191	0.193
Platform FE		Yes	Yes	Yes	Yes	Yes
Event FE		Yes	Yes	Yes	Yes	Yes

Note: This Table presents the coefficients (*t*-statistics in parentheses) for the analyzes of the effect of *Expert Rating* on market reactions to transparency regulation news events. The variables are defined in the Appendix A1. We cluster standard errors at the event- and crypto token-level and include crypto token platform- and event fixed effects. *, **, and *** denote statistical significance at the two-tailed 10, 5, and 1% level, respectively.

date.[20] A larger website contains more information, which can indicate a more transparent crypto token firm. Next, Bourveau et al. (2022) document that the disclosure of product information and source code on GitHub, a code repository website, is associated with the transparency of a crypto token firm. We measure two aspects of source code transparency: whether there is a GitHub page, and how many code changes have been shared, up until the event date. Lastly, we focus on a crypto token's firm activity on Twitter, because it is a relatively visible and interactive medium (Zhou et al., 2015), and most crypto token issuers are on this platform: 4893 of the 5149 crypto tokens that hosted an ICO and are listed on ICOBench are on Twitter.[21] We use Twitter data to calculate the following transparency measures: the number of tweets by a crypto token issuer (*Total Tweets*) and how many tweets are replies to followers or previous tweets (*Total Replies*), up until the event date. We distinguish between replies and general tweets, because we observe that crypto token tweets can contain token-specific content as well as general content that is irrelevant to the token, whereas replies are typically more focused on answering questions about the token.

Tables 4 and 5 provide descriptive statistics for these disclosure measures. There appears to be significant cross-sectional variation in the amount of disclosure across crypto token issuers: for instance, we observe that the interquartile range of website size in bytes is over 4.5 times larger than the value at the 25th percentile. In addition, 35% of the issuers provide no information about the product or underlying on GitHub, and while most issuers have Twitter, their activity on this

[20] More information about the Wayback Machine is available here: https://archive.org/about/.
[21] In contrast, only 1500 are active on Reddit.

platform varies. We also observe differences over time (untabulated): almost all issuer websites increase in size over time, while Twitter activity does not vary much on a rolling basis. Overall, these observations suggest differences in the amount of information that token issuers disclose, both cross-sectionally and over time.

Interestingly, Table 5 reports that *Website Size* and *Social Media Score* do not appear to be highly correlated with Twitter activity (between −0.01 and 0.27), nor is *Product Info. Score* highly correlated with GitHub activity (between −0.02 and 0.21). One explanation could be that these disclosure measures vary over time, whereas *Social Media Score* and *Product Info. Score* is only based on activity around the time of the ICO. Alternatively, the ICOBench scores are based on activity on multiple platforms.

To gauge the effect of disclosure on the reaction to transparency regulation news, we estimate the following regression:

$$\begin{aligned} CAR_{i,t} = \alpha &+ \beta_1 Website\ Size_{i,t} + \beta_2 GitHub_i + \beta_3 Total\ Github\ Changes_{i,t} \\ &+ \beta_4 TotalTweets_{i,t} + \beta_5 Total\ Replies_{i,t} + \beta_6 Expert\ Rating_i \\ &+ \beta_7 Social\ Media\ Score_i + \beta_8 Size_{i,t} + \beta_9 Supply_{i,t} \\ &+ Platform\ Fixed\ Effects_i + Event\ Fixed\ Effects_t + \varepsilon_{i,t}, \end{aligned} \tag{3}$$

