Cryptocurrency Regulation: Protective vs. Enabling Approaches*

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ABSTRACT

Using novel data on state cryptocurrency licensing requirements, I document a disconnect between market perceptions and economic reality. Both public equity and crypto markets react negatively to states enacting protective regulation, with asymmetric responses to subsequent licensing announcements and news coverage, consistent with protective regulation benefitting traditional, centralized firms over crypto startups. Yet, exploiting the quasi-experimental variation stemming from the state laws reveals that regulation fosters entrepreneurial activity and innovation. Protective licensing is associated with benefits like increased startup entry, raising more capital, applying for patents, and greater job growth, particularly in compliance and engineering roles. These findings are consistent with the proposed theoretical model, which posits regulatory intensity influences market structure through size-based entry and strategic delay. I find some evidence that protective regulation is correlated with industry concentration and that states compete on regulation, leading to a separating equilibrium. Nevertheless, it appears, on average, that high-quality startups benefit from the protective regulatory framework.

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The emergence of blockchain and cryptocurrency presents a significant regulatory challenge for U.S. financial regulators, particularly at the federal level where political turf wars have sustained regulatory uncertainty for over a decade. This challenge stems partly from the fundamental mismatch between traditional financial regualtion, which operates through centralized gatekeepers and intermediaries, and the decentralized nature of blockchain technology. While centralized systems generate accountability, they also generate intermediation costs. Decentralized finance (DeFi) aims to transform financial intermediation through automation and the elimination of fees associated with centralized intermediaries (Harvey et al., 2021). Given the value proposition, DeFi's tremendous growth is logical, with total value locked (TVL) exceeding $300 billion in 2024. Yet, in the absence of federal guidelines, many state regulators have implemented their own policies, which have varied from highly protective to enabling approaches. Given the Trump administration's agenda includes bringing regulatory clarity to crypto at the federal level, it seems both prudent and timely to understand what is and is not working at the state level. In particular, this study leverages the significant variation in regulatory intensity at the state level to test broader theories of financial technology (FinTech) regulation (Makarov and Schoar, 2022; Chen et al., 2023; Grennan, 2024; Campello et al., 2024).

On one hand, enabling regulatory frameworks aim to foster business development through principles-based regulation, outcomes-focused metrics, and public-private collaboration. However, legal analyses of regulatory sandboxes, a popular form of enabling regulation, highlight the economic distortions they create (Zetzsche et al., 2017; Brummer and Yadav, 2017; Allen, 2019). First, sandbox participants gain first-mover advantages and insider knowledge that lets them shape regulation and create entry barriers, consistent with regulatory arbitrage theory (Stigler, 1971). Second, there's a reputational benefit, in which successful sandbox entrants often receive positive market signaling and implicit regulatory endorsement, disadvantaging non-sandbox startups in competition for customers and capital (Cornelli et al., 2023). Bureaucratic reputation also matters, as some light-touch regulators fail to even attract relevant startups (Fahy, 2022; Markellos et al., 2024). Conversely, protective regulation employs prescriptive rules, process-based requirements, and arms-length oversight to safeguard market integrity, consumer protection, and financial

stability. While designed to reduce risks, protective approaches may generate unintended consequences, including business relocation, economic contraction, innovation constraints, and excessive geographic concentration of financial activity.

Theoretical and empirical evidence on the economics consequences of protective regulation in cryptocurrency markets remains limited to generalization from other contexts (Buchak et al., 2018; Kalmenovitz, 2023; Babina et al., 2024). Yet, several factors suggest cryptocurrency may be a distinct historical phenomenon requiring specialized regulatory approaches. These include cryptocurrencies' fundamental reliance on decentralized technologies, the inherently global and borderless nature of their markets, and their apparent focus on competing against heavily regulated industries like finance where reduced competition led to low levels of innovation in basic services like payments (Tufano, 2003; Lerner and Tufano, 2011). Unlike traditional financial systems, cryptocurrencies often operate without centralized intermediaries, making regulatory oversight more complex and traditional enforcement mechanisms less effective. Furthermore, their capacity to facilitate peer-to-peer transactions and programmable financial products and services introduces new risks and opportunities. These factors speak to the need to understand what approach to regulation (protective vs. enabling) produce specific consequences and the extent to which these outcomes diverge from historical patterns.

To analyze regulation in this space, I develop a theoretical framework to examine how regulatory intensity, ranging from enabling to protective, influences entrepreneurial decisions. The model incorporates heterogeneous firm characteristics, non-linear productivity effects of regulation, and uncertainty in compliance costs and operational outcomes. Two primary mechanisms emerge from this analysis. First, size-based selection arises from a convex compliance cost structures that disproportionately burden larger firms as regulatory intensity increases, driving differential patterns of market entry and exit. Second, uncertainty about productivity and compliance costs generates an option value to waiting, as firms balance the benefits of learning against the risks of delayed investment. These mechanisms not only influence individual firm decisions but also reshape market structure by altering the size distribution and strategic positioning of firms across different legal jurisdictions. I use this framework to generate testable empirical predictions that distinguish

it from other models, including size-dependant entry responses to regulatory changes and larger firms' heightened sensitivity to protective regulatory regimes.

Unlike federal regulators, state regulators have proactively established protective measures for digital assets. New York's BitLicensing regime, which went into effect on June 24, 2015, represented a watershed moment in digital asset regulation. As the first comprehensive state-level regulatory framework, it marked a clear departure from the prevailing approaches and was rapidly developed and implemented. The regime required firms engaging in virtual currency business activity, which includes the transmission, custody, exchange, and even certain types of software development, to obtain state licenses, maintain extensive compliance programs, and meet some capital requirements. The unexpected scope and stringency prompted immediate industry respone, with prominent startups like Kraken and Bitfinex publicly expressed their opposition to what they viewed as excessive regulatory burdens. This pronounced industry reaction, combined with New York's outsized importance in financial markets, creates a valuable quasi-natural experiment to examine regulation's relationship with startup growth, entrepreneurial activity, and innovation.

In fact, the influence of New York's licensing approach to cryptocurrency regulatory framework has extended well beyond its borders, as other states have adopted similar licensing regimes. In 2017, the Uniform Law Commission began work on the Virtual Currency Business Act (VCBA) to help states standardize their approach. Ultimately, the Conference of State Bank Supervisors (CSBS), in conjunction with state regulators and industry stakeholders, approved the Money Transmission Modernization Act (MTMA) in 2021, as a set of standards for regulating money transmitters. Within the MTMA, there was an optional virtual currency component that states could adopt. As Figure 1 illustrates, many states have provided guidance, introduced, enacted, and/or made effective new legislation involving protective measures that require certain business entities engaging in cryptocurrency transactions to be licensed. This staggered implementation across states provides quasi-random variation that allows for identification of protective regulation's relationship with entrepreneurial activity and innovation while controlling for broader market trends.

To evaluate the impact of the protective licensing regimes, I begin by exploring perceptions of the legislation. I examine the reaction in both equity and crypto markets to legislative an-

nouncements and press releases. I also explore the crypto media's coverage of licensing regimes to see if perceptions change over time. Then, I turn from perceptions to real effects by exploring entrepreneurial activity, including startup quality and employment growth. To do this, I construct a comprehensive panel of startup outcomes by combining startup data with resume data for startup employees. This multi-pronged approach allows me to explore the potential intended and unintended consequences of protective licensing regulation in the cryptocurrency space.

The empirical strategy leverages the staggered implementation of BitLicense-like requirements across states in a difference-in-differences framework. This design allows me to separate the influence of regulation from broader market trends and macroeconomic conditions. By comparing outcomes in treated state-industry pairs with control state-industry pairs before and after implementation, I can identify how protective regulation is associated with various dimensions of market activity. To help establish the credibility of this approach, I augment the main analysis with tests for pre-trends and various robustness checks to ensure concurrent changes in market conditions or regulatory environments do not drive the findings. This empirical approach builds on recent methodological advances in evaluating staggered treatment designs (Goodman-Bacon, 2021), while addressing specific challenges in measuring entrepreneurial activity (Lerner and Seru, 2022; Rin et al., 2013). The primary specification is a two-way fixed effect (TWFE) estimator, and I complement this approach by using a stacked difference-in-differences estimator. The latter addresses potential biases arising from staggered treatment timing and evolving treatment effects (Barrios, 2021; Roth et al., 2023).[1]

Using this multi-pronged empirical approach, I provide new evidence on how protective versus enabling regulatory approaches influence markets, entrepreneurial activity, and job creation in the cryptocurrency industry. The findings reveal important insights into the relationship between regulatory design and innovation that challenge conventional wisdom. Most notably, while market participants react negatively to protective regulation, suggesting potential constraints on innovation, the actual effects on entrepreneurial activity and employment are more favorable.

In particular, I start by exploring the market's perception of various regulatory initiatives.

[1]The inferences are also robust to the use of the estimator proposed by Callaway and Sant'Anna (2021).

Using abnormal equity returns, I find that protective licensing legislative events are associated with significant negative market reactions for public firms likely to be impacted by the legislation, such as Coinbase and Block. When these regulations become effective, these focal firms experience negative abnormal returns that are significant at the 95th percentile, suggesting equity markets view protective regulation as consequential for crypto-industry incumbents. Both within-equity and cross-sectional evidence support these findings. Interestingly, enabling legislation, popular in states like Wyoming and Hawaii, shows no market reaction, indicating markets respond differently to protective vs. enabling regulatory approaches and only have adverse perceptions of protective legislation.

Since many crypto-related business entities are not publicly traded equities, I also examine crypto market reactions to these regulatory events. The theoretical model predicts that firms at different stages of maturity may react differently to regulatory announcements. The crypto exchanges and startups likely to be impacted by protective legislation also exhibit negative abnormal crypto returns to regulatory announcements. Interestingly, unlike public equities, the reaction is adverse even to enabling legislation. However, the economic magnitude of the abnormal crypto return is not as large as that of public equity markets. While the sign of the coefficient in response to regulatory guidance, introduction, and enactment are all consistent with negative abnormal returns, they are not statistically significant. This suggests that it is legislation taking effect, as the BitLicensing regime did in New York, and knowing that a license is required is what crypto market's perceive as most important.

Next, I look at the market's reaction to media coverage of Bitlicensing news and press releases made by the New York Department of Financial Services (NYDFS) pertaining to Bitlicenses. The analysis shows that while license grants made by the NYDFS are associated with negative abnormal returns in crypto markets, license rejections and surrenders generate substantial abnormal positive returns in equity markets. This asymmetric response suggests that protective regulation through licensing requirements may inadvertently benefit more traditional crypto firms organized in a centralized manner, like Coinbase, while constraining more decentralized ventures, like Shapeshift, with associated tokens in crypto markets. News coverage analysis further supports this interpre-

tation. I find that news coverage of BitLicensing regulation with negative sentiment positively correlates with abnormal equity market returns for focal firms. These findings are consistent with market participants' perceiving that protective regulation hampers innovation and entrepreneurial dynamism.

Second, I turn to actual evidence on entrepreneurial formation and innovation to understand if the market's perceptions are correct. It could be the case that the industry is engaging in cheap talk. That is, they are vocal about regulation being burdensome, but, in fact, are able to accommodate regulatory requirements without reducing innovative efficiency. This is what I see. Contrary to predictions of stifled innovation, I find that BitLicensing legislation has a nuanced but economically meaningful relation to entrepreneurial activity. In particular, the initial introduction of potential licensing legislation is associated with a reduction in overall startup activity of 0.083 standard deviations. However, this relation reverses once legislation is enacted, with startup activity increasing by 0.042 standard deviations. The impact is particularly pronounced for early-stage ventures, where seed and early-stage startups experience substantial increases of 0.197 standard deviations following enactment. These effects strengthen further when the legislation becomes effective, with seed and early-stage ventures showing gains of 0.215 standard deviations. Notably, the requirement for licensing, whether through guidance or enacted legislation, consistently promotes entrepreneurial activity across all stages, suggesting that regulatory clarity ultimately fosters rather than inhibits startup formation. These findings indicate that while regulatory uncertainty during the legislative process may temporarily deter entrepreneurship, and even if the market perceives regulation as a negative, establishing clear regulatory frameworks creates conditions conducive to cryptocurrency startup activity.

Third, I document spillover relation to employment. Following enactment, employment increases by 0.090 standard deviations, with a more pronounced relation for specialized positions like compliance and engineering. These associations persist when legislation becomes effective, though at slightly lower magnitudes. At the same time, the introduction of legislation shows no significant employment effects, and event dates associated with regulatory guidance correlate with a substantial decline in overall employment. These results indicate that protective licensing requirements

are related to meaningful changes not only in entrepreneurial activity but also in the level and composition of employment, especially for specialized compliance and engineering roles.

Fourth, I show that protective licensing regulation in cryptocurrency markets stimulates innovation more strongly among established firms than early-stage ventures, with statistically significant increases in patent applications for larger companies but only modest effects for smaller ones. This pattern aligns with theoretical predictions that larger firms have greater capacity to absorb regulatory compliance costs while extracting advantages from the resulting market structure, leading to asymmetric innovation responses across firm size categories.

Fifth, I investigate the relationship between protective licensing regulations and industry concentration, finding that regulatory actions disproportionately impact firms based on size, leading to increased concentration. Notably, regulatory uncertainty (e.g., proposed legislation) appears to drive stronger firm dynamics than regulatory clarity (e.g., licensing requirements), with fewer closures and a greater likelihood of startup success through IPOs or acquisitions. Extending the model to regulatory competition, the study examines how market share incentives drive clustering in regulatory regimes. More globally integrated jurisdictions tend to favor enabling regulation to attract firms, while those with dominant incumbent financial sectors cluster around protective regulation. Empirical tests support this prediction by correlating regulatory choices with state characteristics, using proxies for global exposure such as demographic diversity and financial sector concentration.

In conclusion, the results of this study paint a nuanced picture of protective regulation in cryptocurrency markets. While I find evidence of some predicted costs, the costs stem primarily from the market's perceptions rather than incurred costs. This suggests the overall influence of regulatory activity on innovation appears more positive than what the many vocal critics of the licensing regime suggested. Therefore, I conclude that protective regulation, while creating some inevitable consequences like consolidation, has not generated the severe negative consequences initially predicted, such as stifling innovation.

1 Related Literature and Institutional Background

1.1 Literature

This study contributes to the literature on financial regulation and innovation. First, I provide novel empirical evidence on how protective regulation influences cryptocurrency market innovation and entrepreneurial activity, extending prior research on financial innovation (Allen and Gale, 1994; Lerner, 2006; Lerner and Tufano, 2011; Philippon, 2019; Goldstein et al., 2019) to this context. Second, I collect new, state-level data to measure the regulatory effects of licensing regimes, which may prove valuable for future research. Third, I identify how unique features of cryptocurrency markets, viz., early price discovery amplifying sentiment, can create unintended consequences (Sunstein, 2018; Rong et al., 2024). Finally, the findings inform ongoing policy debates about optimal regulatory design for emerging technologies without hampering entrepreneurial activity (Ewens and Farre-Mensa, 2022; Eldar and Grennan, 2023).

More broadly, this study contributes to research on blockchain and digital assets' ability to transform capital markets and create new opportunities for entrepreneurs and investors. Early work highlights the potential opportunities for FinTech to enhance financial inclusion, capital formation, and regulatory technology (Philippon, 2016; Yermack, 2017; Cong and He, 2019). Subsequent research has highlighted the risks created by these novel technologies. In this vein, this research complements research examining risks and regulation in this space, including those examining the use of digital assets for illicit activities (Foley et al., 2019; Griffin and Shams, 2020), scams stemming from initial coin offerings (ICOs) Howell et al. (2020); Lyandres et al. (2022), DEX regulation (Harvey et al., 2024; Yadav, 2022), and tax implications (Pennec et al., 2021; Cong et al., 2023; Meling et al., 2024). Finally, it contributes to work on entrepreneurial finance and innovation, especially those examining how regulation interacts with financing constraints to influence entrepreneurial entry.