where *Website Size* is the natural log of website size (in bytes) of the website HTML code. *GitHub* is an indicator variable that is equal to one if the crypto token company shares a link to a GitHub code repository on the ICO page on ICOBench, and zero otherwise. *Total Github Changes* is the natural log of the total number of publicly shared GitHub code changes (both additions and deletions) from CoinGecko. *Total Tweets* is the natural log of one plus the number of a crypto token's tweets and *Total Replies* is the natural log of one plus the number of its tweets are replies to followers or previous tweets. All countable variables are measured up until the event date, but our results hold when we measure them using a rolling window of 90 days prior to the event. In the full specification, we include *Expert Rating* and *Social Media Score* to control for management capabilities such as responsiveness and disclosure activity at time of the ICO. We again include crypto token size, supply and platform fixed effects to capture difference in market micro-structure, and event fixed effects to ensure that the only variation in CAR is cross-sectional. Starting with the sample of crypto tokens for which we have all ICO rating data (Tables 6 and 7), we further restrict the sample of the disclosure tests to those crypto tokens for which all disclosure variables are available on the event date. This yields a sample of 1747 observations.[22]

Table 8 presents results from the regressions using these three alternative disclosure measures. We find that *Website Size* is significantly positively associated with *CAR*, consistent with the prediction that investors view regulation as less costly for crypto tokens that are more transparent and disclose more information. This result is robust for other measures of transparency and quality captured by the rating variables, and for other disclosure measures. We do not find a significant association between disclosure on GitHub or Twitter and *CAR*, suggesting not all tweets and code change is informative for token investors. Although *Expert Rating* is no longer significant, *Social Media Score* remains significantly positive throughout.[23] Overall, these analyzes are in line with our earlier conclusions about the value of transparency and disclosure to crypto token investors, with the caveat that not all types of disclosure seem to matter equally.

[22]The mean market reaction for this restricted sample is −0.054, with a *t*-statistic of −2.56, similar to the reaction for the full sample in Table 2

[23]The diminished significance of *Expert Rating* could be due to the restricted sample size.

Table 8. Role of disclosure

		CAR										
	Prediction	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Website Size	+		0.009*	0.008*							0.009*	0.008*
			(1.99)	(1.87)							(2.08)	(1.93)
GitHub	+				0.013	0.007					0.014	0.008
					(1.55)	(0.69)					(1.64)	(0.82)
Total GitHub Changes	+				−0.000	−0.000					−0.000	−0.000
					(−0.21)	(−0.33)					(−0.20)	(−0.34)
Total Tweets	+						0.000	−0.002			−0.002	−0.005
							(0.06)	(−0.32)			(−0.22)	(−0.57)
Total Replies	+								0.000	−0.000	0.001	0.003
									(0.12)	(−0.04)	(0.24)	(0.52)
Expert Rating	+	0.005		0.005		0.006		0.005		0.005		0.006
		(1.07)		(1.01)		(1.13)		(1.11)		(1.07)		(1.27)
Social Media Score	+	0.060***		0.057***		0.053**		0.061***		0.060***		0.052**
		(3.07)		(3.21)		(2.17)		(3.45)		(3.09)		(2.57)
Size	?	−0.009***	−0.005	−0.009***	−0.005	−0.008**	−0.005	−0.009***	−0.005	−0.009***	−0.005	−0.008**
		(−3.16)	(−1.41)	(−3.26)	(−1.12)	(−2.72)	(−1.48)	(−3.24)	(−1.35)	(−3.19)	(−1.26)	(−2.76)
Supply	?	−0.004*	−0.004*	−0.004**	−0.004*	−0.004**	−0.003	−0.004*	−0.003	−0.004*	−0.004**	−0.004**
		(−2.05)	(−2.03)	(−2.33)	(−2.04)	(−2.20)	(−1.72)	(−2.03)	(−1.75)	(−2.07)	(−2.40)	(−2.54)
N		1747	1747	1747	1747	1747	1747	1747	1747	1747	1747	1747
No. of Crypto Tokens		252	252	252	252	252	252	252	252	252	252	252
No. of Events		15	15	15	15	15	15	15	15	15	15	15
R^2		0.227	0.226	0.230	0.224	0.227	0.222	0.227	0.222	0.227	0.227	0.230
Platform FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Event FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This Table presents the coefficients (*t*-statistics in parentheses) for the analyzes to the effect of cross-sectional differences in crypto token firm disclosure on market reactions to transparency regulation news events. The variables are defined in the Appendix A1. We cluster standard errors at the event- and crypto token-level and include crypto token platform- and event fixed effects. *, **, and *** denote statistical significance at the two-tailed 10, 5, and 1% level, respectively.