1.2 Regulatory Approaches: Enabling vs. Protective

Regulators face a choice between enabling and protective approaches when overseeing emerging technologies. An enabling regulatory approach aims to create an environment that supports business development through principles-based regulation, outcomes-based metrics, and industry-government collaboration. In contrast, protective regulation, exemplified by the BitLicense framework discussed in the introduction, emphasizes prescriptive rules, process-based requirements (e.g., if your firm is a custodian of cryptocurrency, you need a license), and more authoritarian, arms-length oversight of an industry. In the subsections below, I provide additional details on the contrasts between enabling and protective regulatory approaches. In subsection 2.3, I provide details on New York's pioneering protective regulatory framework for virtual currencies, discussing its dual-track licensing system and influence on other state-level regulatory approaches. Finally, in subsection 2.4, I provide anecdotal evidence from the implementation of New York's BitLicensing legislation of how protective licensing regimes affect market outcomes through both explicit regulatory requirements and changes in market structure.

1.2.1 Enabling Regulation

An enabling regulatory approach aims to create an environment that supports business development rather than imposing strict rules and restrictions often seen as unsupportive of business operations. Advocates argue this approach provides flexibility for innovation while maintaining adequate safeguards. Critics highlight risks of regulatory capture, insufficient deterrence, and inconsistent enforcement. Under the enabling approach, innovation, growth, and competition are considered unencumbered. Regulators maintain safeguards by requiring firms to comply with mission-driven goals and aspirations like protecting consumers and maintaining market integrity. For these reasons, the often-cited features of enabling regulation are that it is principles-driven, outcomes-based, and involves meaningful collaboration between industry and government.

Enabling regulation relies on broad, aspirational principles rather than detailed, prescriptive rules. This is thought to allow for greater adaptability when market conditions are changing or

technological advancements are rapidly occurring. In such instances, rather than writing rules and then constantly updating rules to accommodate gaps and limitations posed by emerging technologies, regulators will focus on desired outcomes, such as financial stability. In practice, this means that regulators nurture these potential high-growth startups through close collaboration rather than dictating specific processes (e.g., your firm must get a license if you transmit virtual currencies) or actions (e.g., your firm must hold this amount of capital in reserve). In this sense, the regulator's role extends beyond traditional activities like supervision and enforcement to more hands-on activities like strategic advice and fostering innovation.

Advocates of the enabling approach argue that it provides flexibility for innovation while maintaining adequate safeguards. Of course, given many frictions between entrepreneurs and regulators, this approach necessitates an emphasis on open dialogues, commentary between industry participants and regulators on any proposed actions, and shared responsibility in implementing any efforts to achieve these overarching principles or missions. In fact, by relying on principles rather than prescriptive rules, regulators would argue that they are giving firms the flexibility to adapt to changing market conditions and develop new products and services. This can lead to increased competition, as firms seek to differentiate themselves and capture market share through innovation. Additionally, enabling regulation can reduce compliance costs and administrative burdens, as firms have greater discretion in how they meet regulatory objectives, and these gains translate directly into the bottom-line net income, which enables more firms to enter the market and compete. Finally, an additional benefit of enabling regulation includes improved collaboration between regulators and industry participants, which is thought to improve regulatory efficiency and responsiveness to emerging risks. It is thought to allow regulators to focus their resources on the most significant risks and issues, rather than spending resources on monitoring and micromanaging firms' activities.

In contrast, critics of enabling regulation highlight risks of regulatory capture, insufficient deterrence, and inconsistent enforcement brought about by a lack of clarity in the first place. For example, critics often argue that the flexibility and broad principles of enabling regulation can lead to uncertainty and inconsistent application of the rules, making it difficult for firms to comply and for regulators to police actions. In addition, it is well-established that the revolving door in poli-

tics, bolstered by the collaborative approach of enabling regulation, can lead to regulatory capture (Agarwal et al., 2014; Buchak et al., 2018) and/or special interest groups exerting undue influence over the regulatory process (Stigler, 1971; Grossman and Helpman, 2002). Finally, it is possible that enabling regulation may not provide strong enough deterrents against misconduct, as the focus on principles and outcomes may lead to a lack of clear penalties for violations.

To date, the empirical literature on enabling approaches is mixed. Evidence from the United Kingdom stemming from its staggered introduction found that firms entering the sandbox were more likely to raise subsequent capital and larger rounds of capital from VCs. It also significantly affected survival rates and patenting, which the authors attributed to reduced regulatory uncertainty. In contrast, however, studies examining the exact same setup found that those who did not get into the sandbox did meaningfully worse than they otherwise would have. In particular, Abis (2020) documents many perverse effects. Thus, many lawmakers still perceive inconclusive evidence on the effectiveness of enabling regulation. In fact, some have argued that light-touch enabling regulation contributed to the great financial crisis and its contagion.

1.2.2 Protective Regulation

A protective regulatory environment aims to protect. The defining features of protective regulation are stringent rules and closely monitored processes. Moreover, regulators need to enforce the rules and have a deterrent effect, so it is important for them to maintain authority and separation from industry participants who may seek to influence them. This regulatory philosophy has deep historical roots in U.S. financial regulation, exemplified by the Glass-Steagall Act's strict separation of commercial and investment banking, the detailed capital requirements under Basel frameworks, and the prescriptive disclosure rules established by the Securities Acts of 1933 and 1934 that lead to all the financial statements that investors regularly read. More recent examples include the Sarbanes-Oxley Act's specific internal control requirements and the Dodd-Frank Act's detailed provisions for systemically important financial institutions.

Advocates of protective regulation emphasize several key benefits that distinguish it from enabling approaches. First, explicit rules and clear enforcement mechanisms create stronger deterrence

against misconduct, as evidenced by the reduction in accounting fraud following Sarbanes-Oxley implementation Coates and Srinivasan (2014). Second, standardized processes facilitate regulatory oversight and reduce supervisory discretion, potentially limiting regulatory capture. This contrasts sharply with enabling regulation's collaborative approach, which critics argue contributed to the savings and loan crisis of the 1980s through overly close relationships between regulators and regulated entities. Third, protective regulation's emphasis on specific requirements can enhance market stability by ensuring consistent risk management practices across firms, as demonstrated by the resilience of well-capitalized banks during the 2008 financial crisis.

Critics of protective regulation, however, point to significant drawbacks beyond the commonly cited concerns about compliance costs. They argue that prescriptive rules can create a "check-the-box" mentality that emphasizes formal compliance over substantive risk management, a criticism notably raised about Basel II's standardized risk weightings prior to the financial crisis. The strict separation between industry and regulators, while reducing capture risk, can lead to information gaps that make regulation less effective or even counterproductive. For instance, the SEC's initial attempts to regulate credit default swaps were hampered by limited understanding of market practices. Additionally, protective regulation's process-based requirements can create operational inefficiencies, as firms must maintain specific procedures even when alternative approaches might better suit their business models or risk profiles. This inflexibility particularly affects emerging technologies, where standardized processes may poorly match rapid innovation cycles.

1.3 Protective Cryptocurrency Regulation

1.3.1 New York's BitLicense

New York's BitLicense regulation, introduced in 2014 by New York's Department of Financial Services (NYDFS), represents a clear example of protective regulation. The framework requires virtual currency businesses to obtain specialized licenses, maintain extensive compliance programs, meet stringent capital requirements, and undergo regular examinations. The BitLicense is a specialized regulatory framework established by New York State for businesses engaging in virtual

currency activities. Companies have two options for legal operation: obtaining either a BitLicense or a limited-purpose trust company charter under New York Banking Law. The trust company charter offers additional benefits, including fiduciary powers and automatic money transmission authorization, though it comes with increased regulatory oversight.

A BitLicense is required for any entity conducting specific virtual currency activities with New York residents, including transmitting virtual currencies, holding custody of others' virtual currencies, operating a virtual currency exchange business, or issuing virtual currencies. Notably, purely technical services like software development don't require a BitLicense – for example, creating self-custody wallet software wouldn't require a license, but operating a custodial wallet service would. This framework has become influential beyond New York, serving as a model for other states' approaches to virtual currency regulation, though some jurisdictions have opted for less stringent requirements.

The introduction of BitLicensing model in New York was at least partially spurred by the 2014 Mt. Gox crisis, which exposed significant vulnerabilities in the virtual currency ecosystem. But the consistent exposure of consumers to fraud in the cryptocurrency space meant that other states were also likely to be seeking to adopt similar practices to this pioneering state. In fact, some states have chosen to modify their existing Money Transmitter Laws to explicitly include virtual currencies or make their definitions of money, store of value, and financial instruments broad enough to encompass entities transmitting virtual currencies. Currently, U.S. money transmission regulation operates under a decentralized framework, with all states except Montana requiring and maintaining independent licensing regimes. These regulations encompass entities facilitating payment intermediation, including payment processors, cross-border transfer services, and more recently, digital asset platforms like Coinbase, Binance, and Ripple.

This led to meaningful regulatory uncertainty as digital asset businesses did not know if they needed to obtain a money transmitter license. Some states offered guidance, while other states introduced and enacted new legislation. In 2021, the Conference of State Bank Supervisors, in conjunction with input from industry, developed the Mondel Money Transmission Modernization Act (MTMA) as an attempt at making state laws uniform or at least more harmonized. To date,

many states have introduced legislation. While some jurisdictions have enacted comprehensive adoption of the MTMA standards, others have implemented selective provisions or introduced jurisdiction-specific modifications.

Appendix A provides a state-by-state description current through 2024 that captures the key institutional features as they relate to business entities transacting in virtual currencies needing a license. Furthermore, Figure 1 illustrates trends in legislative activity focusing on "BitLicenses" and money transmitter laws that were subject to change or guidance between 2013 and 2024. The figure shows a steady increase in the introduction of bills over the years, with notable peaks in 2023 and 2024 after the MTMA. Enactment was initially low, with many bills getting stalled or postponed, but has increased most recently, aligning with the maturation of state-level policy frameworks. The guidance provided by states shows periodic fluctuations, with spikes in 2018 and 2020, indicating efforts to protect consumers by ensuring that virtual currency transmitters are licensed and regulated.

1.3.2 Anecdotes On the Direct and Indirect Effects of Licensing

The introduction of protective licensing regimes has the potential to influence market outcomes through multiple channels that can be broadly categorized into direct and indirect effects. Direct effects primarily operate through explicit regulatory requirements imposed on firms. The most immediate direct effect stems from compliance costs, which (Philippon, 2019) estimates can account for up to 20% of operating expenses in traditional financial institutions. In digital asset markets, these costs include developing and maintaining cybersecurity infrastructure, implementing transaction monitoring systems, and establishing internal controls. Capital requirements represent another significant direct effect, potentially constraining firm financing decisions and growth trajectories. Indirect effects of licensing emerge through changes in market structure and participant behavior. One key indirect effect operates through market concentration. As smaller firms find compliance costs prohibitive, they may exit the market or consolidate with larger entities, increasing concentration among regulated firms. This pattern mirrors historical evidence from traditional financial services, where (Buchak et al., 2018) document significant consolidation following increased regu-

latory burden.

New York's introduction of a BitLicensing framework was met with harsh criticism. In 2015, the CEO of Kraken, a cryptocurrency exchange, wrote a blog post entitled, "Farewell, New York," explaining that Kraken would discontinue services to New York residents. "Regrettably, the abominable BitLicense has awakened. It is a creature so foul, so cruel that not even Kraken possesses the courage or strength to face its nasty, big, pointy teeth." Similarly, in 2018, the CEO of Shapeshift, a crypto platform, still felt NY's BitLicense was such overreach, he used his time on stage at Consensus to say, "Here we are two miles from the Statue of Liberty, and you cannot sell CryptoKitties in the state without that license. That's the absurdity of what's happened here."

The crypto industry's negative reaction was not limited to New York. Wyoming's initial guidance interpreting the state's Money Transmitter Act as requiring entities offering hosted wallet services to be licensed was deemed so impractical and inefficient by Brian Armstrong, the CEO of Coinbase, a crypto exchange and wallet platform, that Coinbase left the state in 2015. This led Wyoming to change its ways and become one of the few states taking an enabling approach to legislation. While there are plenty of anecdotes from the crypto industry about these protective licensing regimes, I am unaware of any empirical papers systematically examining these legislative actions. In the next section, I develop a theoretical framework for studying the impact of regulatory decisions.

2 Theoretical Framework

In this section, I develop a stylized model of entrepreneurial activity such as entry and exit under varying regulatory intensities which range from enabling to protective. The model captures both direct productivity effects and compliance costs while incorporating heterogeneity in firm characteristics and uncertainty in outcomes.

Firm productivity is modeled as a non-linear function of regulatory intensity.

$$A(p_l) = A_0 e^{-\delta p_l} \tag{1}$$

where $p_l \in [0, 1]$ represents the protective intensity of regulation in location l, and δ captures the sensitivity of productivity to regulation. This exponential specification captures the fundamental nature of how regulatory burden affects firm operations in digital asset markets. When regulatory intensity remains low, near $p_l = 0$, firms experience relatively modest productivity effects. These initial impacts might manifest through basic compliance requirements such as maintaining transaction records or implementing standard customer verification procedures.

As regulatory intensity increases, however, the exponential specification generates compounding effects that mirror the observed complexity of regulatory compliance in digital asset markets. The parameter δ captures the sensitivity of productivity to these regulatory requirements, with higher values indicating more severe productivity impairment as regulations accumulate. This specification proves particularly relevant for digital asset firms operating across multiple jurisdictions.

Consider a digital asset firm facing both state-level licensing requirements and federal custody standards. Under minimal regulation, the firm might need basic licensing in a few key jurisdictions. As regulatory intensity increases through, the firm must not only obtain licenses in more jurisdictions but also ensure its custody arrangements satisfy varying local requirements. This modeling approach captures how these requirements interact multiplicatively.

Next, I introduce market-wide benefits of protective regulation:

$$B(p_l) = B_0(1 - e^{-\eta p_l}) \tag{2}$$

where η determines the speed at which regulatory benefits materialize. This specification captures the intuition that initial regulatory frameworks may provide substantial benefits (e.g., market stability, consumer protection), but they are often market-wide and not dependent on firm size or business model.

Next, the model introduces an option value to waiting, driven by two distinct sources of uncertainty: productivity uncertainty (σ_ϕ) and compliance cost uncertainty (σ_c). Firms face a choice between immediate entry and delaying entry to gather information about these uncertainties. This option value arises because waiting allows firms to update their expectations about potential prof-

itability before committing to irreversible investments (F_e). One can think of these irreversible investments as obtaining the necessary money transmitter license and surety bonds in a state where an entrepreneur may want to offer custody or wallet services.

Productivity uncertainty, σ_ϕ, affects the potential upside of entry. For example, a firm may discover that its proprietary technology is more compatible with regulatory requirements than initially expected, leading to higher-than-anticipated operational efficiency. Compliance cost uncertainty, σ_c, by contrast, primarily influences downside risk. Firms may encounter unexpected costs associated with meeting regulatory mandates, such as implementing enhanced reporting systems or adhering to jurisdiction-specific standards.

The distinct effects of these uncertainties create a strategic trade-off. While productivity uncertainty offers firms the potential to capitalize on favorable realizations, compliance cost uncertainty highlights the risk of adverse outcomes. Together, these uncertainties shape the timing of entry, as firms weigh the benefits of learning more about their operational and cost environments against the opportunity cost of delaying market presence.

Consider a digital asset custody provider evaluating entry into a regulated jurisdiction. The firm faces uncertainty about how effectively its custody solution will perform under new regulatory requirements (σ_ϕ) and about the precise compliance measures that will be mandated (σ_c). Delaying entry provides the opportunity to resolve some of this uncertainty, thereby reducing the likelihood of costly surprises or operational misalignment. The model suggests that the value of waiting increases with the level of both types of uncertainty, though through distinct channels: σ_ϕ enhances the potential upside from learning, while σ_c mitigates the downside risk of unexpected costs.

Expected firm profits are given by:

$$E[\pi(p_l, s, g, \phi)] = E[\tilde{\phi}]A(p_l)k^\beta + B(p_l) - E[\tilde{C}_l] - gC_g(p_{-l}) - F_e \tag{3}$$

where s represents firm size, g captures global exposure, and k represents capital input.