4.2.3. The role of crypto exchanges

Besides capturing transparency with the alternative disclosure measures in the previous subsection, we also assess whether investors' reactions differ with the trading environment of tokens. Crypto exchanges play an important gate-keeping role by facilitating crypto token trading to investors and deciding on the (de-)listing of crypto tokens. As highlighted in Section 2, there are significant differences in listing requirements. Crypto exchanges with stricter listing requirements put more emphasis on crypto token transparency as this is associated with higher investor confidence, while those with looser listing requirements aim to facilitate trading in as many crypto tokens as possible. For example, Coinbase requires disclosure on e.g., governance, compliance and underlying economics (GDAX, 2017), while Bitforex only requires contact information and a minimum market capitalization.[24] As a consequence, we expect to observe differences in the transparency across trading exchanges due to differential listing requirements.

We examine observable market-level trading outcomes to capture transparency. Although anecdotally, we know that the strictness of listing requirements differs across exchanges, we are unable to objectively measure these differences systematically, since not all exchanges publicly provide a detailed set of listing requirements. First, we assess the liquidity of exchanges on which a token is listed, because prior research documents that transparency should reduce information asymmetry and increase liquidity (see e.g., Chae, 2005; Welker, 1995). Therefore, we expect that the negative market reaction to transparency regulation news for crypto tokens that trade in a more liquid, and therefore more transparent, environment should be attenuated. Second, we also study exchange-level trading volume, although the theoretical relation with information asymmetry is less clear in this case. Although prior work has established that information asymmetry can reduce trading volume (Admati & Pfleiderer, 1988), some studies predict the opposite (Kim & Verrecchia, 1994). Moreover, specifically for crypto exchanges, Cong et al. (2021) find that some exchanges engage in crypto wash trading to artificially inflate trading volume. Hence, we do not predict ex ante how exchange trading volume moderates investors' reactions to transparency regulation news.

To gauge the effect of these characteristics on the reaction to transparency regulation news, we estimate the following regression:

$$\begin{aligned} CAR_{i,t} = \alpha &+ \beta_1 Exchange\ Liquidity_i + \beta_2 Exchange\ Volume_i \\ &+ \beta_3 Exchange\ Visits_i + \beta_4 Exchange\ \#Cryptos_i + \beta_5 Expert\ Rating_i \\ &+ \beta_6 Social\ Media\ Score_i + \beta_7 Size_{i,t} + \beta_8 Supply_{i,t} \\ &+ Platform\ Fixed\ Effects_m + Event\ Fixed\ Effects_t + \varepsilon_{i,t}. \end{aligned} \tag{4}$$

Our main measures of interest are *Exchange Liquidity* and *Exchange Volume*. *Exchange Liquidity* is the natural log of one plus the per crypto token liquidity score. The liquidity score ranges from 0 to 1000 and is based on the slippage incurred by various order sizes.[25] *Exchange Volume* is the natural log of the per crypto token average total dollar trading volume. We also gather data on two other exchange characteristics to control for other factors that could drive liquidity or volume. *Exchange Visits* is the natural log of the per crypto token average of total number of unique visitors. *Exchange #Cryptos* is the natural log of one plus the per crypto token average of the total number of cryptocurrencies. Since crypto tokens can be listed on multiple exchanges, we take the

[24] See the application form of Coinbase (https://www.coinbase.com/assethub) and Bitforex (https://docs.google.com/forms/d/e/1FAIpQLSfHSFgFn3dHpdMMHwHKzfBTLYL6FMpWJ-pYj8bExKQ1Orzsdg/viewform) for more information on the specific listing process.

[25] Coinmarketcap calculates 'slippage' as the number of times a hypothetical order is settled for a price different from the price that order was originally requested, out of 1000.

Table 9. Role of crypto exchanges

		CAR	
	Prediction	(1)	(2)
Exchange Liquidity	+	0.014**	0.013**
		(2.20)	(2.87)
Exchange Volume	?	−0.005	−0.005*
		(−1.75)	(−1.92)
Exchange Visits	?	0.008*	0.008*
		(2.04)	(2.06)
Exchange #Cryptos	?	−0.012	−0.013
		(−0.84)	(−0.89)
Expert Rating	+		0.007*
			(1.85)
Social Media Score	+		0.038**
			(2.35)
Size	?	−0.012**	−0.014***
		(−2.97)	(−3.82)
Supply	?	−0.003*	−0.003*
		(−1.88)	(−1.96)
N		1771	1771
No. of Crypto Tokens		229	229
No. of Events		15	15
R^2		0.232	0.235
Platform FE		Yes	Yes
Event FE		Yes	Yes

Note: This Table presents the coefficients (*t*-statistics in parentheses) for the analyzes to the effect of cross-sectional differences in characteristics of exchanges on which tokens are listed on market reactions to transparency regulation news events. The variables are defined in the Appendix A1. We cluster standard errors at the event- and crypto token-level and include crypto token platform- and event fixed effects. *, **, and *** denote statistical significance at the two-tailed 10, 5, and 1% level, respectively.

average across all exchanges on which a token is listed to calculate the following variables at the token *i* level, using data from Coinmarketcap.[26] We collect these measures from Coinmarketcap on December 7, 2021.[27] In the full specification, we include *Expert Rating* and *Social Media Score* to control for management capabilities such as responsiveness, and disclosure activity. We again include crypto token size, supply and platform fixed effects to capture difference in market micro-structure, and event fixed effects to ensure that the only variation in CAR is cross-sectional. Starting with the sample of crypto tokens for which we have all ICO rating data (N = 2419), we further restrict the sample of the exchange-level tests to those crypto tokens for which all these exchange variables are available. This yields a restricted sample of 1771 observations.[28]

We present the results of our final tests in Table 9. Consistent with our predictions, we find that *Exchange Liquidity* is significantly positively associated with the market reaction to transparency regulation news, suggesting that investors perceive the costs of transparency regulation to be less for tokens that are likely already more transparent, based on the environments in which they are traded. Second, we find a negative, but only marginally significant coefficient for *Exchange*

[26] See https://coinmarketcap.com/nl/rankings/exchanges/ for more information.

[27] Due to data limitations, these measures are time-invariant and calculated by Coinmarketcap over 24 hours. However, we have tracked these measures at several points over the course of a month and find that both the level and the relative ranking between exchanges do not vary much.

[28] The mean market reaction for the sample in this analysis is −0.055, with a *t*-statistic of −2.66, similar to the reaction for the full sample in Table 2

Volume. This seems consistent with the results in Cong et al. (2021), which suggest that higher trading volume does not necessarily indicate a more transparent trading environment, but rather the opposite due to crypto wash trading. These results are similar if we control for *Expert Rating* and ICO transparency in column (2), and these two variables also load in the same direction as in previous tests. Hence, our results appear consistent with the conclusion that token investors value transparency but may view regulatory efforts to mandate more disclosure as costly.