2.1 Mechanism Discussion

The interaction of the model's parameters generates two distinct mechanisms through which regulation affects firm behavior: (i) size-based selection and (ii) the option value of waiting due to uncertainty. First, the size-based selection mechanism arises from the convex compliance cost structure, $C_l(p_l, s) = c_0 p_l s^\alpha$, where $\alpha > 1$. As firm size (s) increases, the marginal compliance cost of regulatory intensity (p_l) grows disproportionately, making larger firms more sensitive to regulatory changes. This relationship is captured by the cross-partial derivative $\partial^2 C_l / \partial p_l \partial s > 0$, which shows that larger firms face accelerating compliance burdens as regulation intensifies.

In digital asset markets, this mechanism is particularly evident. For example, a small exchange serving a few thousand customers may implement basic KYC systems that scale roughly linearly with customer volume. In contrast, a larger exchange serving millions of customers requires exponentially more sophisticated infrastructure to handle cross-jurisdictional flows and compliance requirements. As a result, larger firms are more likely to exit high-intensity regulatory environments or avoid them entirely, altering the size distribution of firms within these markets.

Second, the presence of both productivity (σ_ϕ) and compliance cost (σ_c) uncertainty generates an option value of waiting for firms to decide whether to enter a market. Productivity uncertainty, σ_ϕ, affects potential upside: firms may discover that their operations are more efficient under regulation than anticipated. Compliance cost uncertainty, σ_c, primarily affects downside risk, as firms may find compliance more expensive than expected. Together, these uncertainties create a strategic trade-off, where firms weigh the benefits of learning about their operational and cost environments against the opportunity cost of delaying entry.

For example, a digital asset custody provider may face uncertainty about how effectively its technology will adapt to new regulatory requirements (σ_ϕ) and about the specific compliance measures regulators will mandate (σ_c). Delaying entry allows the firm to resolve some of this uncertainty, reducing the risk of costly surprises. The model predicts that the value of waiting increases with both types of uncertainty, though through distinct channels: σ_ϕ enhances potential upside from learning, while σ_c mitigates downside risk.

These mechanisms affect individual firm decisions and shape market structure. Larger and more-established ventures such as those receiving late-stage VC funding are likely to face high uncertainty, and so, may delay entry until regulatory clarity emerges. Consequently, regulatory intensity not only influences entry and exit rates but also alters the size distribution of firms within the market.

2.2 Empirical Predictions for Baseline Model

The model generates three interrelated predictions about firm entry and exit behaviors that distinguish it from simpler regulatory frameworks. These predictions emerge from the interaction between the non-linear productivity specification, convex compliance costs, and firm heterogeneity.

First, the exponential specification of productivity, $A(p_l) = A_0 e^{-\delta p_l}$, combined with convex compliance costs, generates non-linear responses in entry rates to changes in regulatory intensity. Put another way, seed, early-stage, late-stage, and non-VC-backed ventures should respond differently to regulatory announcements. As p_l increases, the compounding effect of productivity losses and rising compliance costs creates accelerating declines in entry rates. Thus, a key prediction is that one should observe fewer high-potential startups entering, viz., seed-stage ventures. At the same time, these exact mechanisms are likely to influence the timing of entry and exit by later stage ventures. This prediction differs from models with linear regulatory costs, which would suggest proportional changes in entry rates across all levels of regulatory intensity.

Second, the model predicts that increased regulatory intensity shifts the size distribution of entrants toward smaller firms. This occurs because compliance costs grow faster than linearly with firm size through the term s^α in the cost function. When regulatory intensity increases, larger potential entrants face disproportionate increases in compliance costs relative to their productivity advantages. For example, when a jurisdiction introduces enhanced customer due diligence requirements, large digital asset firms must implement complex, multi-jurisdictional compliance systems, while smaller firms can often manage with simpler, localized solutions.

Third, the same mechanisms that affects entry patterns generate predictions about exit behav-

ior. Following increases in regulatory intensity, exit rates should be higher for larger firms due to the convex scaling of compliance costs. This prediction is particularly stark in the digital asset context, where larger firms often face complex compliance requirements across multiple product lines and jurisdictions. Thus, a key prediction of the model is that when regulatory requirements increase, one should see larger firms either exiting completely or shifting operations to more accommodating jurisdictions.

2.2.1 Endogeneity of Regulatory Intensity

While the model treats regulatory intensity (p_l) as exogenous, real-world regulatory decisions are often shaped by endogenous factors such as industry lobbying, public pressure, or cross-jurisdictional spillovers. For example, jurisdictions with a high concentration of digital asset firms may face stronger lobbying for enabling regulation, while those with recent cases of fraud or market instability may opt for more protective regimes. This endogeneity could influence both the timing and level of regulatory intensity, potentially creating reverse causality between firm entry patterns and regulation.

Accounting for endogeneity is important and is a prime focus of the empirical tests that follow. If more accommodating jurisdictions attract larger firms, the observed relationship between firm size and regulatory intensity might reflect selection. Similarly, if there is some latent, unobservable variable like better investment opportunities in states with rather than causal impacts. Similarly, jurisdictions that increase regulatory intensity following market instability may observe a simultaneous decline in entry rates, complicating the identification of the direct effects of regulation.

In the empirical section, I address these concerns by leveraging a series of quasi-natural experiments that led to abrupt regulatory changes. In the experimental tests, I also seek to test the empirical predictions using firm-level data around changes in regulatory intensity. Entry rates, size distributions, and exit patterns can be measured using metrics such as VC funding, employee counts, or revenue. The combination of these three predictions helps distinguish the model from alternatives where regulatory costs scale linearly or affect all firms uniformly. The model implies that regulatory intensity not only affects the level of market activity but fundamentally shapes the

size distribution and structure of the industry.

2.2.2 Comparison with Simpler Regulatory Models

The empirical predictions from this model contrast sharply with those derived from simpler regulatory frameworks, such as those assuming linear compliance costs or homogeneous firm responses.

In models with linear compliance costs, regulatory intensity leads to proportional changes in firm behavior, implying uniform entry and exit responses across the firm size distribution. In contrast, this model's convex cost structure ($C_l(p_l, s) \propto s^{\alpha}, \alpha > 1$) predicts disproportionately higher compliance burdens for larger firms, leading to skewed entry and exit patterns. Similarly, models assuming homogeneous firm responses overlook the differential impact of regulatory uncertainty on firms of varying size and global exposure. By incorporating productivity (σ_ϕ) and cost (σ_c) uncertainty, this model highlights the strategic trade-offs firms face in timing entry and assessing operational viability.

These distinctions are particularly relevant for understanding the the implications of protective vs. enabling regulation. Whereas simpler models predict uniform adjustments in market activity, this model suggests that regulatory intensity fundamentally reshapes the size distribution of firms and their organizational strategies across jurisdictions.

2.2.3 Model Extension to Regulatory Competition

In this section, I extend the theoretical model to analyze the strategic interaction between jurisdictions in setting regulatory intensity for industries characterized by mobile capital and significant compliance costs, such as digital assets. The model explicitly incorporates the trade-offs faced by jurisdictions, which balance the benefits of local regulatory policies against the costs of regulatory arbitrage and the incentives to attract market share. These trade-offs are formalized through the local jurisdiction l's payoff function:

$$V_l(p_l, p_{-l}) = U_R(p_l) - \lambda \sum_{j \neq l} h(|p_l - p_j|) + \theta M(p_l, p_{-l}) \tag{4}$$

where $U_R(p_l)$ captures the local welfare derived from regulatory intensity p_l, $h(|p_l - p_j|)$ represents the costs of regulatory arbitrage driven by inter-jurisdictional differences, and $M(p_l, p_{-l})$ represents investment inflows or market share in the industry. The parameters λ and θ determine the relative weights of arbitrage costs and market share concerns, respectively.

Jurisdictions choose their regulatory intensity p_l to maximize their payoff, taking the regulatory intensities of other jurisdictions (p_{-l}) as given.This leads to the best response function for jurisdiction l:

$$BR_l(p_{-l}) = \arg\max p_l V_l(p_l, p_{-l}) \tag{5}$$

The first-order condition for the maximization problem is:

$$\frac{\partial U_R}{\partial p_l} - \lambda \sum_{j \neq l} h'(|p_l - p_j|)\text{sign}(p_l - p_j) + \theta \frac{\partial M}{\partial p_l} = 0 \tag{6}$$

This equation highlights the key forces shaping regulatory decisions. The first term reflects the marginal benefit of regulation to local welfare, while the second and third terms capture the opposing effects of arbitrage costs and market share incentives. The interaction of best response functions across jurisdictions determines the regulatory equilibrium. Two types of equilibria emerge depending on the relative magnitudes of λ and θ:

- **Convergent Equilibrium:** When arbitrage costs (λ) are low and market share concerns (θ) dominate, jurisdictions set similar regulatory intensities ($p_l^* = p^*$ for all l).
- **Polarized Equilibrium:** At higher levels of λ, jurisdictions prioritize local welfare over market share, leading to divergent regulatory regimes (p_H for some jurisdictions and p_L for others). The extent of divergence depends on the trade-off between arbitrage costs and market share incentives.

The model also defines a polarization threshold, λ^*, which marks the boundary between con-

vergent and polarized equilibria:

$$\lambda^* = \sup\{\lambda : \text{polarized equilibrium exists}\}.$$

For $\lambda < \lambda^*$, jurisdictions cluster into distinct regulatory regimes; for $\lambda > \lambda^*$, regulatory convergence dominates.

2.2.4 Empirical Predictions for Model Extension

The extension offers testable predictions regarding regulatory intensity and its variation across jurisdictions. The first prediction concerns which type of equilibrium will emerge. The model predicts that jurisdictions will converge to a common regulatory intensity when arbitrage costs are low (λ) and market share concerns are strong (θ). Conversely, when arbitrage costs dominate, jurisdictions will adopt divergent regulatory intensities, resulting in clusters of high (p_H) and low (p_L) regulation. As such, a clear empirical prediction is that regulatory convergence should be more likely in industries with low arbitrage costs, such as services with minimal compliance frictions, while regulatory polarization is expected in high-arbitrage industries, such as digital assets.

The second empirical prediction relates to the effect of arbitrage costs on regulatory distance. In particular, the divergence between high and low regulatory jurisdictions ($|p_H - p_L|$) is inversely related to arbitrage costs (λ):

$$|p_H - p_L| = f(\lambda, \theta), \text{ decreasing in } \lambda.$$

As arbitrage costs increase, the penalty for regulatory divergence grows, incentivizing jurisdictions to converge. This leads to the empirical prediction that cross-jurisdictional variation in regulatory intensity should be smaller in industries with significant compliance or transaction costs. For example, banking regulations with high compliance requirements should exhibit less variability compared to digital marketplaces.

The third empirical prediction relates to regulatory clustering. As I observed above, market

share incentives (θ) influence the formation of regulatory clusters. Larger and more globally integrated jurisdictions are predicted to favor enabling regulation (p_L) to attract firms. This clustering effect becomes more pronounced when θ dominates arbitrage costs ($\lambda < \lambda^*$). The key empirical prediction is that jurisdictions with larger market sizes or higher global exposure should exhibit a stronger tendency toward regulatory clustering. While this study focuses on the United States, there is certainly variation in the presence of financial services in states prior to crypto and in their integration with an international diaspora.

The final empirical prediction relates to the polarization threshold, λ^*, which determines whether jurisdictions exhibit convergence or polarization. Reductions in arbitrage costs, driven by technological advancements or regulatory harmonization, shift the equilibrium regime toward convergence. This suggests in the time-series data, one should see decreasing regulatory divergence in response to declining arbitrage costs over time. For instance, the introduction of global compliance standards will reduce regulatory polarization in digital asset markets. Thus, this theoretical extension provides a structured approach to understanding regulatory competition across jurisdictions, and it offers several empirical predictions. In the next section, I introduce the data that we will use to test the baseline insights.

3 Data and Empirical Methodology

3.1 Data Sources

This subsection describes the data sources and sample construction. I combine multiple specialized databases covering different aspects of digital asset markets with hand-collected regulatory information to create a comprehensive dataset spanning 2010-2024. The final sample includes detailed information about firm characteristics, employment, token metrics, trading activity, and regulatory events.

3.1.1 Regulatory Event Data

I hand-collect regulatory event data from each of the 50 states about protective licensing regimes for business entities engaging in cryptocurrency transactions. I track bill introduction, enactment, and effective dates as well as any vetoes, guidance, or postponements. Finally, in reviewing each of the legislative proposals, I also identify the date at which it is reasonable to assume that a license would be needed based on guidance or no action letters regarding prior money transmitter laws or enactment of new legislation specific to virtual currencies. State-by-state details are available in Appendix A. Figure 1 illustrates the annual counts of bills introduced, enacted, and guidance provided across U.S. states related to money transmitter licenses or BitLicneses for business entities engaged in virtual currency transactions. Th bars represent the three categories. Bills introduced are in navy, bills enacted are in gold, and guidance provided is in maroon. The data covers 2013 through 2024. As is illustrated in the figure, introductions and enactments have continued to trend up even through 2024, whereas guidance has had two peaks, one around 2014 (coinciding with the Mt. Gox exploits) and another around 2020 (coinciding with the DeFi summer).

3.1.2 NYDFS Press Release Data

I hand-collect data on BitLicense applications, approvals, and denials from the NYDFS press releases and public notices. I record application submission dates, approval or denial dates, and any subsequent modifications or surrenders of licenses for each potential licensee. Figure 2 illustrates the annual counts of Bitlicneses issued, voluntarily surrendered, rejected, and/or another event (e.g., a Stablecoin approval). The data cover 2015 through 2024. In the first year of the licensing program, only 3 BitLicenses were granted. Over time, more licenses were granted, but never more than a few per year. In total, 23 BitLicenses were granted during the sample period, four were voluntarily surrendered, one application was rejected, and 13 other actions were taken. The other actions have been concentrated in more recent years.

3.1.3 News Coverage Data

I obtain news coverage data from Messari's news database, which serves as a news aggregator from major crypto media outlets (e.g., Coinbase, Defiant, Decrypt, etc.). I identified all articles with the keyword "BitLicense" or "VCBA" in the text. I then had an RA hand-code the news articles for sentiment (positive, neutral, negative) and content. Then, I used the content information to identify firms mentioned in conjunction with the licenses, which helped form the lists of publicly traded equities and cryptocurrencies likely to be influenced by legislative events. Figure 3 illustrates the crypto news sentiment in articles pertaining to BitLicensing over the years. The bars represent the sentiment. Positive is in navy, neutral is in gold, and negative is in Maroon. The data covers 2014 through 2024.

3.1.4 Market Reaction Data

I obtain crypto price data from Coingecko. I estimate crypto-market abnormal returns using the 3-factor model proposed by Yukun et al. (2022) which includes cryptocurrency market, size, and momentum factors. I obtain public equity price data from CRSP. I estimate abnormal returns in equity markets using the Carhart four-factor model. Appendix B lists the public equities and crypto tickers that are the focal points of the analysis. In each case, I focus on exchanges, platforms, and protocols facilitating virtual currency transactions.

3.1.5 Startup Data

I compile private company funding data from Crunchbase and tag startups from focal industries like cryptocurrency or blockchain. Startups can be tagged as in more than one industry. For all startups, regardless of industry, I collect dates associated with founding, new funding rounds, closures, and exits via IPO, acquisition, or trade sales. I also track several key metrics related to VC funding for the analysis. I measure deal count as the number of financing rounds a startup raises in a period. I then classify the funding round as seed, early-stage VC, or late-stage VC, which is defined explicitly as Series B through J or those designated as "Pre-IPO." Deal amounts

are normalized by taking the logarithm of inflation-adjusted U.S. dollar deal sizes. Overall, I have data for 271,848 unique startups with headquarters in the United States in the sample period, which spans 2009Q1 through 2024Q2.