5. Conclusion

Despite calls for, and ad hoc attempts at regulating the cryptocurrency market, the benefits and costs of regulation in this setting are unclear. We provide empirical evidence on this issue by examining investor reactions to transparency regulation news from investors in a type of cryptocurrency issued through an ICO: crypto utility tokens. We identify 15 dates between June 2017 and August 2018 with transparency regulation news and find that the cumulative abnormal two-day return is negative for news that increases the likelihood of transparency increasing regulation. These results are robust for several sample restrictions, and different specifications and methodologies. Cross-sectionally, we observe variation in the degree of token transparency, not only around the ICO but also post-ICO, highlighting that some issuers choose to be more transparent, even absent regulation. We find that the negative reaction is attenuated for crypto tokens that have higher expert ratings for transparency, management competence, and the underlying product idea at the time of the ICO. Furthermore, investors react less negatively to regulation news if crypto tokens disclose more information to investors on their website, and if crypto tokens are listed on more liquid exchanges. These results suggest that investors expect the costs of potential disclosure mandates to be lower for already transparent token issuers, consistent with voluntary disclosures of token issuers being of value to investors. Our results suggest that despite investors perceiving current transparency-enhancing regulatory proposals to be costly, issuers and investors appear to value transparency.

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Appendices

Appendix A. Tables

Table A1. Definition of variables

Variable	Source	Description
CAR	Coinmarketcap	Sum of mean-adjusted return over [0; +1] where $t = 0$ is the event date. For mean adjustment we use the average return over the 80 calendar days around $t = 0$, excluding other event-dates.
Size	Coinmarketcap	Natural logarithm of total market capitalization of a crypto token.
Supply	Coinmarketcap	Natural logarithm of total market capitalization divided by closing price of a crypto token.
Total Rating	ICOBench	Weighted average rating of *Benchy Rating* and *Expert Rating*, provided by ICOBench.
Benchy Rating	ICOBench	Rating of ICO information provided by ICO Analyzer Bot 'Benchy,' as the weighted average of the following four subcomponents: (1) *Team Info. Score*, (2) *ICO Info. Score*, (3) *Product Info. Score*, and (4) *Social Media Score*. ICOBench transforms the percentage ratings of individual subcomponents (see below) to a score between 0 and 5 prior to averaging.
Expert Rating	ICOBench	Weighted average of cryptocurrency/blockchain expert ratings, based on the following subcomponents: (1) *Team Rating*, (2) *Vision Rating* and (3) *Product Rating*.
Team Score	ICOBench	Score (in %) for total information available about team behind ICO, provided by ICO Analyzer Bot 'Benchy' on ICOBench.
ICO Info. Score	ICOBench	Score (in %) for total information available about ICO provided by ICO Analyzer Bot 'Benchy' on ICOBench.
Product Info. Score	ICOBench	Score (in %) for the total information available about product, provided by ICO Analyzer Bot 'Benchy' on ICOBench.
Social Media Score	ICOBench	Score (in %) for presence on social media, both in terms of total number of platforms and in activity on those platforms, provided by ICO Analyzer Bot 'Benchy' on ICOBench.
Team Rating	ICOBench	Rating (out of 5) of team behind the ICO provided by experts on ICOBench.
Vision Rating	ICOBench	Rating (out of 5) of the vision and/or plans outlaid in the ICO provided by experts on ICOBench.
Product Rating	ICOBench	Rating (out of 5) of the actual product or service offered by the company doing an ICO provided by experts on ICOBench.
Exchange Volume	Coinmarketcap	Natural log of the per crypto token average total dollar trading volume of all exchanges on which a crypto token is listed. The dollar trading volume is measured from December 7th till December 8th, 2021.
Exchange Liquidity	Coinmarketcap	Natural log of the per crypto token liquidity score of all exchanges on which a crypto token is listed. The liquidity score ranges from 0 to 1000 and is based on the slippage incurred by various order sizes, and is calculated by Coinmarketcap between December 7th and December 8th, 2021.

(*Continued*).

Table A1. Continued.