3.1.6 Industry Classification

Crunchbase includes a field for industries and business descriptions. The industries are listed in alphabetical order rather than by relevance. As an example, Ripple's business description is "a technology company that provides solutions for cross-border payments, crypto liquidity, and central bank digital currency." Ripple's listed industries include blockchain, cryptocurrency, fintech, foreign exchange trading, internet, payments, and web3. For analysis at the industry level, treated industries include blockchain, cryptocurrency, platforms-as-a-service, Ethereum, funding platforms, bitcoin, mobile payments, payments, financial exchanges, foreign exchange trading, transaction processing, virtual currency, and web3. There are 800 unique industries. Appendix Table B.1 provides additional details on the industries with the most startups as well as the commonly selected industries for startups with cryptocurrency in their business description.

3.1.7 Employment Data

I obtain detailed employment data from Revelio Labs, which provides resume-style employment records for individuals with job titles, job descriptions, and location information, allowing me to track workforce dynamics over time. CryptoJobsMarket.com offers complementary data on job postings as some smaller, more decentralized firms may not choose to advertise on the more traditional job boards, which Revelio pulls from like LinkedIn or Indeed. I combine these sources to construct firm-level employment growth measures and track growth in technical and non-technical roles. I further pull out jobs with keywords related to cryptography, compliance, policy, and legal roles.

3.2 Empirical Methodology

3.2.1 Market Reaction

To examine the market reaction to different regulatory events, I employ two complementary empirical approaches. First, I analyze the temporal variation within treated firms using the following specification:

$$AR_{it} = \beta_1 Event_t + \beta_2 ln(MktCap_{it}) + \beta_3 ln(Volume_{it}) + \alpha_i + \gamma_t + \epsilon_{it}$$

where AR_{it} represents the abnormal return for firm i on day t. When the firms are traded on stock exchanges I calculate abnormal returns using a Fama and French 3-factor model plus momentum with a rolling 252 trading day window. I also repeat this exercise for crypto firms. I estimate crypto-market abnormal returns using the 3-factor model proposed by Yukun et al. (2022) which includes cryptocurrency market, size, and momentum factors. $Event_t$ is an indicator variable equal to one on various regulatory event days (e.g., enacting, effective, guidance, etc.), $MCap_{it}$ is market capitalization of either an equity or a token, and $Volume_{it}$ is trading volume. I include year fixed effects (γ_t) and, in our preferred specification, firm fixed effects (α_i). The coefficient β_1 captures the average change in abnormal returns for treated firms on event days relative to their non-event days.

Our second approach exploits cross-sectional variation between treated and untreated firms on event days:

$$AR_{it} = \delta_1 Treat_i + \delta_2 ln(MktCap_{it}) + \delta_3 ln(Volume_{it}) + \theta_t + \eta_{it}$$

where $Treated_i$ is an indicator equal to one for firms subject to the regulation and θ_t represents event fixed effects. The coefficient δ_1 measures the differential abnormal returns between treated and untreated firms on event days. This specification controls for market-wide reactions through event fixed effects while accounting for firm size and liquidity differences.

These approaches provide complementary evidence by exploiting different sources of variation. The within-firm analysis allows us to explore the temporal variation but may miss broader market effects, while the cross-sectional analysis directly compares treated and untreated firms. However, the cross-sectional analysis may be more sensitive to unobserved heterogeneity between firm types.

3.2.2 Entrepreneurial Activity

To analyze the relation between the "Bit"Licensing legislation and entrepreneurial activity, I employ a TWFE difference-in-differences research design that exploits the staggered adoption of various protective legislation events across states. States implemented BitLicensing-like requirements at different times, and this approach enables a comparison of entrepreneurial activity across treated and untreated state-industry pairs while controlling for time-invariant characteristics and common temporal shocks. The baseline specification is:

$$Y_{sit} = \alpha_{si} + \lambda_t + \beta \text{Treatment}sit + \epsilon sit \tag{7}$$

where Y_{sit} represents a measure of entrepreneurial activity based on firm fundraising status (seed, early, late-stage venture) as a proxy for firm size in state s, industry i, and quarter t. The variable Treatmentsit is an indicator that takes the value of one after a state-industry pair experiences a specific legislative event (introduction, enactment, effectiveness, guidance, or licensing requirement). The specification includes state-industry fixed effects (αsi) that absorb any time-invariant heterogeneity at the state-industry level, such as persistent differences in entrepreneurial culture or industry concentration, and time fixed effects (λ_t) that control for aggregate temporal shocks affecting all state-industry pairs. Standard errors are clustered at the state level to account for serial correlation in the error terms and arbitrary correlation across industries within a state. The coefficient of interest, β, captures the average treatment effect of BitLicensing legislation on entrepreneurial activity, measured in standard deviation units. Given the staggered nature of treatment adoption, the TWFE estimator provides a weighted average of all possible two-group/two-period difference-in-differences estimators in the sample period.

A TWFE design is particularly appropriate in our setting because the treatment effect of BitLicensing legislation is likely homogeneous across states and industries, given the standardized nature of these regulations and their uniform implementation within jurisdictions. However, recent econometric literature, beginning with Goodman-Bacon (2021), has highlighted potential pitfalls in TWFE estimation when treatment timing varies, and effects are heterogeneous. This critique

centers on the fact that in staggered adoption settings, already-treated units implicitly serve as controls for later-treated units, which can lead to biased estimates if treatment effects vary over time or across cohorts. Sun and Abraham (2021) further demonstrate that heterogeneous dynamic treatment effects can result in the negative weighting of some treatment effects in TWFE specifications, potentially yielding estimates of the opposite sign to the true effect. Callaway and Sant'Anna (2021) formalize these concerns, showing that under treatment effect heterogeneity, the TWFE estimator produces a weighted average of treatment effects where some weights can be negative. To address these methodological concerns, I complement the main TWFE analysis by implementing a stacked difference-in-differences design, where I create "clean" control groups for each treatment cohort by using only never-treated and not-yet-treated units.

To implement the stacked difference-in-differences estimator, I create cohort-specific samples for each state's licensing implementation. For each specification, I estimate:

$$\mathrm{y}c, ist = \alpha + \beta_1 \mathrm{Licensing}c, st + \lambda_{c,i} + \gamma_{c,t} + \theta_{c,s} + \varepsilon_{c,ist}, \tag{8}$$

where c indexes the cohort, and fixed effects are now cohort-specific. The outcome variable $y_{c,ist}$ represents entry as defined above. Standard errors are clustered at the state-by-cohort level.

3.2.3 Employment

To analyze the relation between the BitLicensing legislation and employment growth, I employ the same TWFE difference-in-differences research design that exploits the staggered adoption of various protective legislation events across states. However, since I'm exploring a different aspect of the entrepreneurial environment, it requires a different level of analysis. I implement the TWFE difference-in-differences estimator using startup-level data as employment decisions are typically specific to the startup. Doing this allows me to include firm fixed effects and analyze within-firm variations in employment.

$$Y_{sitj} = \alpha_{sij} + \lambda_t + \beta \mathrm{Treatment}sitj + \gamma X_{sitj} + \epsilon sitj, \tag{9}$$

where Y_{istj} is the employment in industry i in state s in year t at startup j. X_{sitj} is a vector of control variables including firm age, status as a public or private firm, and an indicator for having recently received a new round of funding. These control variables help account for differences in firm maturity and reputational status. All other variables are defined as above.

In this setting in particular, a key aspect will be to look at what happens between introducing protective legislation, which can create uncertainty about its potentila for enactment, and providing regulatory clarity by enacting protective legislation or providing regulatory guidance consistent with needing a license.

3.2.4 Innovation

Next, we explore the relation between protective legislation and innovation. To test this prediction, we turn to the gendered data from the U.S. PTO and analyze subsamples of data based on firm characteristics. Our primary specification is:

$$Patent_{sitj} = \alpha_{sij} + \lambda_t + \beta \text{Treatment}sitj + \gamma X_{sitj} + \epsilon sitj, \tag{10}$$

3.2.5 Industry Concentration

To analyze the relation between the "Bit"Licensing legislation and industry concentration, I employ the same research design used to study entrepreneurial activity. The baseline specification is:

$$Y_{sit} = \alpha_{si} + \lambda_t + \beta \text{Treatment}sit + \epsilon sit \tag{11}$$

where Y_{sit} represents a measure of industry concentration, including an HHI measure based on employment share as well as measures associated with firm dynamics (closure, exit via IPO, exit via trade sale) in state s, industry i, and quarter t. The variable Treatmentsit is an indicator that takes the value of one after a state-industry pair experiences a specific legislative event (introduction, enactment, effectiveness, guidance, or licensing requirement). The specification includes state-industry fixed effects (αsi) that absorb any time-invariant heterogeneity at the state-industry

level, such as persistent differences in entrepreneurial culture or industry concentration, and time fixed effects (λ_t) that control for aggregate temporal shocks affecting all state-industry pairs. Standard errors are clustered at the state level to account for serial correlation in the error terms and arbitrary correlation across industries within a state. The coefficient of interest, β, captures the average treatment effect of BitLicensing legislation on entrepreneurial activity, measured in standard deviation units. Given the staggered nature of treatment adoption, the TWFE estimator provides a weighted average of all possible two-group/two-period difference-in-differences estimators in the sample period.

3.2.6 Common Trends Tests

Before discussing the main findings, I first analyze the evidence to see if the assumptions necessary for identification appear to hold. While it is not possible to definitively establish if the assumptions are met, these tests can provide suggestive evidence in support. Specifically, I evaluate the assumption of whether common parallel trends is likely to hold in our setting.

For both the TWFE and stacked difference-in-differences estimations, I assume that the outcomes of startups in treated and untreated industry-state groups would have followed a common parallel trend in the absence of legislative efforts. To evaluate the credibility of this assumption, I compare the pre-trends in the quarterly entrepreneurial outcomes between treated and control groups. I plot the average quarterly differences-in-time estimates, which are generated using the TWFE, and 90% confidence intervals. These results shown in Figure 4 for seed-stage and early-stage startups in relation to the effective date of licensing regimes. The p-values for the pre-period are consistent with no pre-trends based on the event specification.

4 Results

4.1 Market Reaction

Table 1 examines the relationship between how abnormal equity returns and cryptocurrency licensing regulation events. The analysis explores both within-equity variation (Panel A) and cross-sectional variation (Panel B), with abnormal returns calculated using the cryptocurrency 3-factor model proposed by (Yukun et al., 2022). Panel A reveals negative market movements associated with various regulatory events. The introduction of protective licensing legislation is linked to a decline in abnormal returns of 0.085 to 0.093 standard deviations, and is statistically significant at the 5% level. This negative association grows to 0.158 standard deviations when the legislation becomes effective (column 4, significant at the 5% level). The timing suggests markets may respond more strongly to actual implementation than initial proposals or that the market may initially underestimate regulatory impacts.

Examining abnormal equity market returns in response to any protective legislation (Table 1, Panel A, column 5), I find an average decline in abnormal returns of 0.090 standard deviations, significant at the 1% level. This economic magnitude of this relationship is meaningful given typical daily return variations, indicating that market participants perceive protective legislation as detrimental to firm performance. In contrast, enabling legislation (column 6) shows no abnormal market reaction, supporting the hypothesis that markets respond differently to various regulatory approaches and that the specific approach to cryptocurrency regulation materially affects firm valuations.

Panel B analyzes cross-sectional variation between treated and untreated firms. Firms subject to licensing requirements experience abnormal returns that are 0.102 standard deviations lower than unaffected firms when guidance is issued (column 1, significant at the 95th percentile) and 0.153 standard deviations lower when legislation becomes effective (column 4, significant at the 5% level). These cross-sectional patterns align with the within-equity estimates from Panel A. The small adjusted R-squared values are typical for daily return regressions. The inclusion of firm and

year fixed effects in Panel A, alongside controls for market capitalization and trading volume, helps address potential confounding variables.

Table 2 illustrates how abnormal crypto returns are associated with the licensing regulation events. As with the public equity markets table, the analysis explores both within-crypto variation (Panel A) and cross-sectional variation (Panel B). In this case, abnormal returns are derived from the common factors cryptocurrency model proposed by Yukun et al. (2022).

The results in Panel A reveal modest but consistently negative reactions to protective regulatory events. Specifically, when examining within-crypto variation, I see negative abnormal returns ranging from -0.001 to -0.003 standard deviations across different regulatory stages (guidance, introduction, enactment, and effectiveness). While these effects appear economically small, they become statistically significant at the 1% level when aggregating across all protective regulatory events (-0.003 standard deviations). Notably, enabling regulation generates a larger negative response (-0.007 standard deviations), though this is only marginally significant at the 10% level.

The cross-sectional analysis in Panel B provides a more nuanced picture. While treated cryptocurrencies show slightly negative reactions to initial guidance (-0.018 standard deviations), they exhibit small positive responses to both introduction (0.025 standard deviations) and effectiveness (0.013 standard deviations) of protective regulation. However, none of these cross-sectional differences are statistically significant at conventional levels. The relatively low R-squared values (ranging from 0.010 to 0.017) suggest that regulatory events explain only a small fraction of the variation in crypto returns, consistent with the highly volatile nature of these assets.

These findings suggest that there is a relatively modest market reaction to cryptocurrency regulation, especially when compared to the much larger perceived effects observe in traditional equity markets. This pattern suggests that crypto market participants may have already priced in regulatory oversight or view state-level regulation as less consequential for broader market dynamics. The results also highlight an important asymmetry. Namely, while equity markets demonstrate strong perceived effects of regulatory events, crypto projects appear to be perceived as more resilient to regulatory changes.

Next, Table 3 describes the market reaction to BitLicensing press releases in New York and

other media coverage of BitLicensing. As New York was the first state to implement a protective licensing regime and many see it as a bellwether for the financial industry, focusing on New York specifically can provide useful insights. For instance, if over time the reaction changes, this would suggest that industry participants are becoming more friendly to regulation.

The analysis of NYDFS press releases and subsequent news coverage reveals several notable patterns in abnormal returns that shed light on the broader implications of crypto-specific licensing requirements. In Panel A, I observe asymmetric responses to different types of BitLicense announcements. While license grants are associated with modest negative returns in both equity (-0.112 standard deviations) and crypto markets (-0.013 standard deviations), only the crypto market effect is statistically significant at the 1% level. This suggests that protective regulation through licensing may initially dampen crypto market activity, possibly due to increased compliance costs and operational constraints.

More striking are the market reactions to license rejections and surrenders in the equity market, with positive abnormal returns of 0.907 and 1.270 standard deviations, respectively, both significant at the 1% level. These substantial positive effects in the equity market, coupled with minimal response in crypto markets (coefficients of 0.013 and -0.001), indicate that traditional financial institutions may benefit from regulatory barriers to crypto market entry. This finding aligns with the regulatory capture hypothesis, where incumbent financial firms potentially gain competitive advantages from restrictive cryptocurrency regulation.

Panel B's analysis of news coverage sentiment provides additional nuance. Neutral news coverage is associated with negative equity market returns (-0.189 standard deviations, significant at 1%), while negative coverage correlates with positive returns (0.123 standard deviations, significant at 1%). This counterintuitive pattern suggests that market participants may interpret increased regulatory scrutiny as beneficial for traditional financial institutions, even when the news coverage is negative.

The crypto market's response to news sentiment is more muted, with only positive news showing a marginally significant negative effect (-0.005 standard deviations, significant at 10%). This could indicate that crypto markets have already priced in regulatory risks or that participants view New

York's BitLicense framework as less consequential for broader crypto market dynamics.

These findings have important implications for regulators considering protective versus enabling approaches to cryptocurrency regulation. The strong positive equity market reaction to regulatory barriers, combined with negative crypto market responses to licensing grants, suggests that protective regulation may inadvertently reinforce the competitive advantages of incumbent financial institutions. This raises questions about whether licensing requirements achieve their consumer protection objectives without unduly constraining innovation and competition in the digital asset space. The results are robust across specifications, with consistent patterns in the presence of various fixed effects and controls. The relatively high adjusted R-squared values in the crypto market specifications (ranging from 0.306 to 0.375) compared to equity markets (approximately 0.013) suggest that our model better captures crypto market dynamics, potentially due to the more direct regulatory impact on crypto firms.

4.2 Entrepreneurial Activity

I examine the real effects of "Bit"-Licensing legislation on entrepreneurial activity across different stages of startup financing. The results reveal substantial and economically meaningful impacts that vary by legislative stage and firm maturity.

As is illustrated in Table 4 Panel A, the introduction of protective legislation has an immediate negative influence on entrepreneurial activity. The point estimate indicates a statistically significant decrease of 0.083 standard deviations in overall startup activity, with similarly sized negative effects of 0.082 standard deviations for both seed and early-stage ventures. In contrast, late-stage ventures show a small positive response of 0.026 standard deviations. This finding is consistent with the model's implications. The response to protective regulation is not uniform across firm size, and in fact, in this setting, it appears that established startups benefit more, potentially from reduced competition brought about by less seed-stage entry, following the introduction of protective legislation.

The market reaction pattern from introducing potential legislation reverses, however, once the

protective legislation is enacted, as is illustrated in Panel B. Enactment is associated with a positive effect of 0.042 standard deviations on overall startup activity and is significant at the 99th percentile. The impact is particularly pronounced for seed and early-stage ventures, both showing substantial increases of 0.197 standard deviations and is significant at the 99th percentile. The effect on late-stage ventures, while positive (0.022), is not statistically significant. Consistent with the enactment findings, if I use the actual date the legislation becomes effective, the positive influence of protective legislation persists and slightly strengthens. Overall, the estimate suggests that startup activity increases by 0.028 standard deviations, while seed and early-stage ventures see even larger gains of 0.215 standard deviations and is significant at the 99th percentile. Late-stage ventures also show a significant positive response of 0.046 standard deviations and is significant at the 95th percentile.

The economic significance of these results is substantial. The shift from negative point estimates at introduction to positive estimates at enactment and effectiveness suggests that while regulatory uncertainty may initially deter entrepreneurship, especially for seed-stage ventures, the establishment of clear regulatory frameworks, even if they are protective rather than enabling, ultimately fosters startup activity. This pattern is consistent with theories suggesting that regulatory clarity can reduce uncertainty and create stable conditions for entrepreneurial growth. This pattern is also consistent with the prediction from the model that the option value of waiting for clarity varies by firm type.

In Panel D, I explore whether regulatory guidance is enough or if more is needed. The results for regulatory guidance are mixed, suggesting the clarity is what is necessary. When regulatory guidance is provided, overall startup activity decreases by 0.039 standard deviations and this finding is significant at the 1% level. But seed and early-stage ventures experience small, positive effects of 0.040 standard deviations. Late-stage ventures is not statistically significant and close to zero, suggesting guidance does little for more established startups.

Finally, when I examine a combined variable that isolates the date when a business entity whether through enacted legislation or clarifying guidance would reasonably know that they need to get a money transmitter or BitLicense for cryptocurrency transactions, I find consistent positive effects across all stages. Overall startup activity increases by 0.025 standard deviations, with seed

and early-stage ventures showing larger gains of 0.044 standard deviations. Late-stage ventures see similar positive effects of 0.033 standard deviations and this finding is significant at the 1% level. This is consistent with the prior finding that enacting legislation is important as is bringing clarity.

For the main analysis, I focus on the full sample of U.S.-based startups, but this may ignore important heterogeneity across states regarding the availability of VC funding, talent, etc... and thereby, their response to protective regulation. As such, to focus on states with more entrepreneurial activity, I limit the sample to California, Massachusetts, New York, Texas, Florida, and Washington, which are the states where most entrepreneurial startups are headquartered. These results are shown in Appendix Table B.2. They are consistent with the primary interpretation and if anything, show stronger evidence across the board of regulation influencing entrepreneurial activity.

4.3 Employment

Table 7 illustrates the relationship between BitLicensing legislation and employment outcomes measured in standard deviations. The focus of this table is on regulatory uncertainty vs. clarity. In particular, when protective legislation is introduced, it often creates immense regulatory uncertainty, leading to option value of waiting to enter a market. Consistent with this notion, in Panel A, overall employment declines and is statistically significant at the 99th percentile. This specification uses firm, state-by-industry, and year-fixed effects. The observation level is employment for a given company in a particular state. Consistent with waiting, the overall decline in employment is concentrated among engineers. The economic magnitude for engineers is twice as large as the overall estimate and is statistically significant at the 99th percentile. In fact, we see an increase in finance roles that is statistically significant, and no change in compliance roles. One fear a regulator may have when implementing a protective licensing regime is that firms would react in a strategic way that undermines the regulation (e.g., hiring a cryptography to hide a transaction rather than a compliance person to ensure cryptocurrency is not used for illicit activities). The evidence in Panel A is not consistent with that worry. It does not appear that startups are not trying to innovate

around potential regulation. However, the employment data is consistent with the theoretical model that firms may use their optional value and delay entry or expansion of innovative capabilities as they await regulatory clarity.

Turning to Panel B, it becomes clear that when regulatory clarity emerges, firms hire professionals to comply with the regulation. In particular, when licenses become required, employment increases in engineering, compliance, and finance roles. The results are significant at the 99th percentile. The hiring in finance is about double that of the hiring in compliance and engineering. Such activities would be consistent with growth and need for professionals to position the firm for growth opportunities. Interestingly, overall employment declines and is statistically significant. When looking at the job titles associated with the decline it appears to be in strategy and marketing roles. This would be consistent with the firm first needing to implement its compliance feature before it can advertise and offer compliant services. In each case, while the point estimate is small, the magnitude of these coefficients indicates economically meaningful shifts in employment, particularly for specialized compliance positions. These findings help document how protective licensing requirements lead to changes in the employment composition in innovative emerging tech industries. But contrary to anecdotes, they do not kill engineering and innovation roles, rather they appear to re-focus roles on compliant features. Finally, I examine employment outcomes in relation to firm fundraising status. Here again, I see meaningful variation by firm status. Seed and early-stage ventures do hire, but mostly in compliance roles. Later-stage ventures do not hire. But mature, existent firms such as those that are already public do the most hiring.

4.4 Innovation

?? examines how protective licensing regulation affects innovation outcomes across firms of different sizes and development stages. The analysis employs difference-in-differences specifications that account for variation across states and time. In Panel A, I find that protective legislation has small, positive, but statistically insignificant effects on patent applications for seed and early-stage firms. The introduction of protective licensing requirements is associated with a 0.031 increase

in contemporaneous patent applications (column 1) and a 0.068 increase in applications in the following year (column 2), though neither estimate is statistically significant at conventional levels.

For established firms (Panel B), the effects are larger and statistically significant. The introduction of protective regulation corresponds to a 0.092 increase in contemporaneous patent applications (significant at the 5% level) and a 0.084 increase in applications in the following year (significant at the 1% level). Panels C and D provide additional clarity by focusing specifically on licensing requirements rather than general protective legislation. For seed and early-stage firms (Panel C), explicit licensing requirements are associated with a 0.053 increase in contemporaneous patent applications and a 0.024 increase in the following year (both significant at the 5% level). For established firms (Panel D), the effects are more pronounced: a 0.100 increase in contemporaneous applications and a 0.095 increase in applications the following year (significant at the 1% level for both).

These results reveal a clear pattern: protective licensing regulation stimulates innovation more strongly among established firms than among seed and early-stage ventures. This finding is consistent with the theoretical framework's prediction that larger firms possess greater capacity to absorb and respond to regulatory requirements. All specifications include state $\times$ industry fixed effects and time fixed effects to control for unobserved heterogeneity across regions, sectors, and time periods. Importantly, the results related to employment and innovation both establish positive benefits of protective regulation.

Nevertheless, a key predictin from the model that remains to be tested and is consistent with these two tables so far, is that firms will respond differently to regulation based on their size. In such a case, this may lead to unexpected concentration of activity. Hence, these findings point to a more nuanced industry dynamic, which is explored next.

4.5 IndustryConcentration

Table 8 presents coefficient estimates from analyzing the relation between protective licensing regulatory announcements and industry concentration. The analysis is at the industry-state-

quarter level. Each panel in the table illustrates a different regulatory action. Consistent with the predictions in the model, the differential impact of regulation by firm size leads to increased concentration. Interestingly, the firm dynamics contributing to the change in industrial concentration appear stronger in response to regulator uncertainty (Panel A: Legislation Introduced) than to regulatory clarity (Panel E: License Needed). In fact, we observe fewer closures relative to existing firms when legislation is introduced, which is consistent with using the option value to decide to enter, but also with more startups successfully exiting the venture stage via an IPO or trade sale.

4.6 Clustering of Regulatory Regimes

An empirical prediction from the model extension to regulatory competition relates to regulatory clustering. The model demonstrates how market share incentives influence the formation of regulatory clusters. More globally integrated jurisdictions are predicted to favor enabling regulation to attract firms. Thus, jurisdictions with higher global exposure should exhibit a stronger tendency toward enabling regulation. In contrast, jurisdictions with large incumbent market shares (i.e., traditional financial services) will cluster on protective regulation. To explore potential clustering, I correlate decisions to enact protective reglation vs. enabling regulation with state characteristics. My proxies for global exposure is the percentage of the state population that is non-white according to the Census annual ACS files and the share of public firms that have SIC codes associated with financial services (6000-6700).

Table 9 presents these correlation estimates. To match the Census and financial services data, the sample period spans 13 years (2010-2023). For clustering purposes, 13 observations per cluster is low, so clustering may not accurately capture state-level trends and enable reliable statistical inferences. Therefore, I present results both with and without state-level clustering. I also present results both with and without fixed effects (i.e., the raw correlation). While the point estimates are not always statistically significant (only 6 out of 12 are), the estimated signs are consistent with theroy. Globally integrated states cluster on enabling legislation, while states with high exposure to the financial industry cluster on protective legislation.

4.7 Robustness Checks

To assess the robustness of the main findings, I perform a placebo test that randomly varies the treatment date and/or randomly varies the treatment states. In each case, the statistical inferences are negligible and close to zero. This is consistent with the licensing regime driving the entrepreneurial and employment outcomes rather than some other unobservable policy that varies systematically over time and geography in the same states that adopted protective licensing regimes.

5 Conclusion

This study provides new evidence on how protective versus enabling regulatory approaches influence markets, entrepreneurial activity, and the concentration of economic activity in the cryptocurrency industry. The findings reveal new empirical insights into the relationship between regulatory design and startup growth that challenge conventional wisdom. Most notably, while market participants react negatively to protective regulation, suggesting potential constraints on high-growth entrepreneurship and innovation, the actual changes to entrepreneurial activity and employment are more positive, consistent with cheap talk from crypto executives.

The market reaction findings indicate that equity investors perceive protective regulation as creating competitive advantages for more traditional, centralized exchanges. This is evident in the asymmetric responses to regulatory events – license rejections and surrenders generate positive abnormal returns for public firms engaging in crypto transactions but they have minimal impact on the cryptocurrencies associated with crypto startups engaged in similar transactions. The pattern suggests market participants believe protective frameworks like BitLicenses may inadvertently reinforce existing market power rather than fostering competition and innovation.

However, examination of real economic outcomes tells a different story. Exploiting the staggered implementation of crypto licensing regimes across states to help mitigate endogeneity concerns, I find that the enactment of protective licensing requirements increases entrepreneurial activity in

the cryptocurrency space relative to control industries in the same state and year. Furthermore, these are high-quality startups as the results are strongest for those receiving VC funding rather than not. This finding of differential influence of protective legislation based on startup growth potential is consistent with the theoretical model put forward. It predicts that uncertainty about productivity and compliance costs will generate an option value to entry that primarily benefits larger, slower growth firms. This mechanism not only influences individual firm decisions, but also leads to changes in firm exit and entry dynamics that influence the industry structure. Consistent with this mechanism, the data reveals a statistical significant but modest increase in industry concentration in response to protective regulatory approaches.

To better understand the overall benefits given the increase in market concentration, employment and innovation patterns are also explored. I find that employment grows, increasing significantly in specialized areas like compliance and engineering roles, suggesting that regulatory clarity enables firms to make long-term investments in both regulatory technology and core innovation. It also suggests that these high-quality startups are playing by the books rather than going around them. Finally, I see this investment in engineering talent leads to small, positive gain in patent applications. Taken together this suggests, protective regulatory frameworks are not stifling innovation, rather they appear to provide the stability needed for sustainable growth while addressing legitimate regulatory concerns like consumer protection.

These results highlight how market perceptions of regulatory costs can diverge from actual economic impacts. The evidence suggests that protective regulation, when well-designed, can foster growth and has relatively small unintended consequences. This has important implications for ongoing policy debates about protective vs. enabling regulatory approaches for emerging financial technologies, especially, in light of some of the negative unintended consequences of enabling approaches like sandboxes that have emerged (Allen, 2019).

This paper joins a growing literature highlighting the importance financial innovation and its distinctive features, namely, that the financial system is the foundation of all other industries and so changes in trajectory brought about by regulatory changes have meaningful spillovers. Given the nuance, this leaves open many research questions open. For example, one could build on this

work and explore how protective versus enabling frameworks influence the consumer side of the business, such as regulation's role in shaping technology adoption and financial inclusion. Alternately, one could analyze international and cross-border effects and regulatory arbitrage behavior across jurisdictions and its influence on the competitiveness of sovereign entrepreneurial activity. Finally, studying how different regulatory designs interact with financial and digital literacy could help to further inform the best way to balance innovation with consumer protection and capital formation in the cryptocurrency space.

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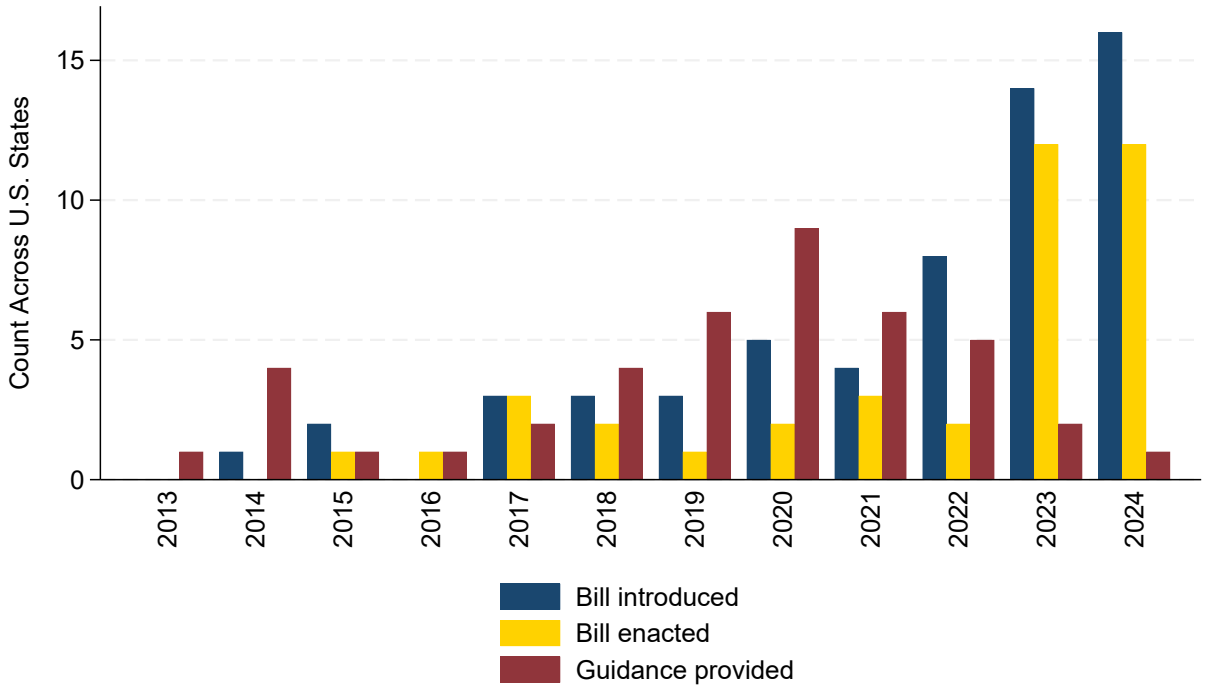
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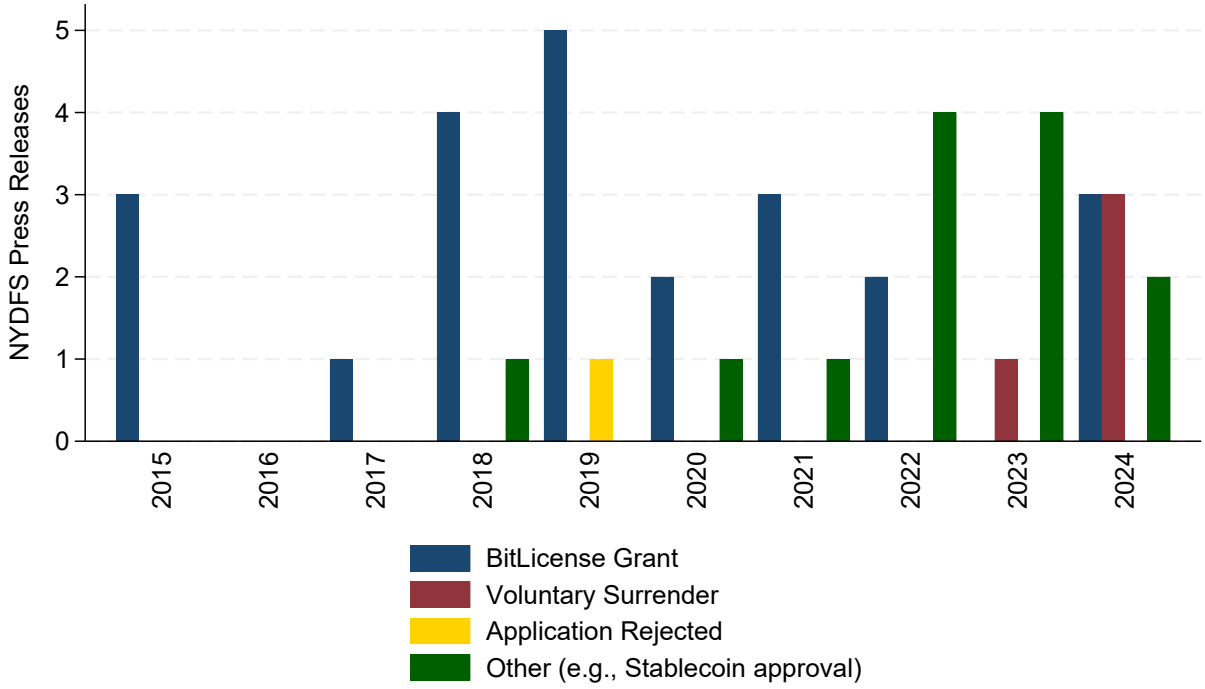
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Figure 1. Trends in the Introduction, Enactment, and Guidance on BitLicensing Legislation Across U.S. States