Variable	Source	Description
Exchange Visits	Coinmarketcap	Natural log of the per crypto token average of total number of unique visitors on the exchanges on which a crypto token is listed. The number of visitors are measured from December 7th till December 8th, 2021.
Exchange #Cryptos	Coinmarketcap	Natural log of the per crypto token average of the total number of cryptocurrencies on the exchanges on which a crypto token is listed. The number of cryptocurrencies is measured from December 7th till December 8th, 2021.
Website Size	WebArchive	Natural log of the size in bytes of the website of the crypto token company, following Boulland et al. (2021). We take the snapshot from the Internet Wayback Machine of the WebArchive at the date closest prior to the event.
GitHub	ICOBench	Indicator variable that is equal to 'one' if the crypto token company shares a link to a GitHub code repository on the ICO page on ICOBench.
Total GitHub Changes	CoinGecko	Natural log of the sum of additions and deletions in the code shared by the crypto token company in the GitHub code repository, up until the date of an event.
Total Tweets	Twitter	Natural log of one plus the number of tweets sent by the crypto token company up until the date of an event.
Total Replies	Twitter	Natural log of one plus the number of reply tweets sent by the crypto token company, i.e., replies to their own or others' tweets up until the date of an event.

Note: This Table gives an overview of the variables used in the analyzes, their sources, and their descriptions.

Table A2. Overview of the top 100 cryptocurrency exchanges

Country	No. of top 100 cryptocurrency exchanges	Exchanges
Australia	1	TOPBTC
Canada	2	BCEX, Coinsquare
Cayman Islands	1	BitMart
China	9	Binance, ZB.COM, DOBI trade, OEX, IDCM, Fatbtc, C2CX, Allcoin, LakeBTC
Cyprus	2	Coindeal, Cryptology
Dubai	1	RightBTC
Estonia	4	Bibox, CoinsBank, P2PB2B, CryptalDash
Gibraltar	1	GBX Digital Assets
Hong Kong	7	OKEx, HitBTC, LBank, Bitfinex, Bit-Z, Coinsuper, CHAOEX
India	1	UEX
Indonesia	2	Exrates, Indodax
Ireland	1	Bitsane
Japan	2	Bitbank, BTCBOX
Luxembourg	1	Bitstamp
Mongolia	1	IDAX
New Zealand	1	Cryptopia
Panama	1	IDEX
Peru	1	Bitinka
Poland	2	Coinroom, Coinbe
Russia	3	Simex, B2BX, YoBit
Singapore	10	Huobi, DigiFinex, CoinBene, DragonEX, CoinTiger, LATOKEN, Kucoin, MBAex, HADAX, Coinut
South Korea	6	Upbit, Allbit, CPDAX, Coinone, Korbit, GOPAX
Switzerland	1	Rfinex
Taiwan	1	Bitrue
Thailand	1	TDAX
Turkey	5	Sistemkoin, Vebitcoin, BtcTurk, Paribu, Ovis
UK	11	Cryptonex, CoinEgg, Bitlish, Exmo, Livecoin, CEX.IO, Mercatox, Bilaxy, BTC-Alpha, DSX, Luno
Ukraine	1	Liqui
Unknown	10	BitBay, Hotbit, InfinityCoin, Trade by Trade, BtcTrade.im, BiteBTC, Coinhub, Ethfinex, Liquid, Waves
US	10	Kraken, Coinbase Pro, Kryptono, Bittrex, Gate.io, Gemini, itBit, bitFlyer, Poloniex, Tidex

Note: This Table presents the total number and the names of top 100 cryptocurrency exchanges per country. If the country of registration could not be determined, the country of registration is 'Unknown.' Data is per November 2018.

Appendix B. Overview of Events

We define a transparency regulation news event as: (announcements of) actions related to concrete and specific regulations and/or laws, or the establishment of working groups, initiated by market authority/regulatory bodies focused on enhancing the transparency of crypto tokens and crypto tokens issuers in the context of securities. Importantly, to observe a market reaction, we focus on regulation efforts that are not only aimed at increasing transparency at the time of the ICO, but also after issuance. We provide more background on the events mentioned in Table 2 and a discussion of potential confounding events on the event dates.

In 2017, we identify five events. On June 13, 2017, the SEC publicly stated that it is looking to regulate the ICO process and the companies behind the ICO after the issuance. Although the precise details were not mentioned, the SEC also stated the aim to enhance transparency with such regulations. On July 25, 2017, the SEC ruled that Decentralized Autonomous Organization (DAO) Tokens, issued by ICO in 2016, are officially securities subject to securities regulation

for disclosure. This ruling set a precedent for other ICOs for case-by-case reviews by the SEC, increasing the likelihood of transparency regulation. On August 1, 2017, the financial regulator of Singapore, a country with 10 of the 100 largest cryptocurrency exchanges globally, announced that it will regulate ICOs and crypto token companies on a case-by-case basis. The regulations mentioned a focus on disclosure and transparency, and therefore we expect this to increase the likelihood of transparency regulation. On August 24, 2017, the financial regulator of Canada announced that it perceives crypto tokens to be more like securities, rather than its own asset class. With this statement, the Canadian regulator implied that most crypto tokens are subject to the disclosure regulations of traditional securities, increasing the likelihood of transparency regulation for these tokens. On September 7, 2017, the financial markets regulator of New Zealand announced that all crypto tokens issued through the ICO process are considered to be securities, and have to adhere to security regulations.

In 2018, we identify ten events. On February 11, 2018, Gibraltar became the first country to introduce regulations specifically aimed at crypto tokens and ICOs. The regulation set forth disclosure rules that provide information to anyone buying tokens, at the time of the ICO and thereafter. On February 14, 2018, the Canadian Stock Exchange announced that it would start a regulated platform for trading in security tokens. Registration with the Canadian security regulator is required, which increases the likelihood of disclosure regulation for tokens looking to register on this exchange. On February 19, 2018, a bipartisan group of U.S. lawmakers announced that they were looking to form new legislation to regulate cryptocurrencies. Part of the proposed legislation is a disclosure framework to protect investors against manipulation and fraud. On March 7, 2018, the SEC announced that cryptocurrency exchanges must be registered with the SEC and subject to similar rules for (de-)listing, disclosure and financial responsibility as traditional exchanges, effectively increasing the expected disclosure of US-listed crypto tokens. On March 13, 2018, and again with more details on May 14, 2018, Thailand announced a regulatory framework for crypto tokens that brings these assets under the jurisdiction of the securities regulator. The framework is focused on investor protection and involves disclosure requirements, but it is yet unclear to what degree. On May 21, 2018, Thai regulators hosted a focus group meeting to clarify proposed crypto regulations of May 14, 2018. At the center of the proposed regulation sits a new framework, which comes with specific rules on capital and disclosure for digital tokens. On July 5, 2018, Thailand officially announced the proposed set of general regulations for ICOs and crypto tokens, which increased the disclosure requirements for ICOs and crypto tokens. On July 20, 2018, the regulatory body of Ukraine officially supported a regulatory concept to regulate cryptocurrencies, which identifies crypto tokens as financial instruments. This regulation also defines information disclosure conditions and requirements, increasing the likelihood of transparency regulation for crypto tokens. On August 10, 2018, the EU announced a new crowdfunding regulation that is also intended for ICOs. The regulation is focused on increasing investor protection through disclosure requirements, dependent on the type of crypto token. We expect this event to increase the likelihood of crypto token transparency regulation.

Next, we examine the possibility of confounding events affecting our results. Using LexisNexis, we do not find any important economic events during all fifteen event windows. This is supported by a low averagereturn of 0.22% for the S&P500 firms during these event windows. Finally, we find one potentially confounding cryptocurrency event: on March 13, 2018, IMF head Christine Lagarde wrote in a blogpost that blockchain technology should be used to regulate cryptocurrencies.[29] However, her proposals do not concern transparency regulation and excluding this (or any other) event from the analyzes yields very similar results (see Section 4.1).

[29] See: https://blogs.imf.org/2018/03/13/addressing-the-dark-side-of-the-crypto-world/.