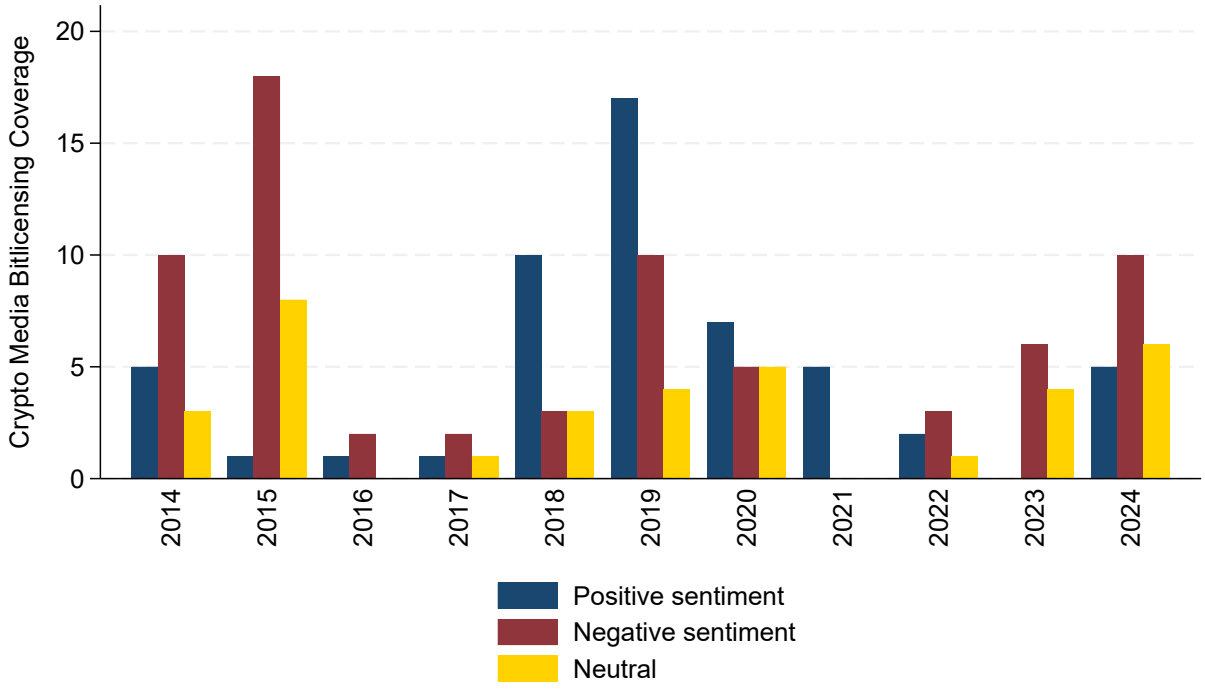
Notes. This figure illustrates the annual counts of bills introduced, enacted, and guidance provided across U.S. states related to money transmitter licenses or bit licenses for entities engaged in virtual currency transactions. The bars represent three categories: bills introduced (blue), bills enacted (gold), and guidance provided (maroon). The data covers 2013 through 2024. For additional details, state by state, please see Appendix A.

Figure 2. BitLicensing Press Releases Over Time



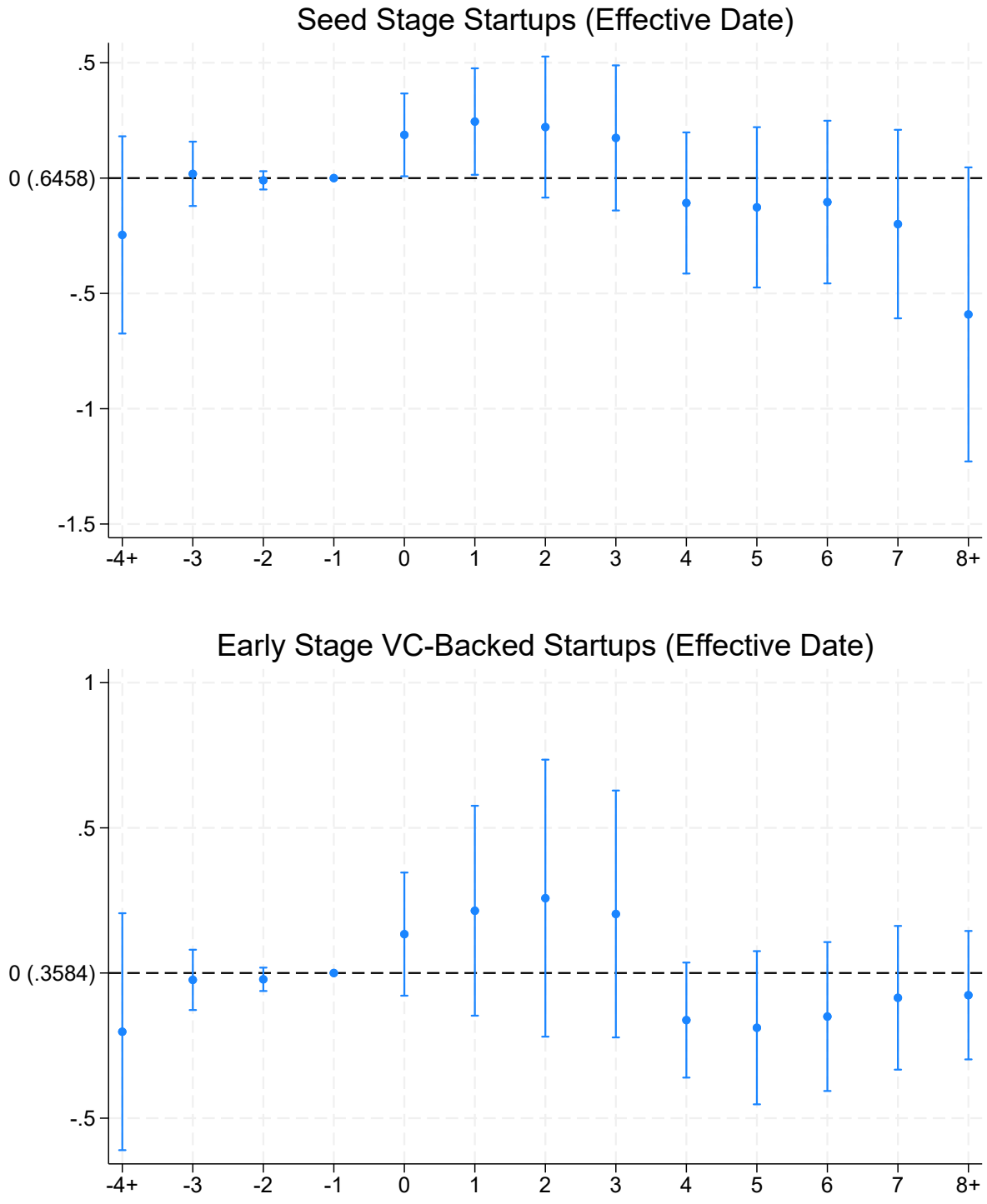
Notes. This figure illustrates the annual counts of Bitlicenses issued, BitLicenses voluntarily surrendered, license applications rejected, and other press releases (e.g., guidance) provided by the New York Department of Financial Services (NYDFS). The bars represent four categories: granted (blue), rejected (gold), surrendered (maroon), and other (green). The data covers 2015 through 2024.

Figure 3. Crypto News Coverage of BitLicensing Press Releases



Notes. This figure illustrates the crypto news sentiment in articles pertaining to Bitlicensing over the years. The bars represent the sentiment: positive (blue), neutral (gold), and negative (maroon). The data covers 2013 through 2024. For additional details, state by state, please see Appendix A.

Figure 4. Test of Common Pre-Trends in Entrepreneurial Activity



Notes. These figures plot the estimates from our parallel trends test for seed-stage and early-stage, VC-backed startups associated with the effective date of Bitlicensing legislation. The point estimates capture the differences in entrepreneurial activity across state-industry pairs after the effective date of licensing regimes. Figures include plots of 90% confidence intervals around each estimate, which are generated using the two-way fixed effect (TWFE) estimator.

Table 1. Equity Market Reaction to "Bit"-Licensing Legislation

			Protective			Enabling
	Guidance	Introduced	Enacted	Effective	Any	Any
Panel A. Within-equity variation	(1)	(2)	(3)	(4)	(5)	(6)
Event	-0.093**	-0.085**	-0.048	-0.158**	-0.090***	-0.053
	(0.047)	(0.040)	(0.055)	(0.080)	(0.033)	(0.093)
Equity FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Observations	36,763	36,763	36,763	36,763	36,763	36,763
Adjusted R^2	0.013	0.013	0.012	0.013	0.013	0.012
Panel B. Cross-sectional variation						
Treated	-0.102**	0.084*	-0.015	-0.153**	-0.078***	-0.013
	(0.041)	(0.043)	(0.051)	(0.074)	(0.029)	(0.107)
Event FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Observations	210,671	246,649	133,992	65,945	393,595	48,032
Adjusted R^2	0.007	0.004	0.004	0.007	0.006	0.011

Notes. This table presents the estimates of the relationship between abnormal equity market returns and "Bit"-licensing legislation milestones across U.S. states. The data covers 2013 through 2024. Panel A focuses on within-equity variation, and Panel B focuses on cross-sectional variation. The dependent variable is abnormal returns on the event days. Abnormal returns are calculated using a Fama and French 3-factor model with momentum and a rolling 252 trading day window for the estimation period. $Event_t$ is an indicator variable equal to one for the various regulatory events. The type of regulatory event changes across columns, focusing on protective legislation in Columns 1 through 5, and enabling legislation in Column 6. Control variables include market capitalization and trading volume. In Panel B, $Treated_i$ is an indicator equal to one for firms requiring licensing based on the regulation and their business model. The observations are limited to the regulatory event dates. Standard errors are reported in parentheses. Statistical significance of 10%, 5%, and 1% is denoted by *, **, and ***, respectively. For additional details on the state legislative changes, please see Appendix A.

Table 2. Cryptocurrency Market Reaction to "Bit"-Licensing Legislation

			Protective			Enabling
	Guidance	Introduced	Enacted	Effective	Any	Any
Panel A. Within-crypto variation	(1)	(2)	(3)	(4)	(5)	(6)
Event	-0.003	-0.002	-0.001	-0.002	-0.003**	-0.007*
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.004)
Crypto FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Observations	37407	37407	37407	37407	37407	37407
Adjusted R^2	0.181	0.181	0.181	0.181	0.181	0.181
Panel B. Cross-sectional variation						
Treated	-0.018	0.025	0.005	0.013	0.002	-0.011
	(0.044)	(0.032)	(0.046)	(0.058)	(0.029)	(0.091)
Event FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Observations	42,912	95,903	43,096	27,717	110,938	12,338
Adjusted R^2	0.017	0.010	0.010	0.010	0.013	0.012

Notes. This table presents the estimates of the relationship between abnormal crypto market returns and "Bit"-licensing legislation events across U.S. states. The data covers 2013 through 2024. Panel A focuses on within-crypto variation, and Panel B focuses on cross-sectional variation. The dependent variable is abnormal returns on the event days. Abnormal returns are calculated using the crypto factor model proposed by Li et al. (2022). $Event_t$ is an indicator variable equal to one for the various regulatory events. The type of regulatory event changes across columns, focusing on protective legislation in Columns 1 through 5, enabling legislation in Column 6. Control variables include market capitalization and trading volume. In Panel B, $Treated_i$ is an indicator equal to one for cryptocurrencies requiring licensing based on the regulation and their business model. The observations are limited to the regulatory event dates. Standard errors are reported in parentheses. Statistical significance of 10%, 5%, and 1% is denoted by *, **, and ***, respectively. For additional details on the state legislative changes, please see Appendix A.

Table 3. Market Reaction to New York's BitLicensing Press Releases and News

	Equity Market			Crypto Market		
	Grant	Reject	Surrender	Grant	Reject	Surrender
Panel A. NYDFS press releases	(1)	(2)	(3)	(4)	(5)	(6)
Event	-0.112	0.907***	1.270***	-0.013***	0.013	-0.001
	(0.069))	(0.317)	(0.215)	(0.003)	(0.016)	(0.007)
Equity or Crypto FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Adj. R-Square	0.013	0.013	0.013	0.352	0.306	0.375
Observations	36,763	36,763	36,763	1,676,863	673,039	1,676,863
	Equity Market			Crypto Market		
Panel B. Bitlicensing news coverage	Positive	Neutral	Negative	Positive	Neutral	Negative
Event	-0.004	-0.189***	0.123***	-0.005*	-0.001	-0.001
	(0.055)	(0.058)	(0.044)	(0.003)	(0.003)	(0.002)
Equity or Crypto FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Adj. R-Square 0.012	0.013	0.013	0.181	0.181	0.181	
Observations	36,763	36,763	36,763	37,407	37,407	37,407

Notes. This table presents the estimates of the relationship between abnormal equity and crypto market returns and New York Department of Financial Services (NYDFS) press releases and subsequent news coverage. New York was the first state to introduce BitLicenses and, therefore, serves as a bellwether for the industry. NYDFS issued a press release whenever an entity received a license, an application was rejected, or a license was voluntarily surrendered. Columns 1 through 3 focus on within-equity variation, whereas columns 4 through 6 focus on within-crypto variation. The dependent variable is abnormal returns on the event days. $Event_t$ is an indicator variable for the type of NYDFS press release. Control variables include market capitalization and trading volume. In Panel B, we focus on the sentiment of crypto market news for articles with "Bitlicense" in them. Each article is classified as positive, negative or neutral. The observations are limited to the crypto and equities requiring licensing based on their business model. Standard errors are reported in parentheses. Statistical significance of 10%, 5%, and 1% is denoted by *, **, and ***, respectively.

Table 4. Real Effects of "Bit"-licensing Legislation: Entrepreneurial Activity

	Any	Seed	Early-stage VC	Late-stage VC
Panel A: Introduced	(1)	(2)	(3)	(4)
Introduced	-0.083***	-0.117***	-0.082***	0.026*
	(0.009)	(0.012)	(0.013)	(0.014)
Adjusted R^2	0.746	0.457	0.457	0.371
Panel B: Enacted				
Enacted	0.042***	0.042**	0.197***	0.022
	(0.013)	(0.017)	(0.019)	(0.020)
Adjusted R^2	0.746	0.457	0.457	0.371
Panel C: Effective				
Effective	0.028**	0.033*	0.215***	0.046**
	(0.013)	(0.018)	(0.019)	(0.021)
Adjusted R^2	0.746	0.457	0.457	0.371
Panel D: Guidance				
Guidance	-0.039***	-0.100***	0.040***	-0.016
	(0.009)	(0.011)	(0.012)	(0.013)
Adjusted R^2	0.746	0.457	0.457	0.371
Panel E: License Needed				
License Needed	0.025***	-0.064***	0.044***	0.033***
	(0.008)	(0.011)	(0.012)	(0.013)
Adjusted R^2	0.746	0.549	0.457	0.371
Observations	1,671,768	1,671,768	1,671,768	1,671,768
State × Ind. FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓

Notes. This table presents estimates of how protective licensing regulatory actions for cryptocurrencies (i.e., "Bit"-licenses) influenced entrepreneurial activity based on a difference-in-differences analysis that accounts for variations across states and time. In column 1, the dependent variable is the log of the number of startups. In column 2, the dependent variable is the log of the number of seed-stage startups. In column 3, the dependent variable is a log of the number of early-stage startups, and in column 4, the dependent variable is a log of the number of late-stage startups. The panels vary by the legislative event. Panel A is protective bills introduced. Panel B is protective bills enacted. Panel C is protective bills in effect. Panel D is regulatory guidance, and Panel E is based on the date at which it is reasonable to assume a license is needed, whether through guidance or enacting a protective bill. Observations are at the state-industry-quarter level, and the sample spans 2009Q1 to 2024Q2. Fixed effects and observations for all panels are reported at the end of the table. Standard errors are reported in parentheses and are clustered by state. Statistical significance of 10%, 5%, and 1% is denoted by *, **, and ***, respectively.

Table 5. Protective Legislation and Employment: Regulatory Uncertainty vs. Clarity

	Any	Engineer	Compliance	Finance
Panel A: Regulatory uncertainty	(1)	(2)	(3)	(4)
Introduced	-0.008***	-0.008***	-0.001	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Panel B: Regulatory clarity				
License Needed	-0.004***	0.003***	0.002***	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)
Adjusted R^2	0.103	0.073	0.063	0.149
Observations	35,941,366	35,941,366	35,941,366	35,941,366
Firm FE	✓	✓	✓	✓
State × Ind. FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓

Notes. This table presents estimates of how protective licensing regulatory actions for cryptocurrencies (i.e., "Bit"-licenses) influenced employment based on difference-in-differences analyses that account for variations across states and time. In column 1, the dependent variable is any employee. In column 2, the dependent variable is any compliance employee. In column 3, the dependent variable is any engineering employee, and in column 4, the dependent variable is any finance employee. The analyses use within-firm variation. Panel A focuses on regulatory uncertainty, which is brought about by introducing protective legislation. In contrast, Panel B focuses on regulatory clarity, which is brought about by regulatory guidance or enacted protective legislation. Controls for the within-firm regressions include log(firm age), an indicator for being a public firm, and an indicator for receiving a new round of VC funding in the last 4 quarters. Observations are at the firm-state-industry-quarter level, and the sample spans 2009Q1 to 2024Q2. Fixed effects and observations for all panels are reported at the end of the table. Standard errors are reported in parentheses and are clustered by state. Statistical significance of 10%, 5%, and 1% is denoted by *, **, and ***, respectively.

Table 6. Heterogeneity in Employment Effects by Firm Size

	Any	Engineer	Compliance	Finance
Panel A: Seed and Early-stage	(1)	(2)	(3)	(4)
Introduced	-0.049	-0.026	-0.040**	-0.011
	(0.034)	(0.019)	(0.018)	(0.018)
Adjusted R^2	0.210	0.094	0.025	0.165
Observations	915,244	915,244	915,244	915,244
Panel B: Established Firms				
Introduced	0.186***	0.145***	0.258***	0.503***
	(0.048)	(0.054)	(0.083)	(0.113)
Adjusted R^2	0.506	0.373	0.338	0.441
Observations	1,582,984	1,582,984	1,582,984	1,582,984
Panel C: Seed and Early-stage				
License Needed	0.020	0.017*	-0.010	-0.013
	(0.020)	(0.009)	(0.017)	(0.017)
Adjusted R^2	0.210	0.094	0.025	0.165
Observations	915,244	915,244	915,244	915,244
Panel D: Established Firms				
License Needed	0.192***	0.100**	0.183**	0.412***
	(0.046)	(0.043)	(0.073)	(0.096)
Adjusted R^2	0.506	0.373	0.338	0.441
Observations	1,582,984	1,582,984	1,582,984	1,582,984
State × Ind. FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓

Notes. This table presents estimates of how protective licensing regulatory actions influenced employment conditional on firm size. Consistent with previous tables, the estimates come from difference-in-differences analyses that account for variations across states and time. In column 1, the dependent variable is any employee. In column 2, the dependent variable is any compliance employee. In column 3, the dependent variable is any engineering employee, and in column 4, the dependent variable is any finance employee. Panels A and B focus on regulatory uncertainty, which is brought about by introducing protective legislation. In contrast, Panels C and D focus on regulatory clarity, which is brought about by regulatory guidance or enacted protective legislation. Observations are aggregated to the state-industry-quarter level, and the sample spans 2009Q1 to 2024Q2. Fixed effects and observations for all panels are reported at the end of the table. Standard errors are reported in parentheses and are clustered by state. Statistical significance of 10%, 5%, and 1% is denoted by *, **, and ***, respectively.

Table 7. Protective Legislation and Innovation

	Patent	Patent (t+1)
Panel A: Seed and Early-stage	(1)	(2)
Introduced	0.031	0.068
	(0.043)	(0.045)
Adjusted R^2	0.166	0.115
Observations	915,244	915,244
Panel B: Established Firms		
Introduced	0.092**	0.084**
	(0.044)	(0.047)
Adjusted R^2	0.173	0.221
Observations	1,582,984	1,582,984
Panel C: Seed and Early-stage		
License Needed	0.053**	0.024**
	(0.025)	(0.011)
Adjusted R^2	0.170	0.114
Observations	915,244	915,244
Panel D: Established Firms		
License Needed	0.109***	0.095**
	(0.041)	(0.052)
Adjusted R^2	0.316	0.287
Observations	1,582,984	1,582,984
State × Ind. FE	✓	✓
Time FE	✓	✓

Notes. This table presents estimates of how protective licensing regulatory actions influenced innovation conditional on firm size. Consistent with previous tables, the estimates come from difference-in-differences analyses that account for variations across states and time. In column 1, the dependent variable is log(1 + the number of patent applications) by a firm in a given industry and year. In column 2, the dependent variable is any patent application in the next year given the typical delays in going from innovative idea to patent application. Panels A and B focus on when protective legislation is introduced. In contrast, Panels C and D focus on regulatory clarity, which is brought about by regulatory guidance or enacted protective legislation. Observations are aggregated to the state-industry-quarter level, and the sample spans 2009Q1 to 2024Q2. Fixed effects and observations for all panels are reported at the end of the table. Standard errors are reported in parentheses and are clustered by state. Statistical significance of 10%, 5%, and 1% is denoted by *, **, and ***, respectively.

Table 8. Protective Legislation and Changes in Industrial Organization

	HHI	Closures	IPO	Trade Sale
Panel A: Introduced	(1)	(2)	(3)	(4)
Introduced	0.064**	-0.070**	-0.061***	-0.063*
	(0.030)	(0.028)	(0.014)	(0.036)
Panel B: Enacted				
Enacted	0.023	-0.036	-0.051**	-0.077*
	(0.047)	(0.048)	(0.022)	(0.045)
Panel C: Effective				
Effective	-0.029	-0.024	-0.025	-0.067
	(0.043)	(0.048)	(0.027)	(0.050)
Panel D: Guidance				
Guidance	0.073**	-0.093***	-0.050***	-0.054**
	(0.033)	(0.020)	(0.011)	(0.026)
Panel E: License Needed				
License Needed	0.102***	-0.071	-0.030	0.018
	(0.024)	(0.052)	(0.026)	(0.040)
Adjusted R^2	0.270	0.617	0.079	0.290
Observations	1,820,506	1,538,784	1,538,784	1,538,784
State × Ind. FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓

Notes. This table presents coefficient estimates analyzing the relation between protective licensing regulatory announcements and industry concentration. Consistent with previous tables, the estimates come from difference-in-differences analyses that account for variations across states and time. In column 1, the dependent variable is an HHI measure based on employment share. In column 2, the dependent variable is the ratio of closures to firms that stay open. In column 3, the dependent variable is the count of successful firm exits through an initial public offering (IPO), and in column 4, the dependent variable is the count of successful firm exits via a trade sale. The panels vary by the legislative event. Panel A is protective bills introduced. Panel B is protective bills enacted. Panel C is protective bills in effect. Panel D is regulatory guidance, and Panel E is based on the date at which it is reasonable to assume a license is needed, whether through guidance or enacting a protective bill. Observations are at the state-industry-quarter level, and the sample spans 2009Q1 to 2024Q2. Fixed effects and observations for all panels are reported at the end of the table. Standard errors are reported in parentheses and are clustered by state. Statistical significance of 10%, 5%, and 1% is denoted by *, **, and ***, respectively.

Table 9. Factors Associated with Protective vs. Enabling Cryptocurrency Legislation

Panel A: Enacted	(1)	(2)	(3)
Global integration	-0.048**	-0.048	-0.152
	(0.024)	(0.081)	(0.275)
Financial industry exposure	0.120***	0.120**	0.091*
	(0.019)	(0.056)	(0.051)
Panel B: Enabling			
Global integration	0.043**	0.043	-0.167
	(0.022)	(0.078)	(0.145)
Financial industry exposure	-0.031**	-0.031	0.019
	(0.015)	(0.043)	(0.043)
Adjusted R^2	0.018	0.018	0.843
Observations	683	683	683
State-level clustering		✓	✓
State FE			✓
Time FE			✓

Notes. This table presents correlation coefficients for the two factors that the model extension implies will be associated with the decision to pursue protective vs. enabling legislative activity, viz., global integration and financial exposure. The panels vary by the legislative event. In Panel A, the dependent variable is protective bills enacted. In contrast, in Panel B, the dependent variable is enabling legislation enacted. The main explanatory variables are global integration, which is measured by the percentage of state residents who are not caucasian, and financial industry exposure which is measured by the share of public firms with standard industrial classification (SIC) codes associated with financial services and insurance (6000-6700). Observations are at the state-year level. Standard errors are reported in parentheses. Statistical significance of 10%, 5%, and 1% is denoted by *, **, and ***, respectively.

Internet Appendix

A Legal Analysis

Alabama: Alabama has only introduced legislation related to cryptocurrency taxation and nothing regarding money transmission and/or licensure.

Alaska : Alaska's Division of Banking and Securities added virtual currency to relevant definitions to ensure it is regulated as money transmission in 2022. In 2023, both Alaska's Senate and House introduced legislation involving money transmission licensing requirements for the use of virtual currencies through the NMLS, similar to other states, but the bills have not advanced further.

Arizona: Arizona requires a Money Transmitter License for companies engaged in digital currency activities. Arizona's money transmission law aligns with the Model Money Transmission Modernization Act, introduced by the Conference of State Bank Supervisors in 2021. It is established through House Bill 2731. There are some enabling features such as a regulatory sandbox and exemptions for intrastate offerings, such as crowdfunding or virtual coin offerings, to accommodate evolving digital asset transaction space.

Arkansas: Arkansas amended its Uniform Money Services Act to include virtual currency. Senate Bill 150, signed into law as Act 532, clarifies that businesses dealing with virtual currencies are subject to the same licensing requirements as traditional money transmitters. Furthermore, HB1438 added further amendments to align Arkansas with MTMA.

California: California has pursued the establishment of a regulatory framework for virtual currency businesses over the past decade, with several legislative efforts introduced, stalled or vetoed, and eventually enacted. The first attempt, AB 1326 (2015) stalled; then, AB 2269 (2022) passed but was vetoed by Governor Newsom. Finally, AB 39, referred to as the California Digital Financial Assets Law (DFAL), established a new virtual currency licensing regime and was signed into law in 2023.

Colorado: In early 2018, conflicting bills were introduced relating to how virtual currencies relate to money transmitter laws but neither advanced. In September 2018, the Colorado Division of Banking issued an Interim Regulatory Guidance titled "Cryptocurrency and the Colorado

Money Transmitters Act," which states: "The direct transmission of cryptocurrency between two consumers is not subject to licensure under the Act. With respect to transactions that involve a third party, the complete absence of fiat currency from a transmission from one consumer to another is not a money transmission. Conversely, the presence of fiat currency during a transmission may be subject to licensure under the Act." This implies that businesses facilitating the exchange between cryptocurrency and fiat currency would require a money transmitter license in Colorado. Because of sunset provisions in the money transmitter law, they were reconsidered in 2024 extended until 2030 with no susbtantive changes regarding virtual currencies.

Connecticut: Connecticut has introduced a variety of virtual currency legislative measures, ranging from financial literacy education mandates that included virtual currency to requirements to registrars for virtual currency businesses. Specifically, House Bill 5320 required the registration of virtual currency businesses but did not advance further. In 2024, House Bill 5211 did advance which had provisions that deemed certain persons to be engaged in the business of money transmission and required such persons to be licensed.

Delaware: Delaware has not enacted standalone cryptocurrency laws but applies existing financial and business regulations to crypto-related activities. Under Section 2303, Chapter 23, Title 5 of the Delaware Code, money transmission is broadly defined as receiving or transmitting money as a business activity. Cryptocurrency exchanges are required to comply with these laws, including obtaining a Money Transmitter license, which authorizes virtual currency exchange and trading services. While the courts have not opined, money transmitter registration forms were updated to explicitly include virtual currency exchanging and trading services in 2020.

Florida: In 2021, Florida considered legislation to regulate money services businesses concerning virtual currencies. House Bill 1351 aimed to revise definitions and prohibit certain activities without obtaining a license, specifically addressing money transmitters that receive virtual currency. The bill passed the House but died in the Senate. In August 2021, the Florida Office of Financial Regulation (OFR) issued an industry alert stating amnesty for previous periods but requiring that a person engaged in the business of selling virtual currency in Florida must obtain a license under the state's money transmission law.

Georgia: Georgia's existing money transmission laws apply to virtual currencies. The Georgia Code defines money transmission as: "Receiving money or monetary value for transmission." It further defines virtual currency as: "A digital representation of monetary value." The guidance on virtual currency and the referral to register through NMLS and obtain a money transmitter license have been in place since 2014. House Bill 55, introduced in, included parts of the MTMA but not the virtual currency stuff.

Hawaii: Hawaii adopted an enabling approach to cryptocurrency regulation, conducting the Digital Currency Innovation Lab (DCIL) project from 2020 to 2024 to explore the digital asset landscape and assess regulatory needs. Led by the Department of Commerce and Consumer Affairs (DCCA) and the Hawaii Technology Development Corporation (HTDC), the project evaluated whether Hawaii's money transmitter license was suitable for digital asset activities and whether consumer protection regulations were necessary. Initially planned for two years, the project was extended through 2024. The findings concluded that digital asset firms do not require a money transmitter license and can operate as unregulated businesses in the state.

Idaho: Idaho's Money Transmitters Act requires entities engaged in money transmission to obtain a license from the Idaho Department of Finance. While the Act does not explicitly mention cryptocurrencies or virtual assets, the broad definition of money transmission applies to activities typically conducted by cryptocurrency exchanges, especially when they involve the transfer of fiat currency or its equivalents, as was clarified in an opinion letter. In addition, they have opined through no-action letters that virtual currency kiosks and some business models do not require a license. In 2024, a bill was introduced that would help to align their laws with the Money Transmission Modernization Act, but it stalled.

Illinois : Originally, Illinois issued guidance regarding the application of the state's Transmitters of Money Act (TMA) to those dealing in virtual currencies. According to the Department's guidance, virtual currencies are not "money" under the Transmitters of Money Act. Then, in 2023, Illinois introduced elements of the Virtual Currency Business Act (VCBA) adopted in Rhode Island and Louisiana, but it failed to advance. Finally, in 2024, the TMA was superseded by the Uniform

Money Transmission Modernization Act put forth by the MTMA, which will take effect in 2026. The version of the MTMA does not include the virtual currency component.

Indiana: Prior to 2023, the Indiana Money Transmitter Act defined money transmission as: "Selling or issuing payment instruments primarily for personal, family, or household purposes," eliminating the need for cryptocurrency businesses to register. In 2023, the Money Transmission Modernization Act (SEA 458) was introduced and enacted. Effective January 1, 2024, the new law makes it such that business-purpose money transmission is subject to Indiana's licensing requirements . The statute was previously limited in scope to only consumer-purpose money transmission. Like other states, while the law require licensing for solely cryptocurrency transactions, it does require licensure for any business engaging in cryptocurrency services while also engaging in money transmission involving fiat funds.

Iowa: In 2023, Iowa introduced and enacted House File 675 to modernize money transmission services. The bill makes it such that a digital representation of value is explicitly subject to Iowa's money transmission licensing requirements. Prior to that, Iowa code had not listed digital currency businesses as exceptions to Iowa's Uniform Money Services Act, leading many firms to assume they needed a license. In 2024, House Bill 2622 was introduced to further refine money transmission services, provide penalties, and retroactive applicability provisions

Kansas: Initially, Kansas' existing statutes broadly defined money transmission in a way that some interpreted to include virtual currencies. Guidance was provided in 2021 indicating nuance. Only the exchange of cryptocurrency for sovereign currency through a third-party exchanger was generally considered money transmission. In 2024, legislation was introduced and enacted to amend the Kansas Money Transmission Act (KMTA). The KMTA requires the State Bank Commissioner to oversee the electronic transmission of money. Whether or not a Kansas money transmission license is required for an entity to engage in the transmission of cryptocurrency (either centralized or decentralized) turns on the question of whether cryptocurrency is considered "money" or "monetary value" under the KMTA and the interpretation so far is consistent with the fiat-to-cryptocurrency requiring licensing.

Kentucky: Kentucky provided guidance in 2022 to promote compliance with their Money

Transmitters Act of 2006, indicating existing law applied to certain virtual currency businesses and transactions.

Louisiana: In 2020, Louisiana introduced the Virtual Currency Business Act (VCBA), which establishes a licensing regime for virtual currency businesses operating within the state, aiming to provide consumer protection and regulatory oversight.

Maine: In 2013, Maine provided guidance that an exchanger that accepts and transmits a convertible virtual currency or buys or sell a convertible virtual currency is a money transmitter and shall register for a license. In 2024, Maine introduced and passed SP 905, LD 2112 "An Act to Replace the Money Transmitters Act." This version follows the MTMA and includes the virtual currency component.

Maryland: In 2014, Maryland issued a warning about virtual currencies to consumers and businesses engaged with them. Then, in a 2020 interim report by the Maryland Financial Consumer Protection Commission, it was recommended that the legislature update the State's Money Transmission Act to include virtual currency transmitters. Now, Maryland includes virtual currencies within its regulatory framework for money transmission through SB 219 (Chapter 100). As of October 1, 2021, the definition of "money transmission" was amended to include "receiving... other value that substitutes for currency," where "currency" has the definition of fiat currency. Under Maryland's Money Transmission Act, businesses involved in money transmission, which can encompass virtual currencies, are required to register and be licensed. Additional cleanup of the money transmitter regulations (COMAR 09.03.14) were enacted in 2023 but they did not pertain to virtual currency.

Massachusetts: Prior to 2024, Massachusetts did not have specific legislation about cryptocurrency businesses. An act to establish a special commission on blockchain and cryptocurrency was introduced but no further action was taken. Massachusetts does require entities engaged in the business of receiving deposits or transmitting money to obtain a license. They have provided multiple opinions over the years that are specific to a given fact pattern and context but nonetheless provide insights into licensing requirements, especially 2 in 2020 that appeared to exempt some business models. Finally, in 2024, An Act relative to the regulation of money transmission by the

division of banks was introduced and is awaiting the governor's signature.

Michigan: Michigan's Money Transmitter Act does not explicitly include the concept of virtual currencies and the state has not issued guidance on this. Other virtual currency-related bills were introduced and signed into law from 2015 through 2019, especially relating to taxes and redefining the penal code with regards to money laundering, fraud, and embezzlement. The definitions in the money transmissions laws are broad, implying most virtual currency entities should be licensed. Finally, in 2024, House Bill 5798 was introduced, which aims to amend money transmission laws but is stalled in committee.

Minnesota: Initially, Minnesota did not define money and the term payment instrument was broad enough to encompass virtual currencies. In 2021, Minnesota issued virtual currency guidance clarifying that certain virtual currency transactions involving fiat currency may subject operators to the licensing requirements. In 2023, Minnesota enacted the Money Transmitter Modernization Act (MTMA), codified in Minnesota Statutes Chapter 53B. Minnesota adopted the full MTMA which includes provisions related to virtual currencies. Under the MTMA, individuals or businesses engaged in money transmission, including virtual currency activities, must obtain a license from the Minnesota Department of Commerce. The licensing process occurs through NMLS.

Mississippi: Mississippi Money Transmitters Act (MMTA) broadly defines "money transmission," as engaging in the business of the sale or issuance of checks or of receiving money or monetary value for transmission to a location within or outside the United States by any and all means, including but not limited to wire, facsimile or electronic transfer. However, there is no explicit reference to virtual currencies and no guidance has been issued. In 2024, a bill was introduced (HB 1214) to provide guidance but it failed to advance.

Missouri: Missouri's statutes do not explicitly address virtual currencies and no guidance has been provided. However, prior to 2024, Missouri's "Sale of Checks" law left key definitions open such that it was reasonable to assume virtual currency businesses were included in the licensing requirements. Major cryptocurrency exchanges are all registered in Missouri as money transmitters and Binance also had a Sale of Checks license. In 2022, Missouri introduced legislation that would have adopted Wyoming's enabling approach but it failed to advance. In contrast, in 2024,

Missouri introduced and enacted legislation to modernize money transmission that followed the CSBS framework. Specifically, Missouri repealed the Sale of Checks Law, replacing it with the MTMA. However, Missouri did not adopt the article in the MTMA pertaining to the regulation of virtual currency.

Montana: Money transmitters do not need a license in Montana, according to the Department of Banking and Financial Regulations.

Nebraska: Nebraska regulates money transmission under the Nebraska Money Transmitters Act (Ch 8, Article 28). Initially, the Act defined "money transmission" as the business of selling or issuing payment instruments or stored value, or receiving money or monetary value for transmission to a location within or outside the United States by any means, including wire, facsimile, or electronic transfer. While this Act did not explicitly address virtual currencies, the broad definition of "money transmission" could encompass activities involving virtual currencies. In 2018, Legislative Bill 987 was introduced, proposing to amend the Nebraska Money Transmitters Act to include virtual currency within its scope but it stalled. In 2021, the Nebraska Financial Innovation Act was signed into law. The Financial Innovation Act authorized and defined a digital asset depository institution and required them to be licensed as a money transmitter. In 2023, some cleanup amendments to the Financial Innovation Act were enacted through Legislative Bill 92.

Nevada: Nevada regulates money transmission under Chapter 671 of the Nevada Revised Statutes, which governs issuers of financial instruments for the transmission or payment of money. The statutes require entities engaged in money transmission to obtain a license from the Nevada Financial Institutions Division (NFID). Nevada's statutes do not explicitly define "money" to include virtual currencies. However, the NFID has indicated that the entities engaged in such businesses would be reviewed on a case-by-case basis and should apply for a license. In 2019, Senate Bill 195 was introduced, proposing to create a new statutory license program for entities involved in virtual currency activities that closely followed the Uniform VCBA. During the legislative session, the NFID temporarily suspended issuing licensure determinations pending the outcome of the bill. However,the bill did not advance, and in August, the NFID provided guidance that it would resume licensing applicable entities as money transmitters under existing statutes. Finally, in 2023, Nevada

introduced and adopted the MTMA but not the virtual currency component.

New Hampshire: Originally, New Hampshire had a more enabling approach exempting persons who engage in the business of selling or issuing payment instruments or stored value solely in the form of convertible virtual currency, or who receive convertible virtual currency for transmission to another location, from the state's money transmission regulation. Money transmitters who conduct business in traditional fiat currency, for example U.S. dollars, and those who transmit money in fiat and cryptocurrency are still required to be licensed with the New Hampshire Banking Department. In 2024, New Hampshire introduced and passed the Money Transmission Modernization Act.

New Jersey: New Jersey has a broad definition of payment instrument, and as such it requires entities engaged in the business of money transmission to obtain a license. While specific legislative references or guidance pertaining to virtual currencies and licensing in New Jersey have not been given several exchanges maintain money transmitter licenses there. In 2022, the Digital Asset and Blockchain Technology Act (AB 2371), which had explicit provisions for licensing, was introduced but stalled. A modified version was reintroduced in 2024 (AB 2249) and again stalled.

New Mexico: In New Mexico, the definition of money and money transmission is broadly interpreted. Thus, according to the FAQ and website regulation page, it is the position of the Financial Institutions Division (FID) that any entity engaged in the business of providing the exchange of virtual currency for money or any other form of monetary value or stored value to persons located in the State of New Mexico must be licensed by the FID as a money transmitter. An analysis of Wayback Machine indicates the website has appeared like that since 2021.

New York: In 2015, New York implemented the "BitLicense" framework, requiring businesses involved in virtual currency activities to obtain a license from the New York State Department of Financial Services (NYDFS). This regulation covers activities such as receiving or transmitting virtual currency, securing, storing, or maintaining custody of virtual currency, performing retail conversion services, buying and selling virtual currency as a customer business, and controlling, administering, or issuing a virtual currency. Over the years, guidance has consistently been provided with the most substantive guidance offered in 2020.

North Carolina: North Carolina signed into law House Bill 289, submitted at the request of the Office of the North Carolina Commissioner of Banks. The Act, which enacts the newly revised North Carolina Money Transmitters Act, subjects certain virtual currency activities to licensure and requires applicants seeking licensure to do so via the Nationwide Multistate Licensing System (NMLS).

North Dakota: Initially, North Dakota's Department of Financial Institutions provided guidance through the FAQ section of its website that they do not consider the control or transmission of virtual currency to fall under the scope of its Money Transmission Act. However, entities that do so while also holding or transmitting fiat currency will still need to secure a money transmitter license. In 2023, through SB 2119, North Dakota introduced and enacted portions of the Modernizing Money Transmitters Act but did not enact the virtual currency part.

Ohio: Ohio has issued guidance in both 2020 and 2022 clarifying that under the Ohio Money Transmitters Act (OMTA) cryptocurrencies are equivalent to money. Therefore, in general, a person engaged in the buying or selling of cryptocurrency as a business qualifies as a money transmitter for the purposes of the OMTA and must obtain an Ohio money transmitter license before the person provides services to Ohioans. This is consistent with prior legal interpretations of the 2007 OMTA indicating a broad definition of money transmitter.

Oklahoma: As of 2006, Oklahoma Statutes §6-1512 define "Money transmitter" as any person who engages in the business of accepting currency or funds denominated in currency, and transmits the currency or funds or the value of the currency or funds, by any means through a financial agency or institution, a Federal Reserve Bank or other facility of one or more Federal Reserve Banks, the Board of Governors of the Federal Reserve System or both, or an electronic funds transfer network. The "electronic funds transfer network" means that entities engaged in transmitting virtual currencies require a money transmitter license. In 2024, the state enacted HB 3594 which states that "anyone engaged in home digital asset mining, or digital asset mining business, staking, or staking as a service shall not be required to obtain a money transmitter license under Section 1513 of Title 6 of the Oklahoma Statutes." This is consistent with other states not regulating entities involved solely in virtual currency transmission.

Oregon: Oregon's money transmitter laws (Ch. 717) require entities engaged in money transmission to obtain a license. However, specific legislative references pertaining to virtual currencies and licensing are not available. The definition of money within the law is broad, though, suggesting it applies to companies dealing in virtual currencies. In 2020, Oregon provided guidance on virtual currencies, suggesting administrators or exchangers of money should register.

Pennsylvania: Pennsylvania changed its stance. Initially, in 2019, the Pennsylvania Department of Banking and Securities provided guidance that virtual currency, including Bitcoin, is not considered "money" under Pennsylvania's Money Transmitter Act (MTA), and the platforms engaged in virtual currency exchanges were not money transmitters or regulated by Pennsylvania's money transmission laws. Then, in 2024, Pennsylvania provided updated guidance without amending its definition of money and gave companies 6 months to come into compliance.

Rhode Island: In 2019, Rhode Island introduced and enacted legislation (House Bill 5847) that expanded R.I. Gen. Laws § 19-14-1 to update the definition of "currency transmission" to encompass virtual currency activities. This means that entities transmitting virtual currencies need to obtain a license in a manner similar to BitLicenses. Like NY, RI requires registration and licensing to be done through NMLS.

South Carolina: In 2018, South Carolina provided some guidance saying to the extent that virtual currency transactions also involve the transfer of fiat currency, they may be subject to money transmission regulations. In 2019, South Carolina introduced the "Blockhcain Industry Empowerment Act" which was fairly enabling legislation, but it failed to advance. Then, in 2024, South Carolina introduced and passed (HB 5068 and SB 1031) which modernize money transmission definitions but they did not opt to include the virtual currency component.

South Dakota: In 2019, South Dakota provided guidance on virtual currency transmission indicating that such entities required licensing. In 2021, South Dakota formally introduced legislation regarding virtual currency transmission but it did not advance. Legislation was again introduced in 2023 (Senate Bill 43) which adopted many of the provisions of the Uniform Money Transmission Modernization Act recommended by the Conference of State Bank Supervisors (CSBS). In 2024, South Dakota introduced (Senate Bill 58) which further modified some definitions to better align

its bill with other states. For our purposes, the 2023 bill required licensing for transmitting virtual currencies. **Tennessee**: In 2014, Tennessee provided early guidance that any company that offers to exchange, administer, or maintain virtual currencies for sovereign currency may be subject to state regulation and licensing as well as federal regulation. In 2023, Tennessee introduced and enacted legislation to update its money transmission laws to those proposed by the MTMA. It did not include the virtual currency component of the MTMA.

Texas: In 2019, the Texas Department of Banking issued Supervisory Memorandum 1037, clarifying that certain cryptocurrency activities do not constitute money transmission under Texas law. The memorandum states: "Because neither centralized virtual currencies nor cryptocurrencies are coin and paper money issued by the government of a country; they cannot be considered currencies under the statute." It goes on to state, "stablecoins that are pegged to sovereign currency may be considered a claim that can be converted into currency and thus fall within the definition of money." And importantly, it clarifies that, "In contrast, because a sovereign-backed stablecoin may be considered money or monetary value under the Money Services Act, receiving it in exchange for a promise to make it available at a later time or different location may be money transmission. A licensing analysis will turn on whether the stablecoin provides the holder with a redemption right for sovereign currency thus creating a claim that can be converted into money or monetary value. This is true regardless whether the redemption right is expressly granted or implied by the issuer." In 2023, Texas introduced and enacted the MTMA, but it did not adopt the virtual currency provision.

Utah: Title 7, Chapter 25 titled the "Money Transmitter Act" was enacted when the 2015 Utah Legislature passed Senate Bill 24, amending the Financial Institutions Act, Utah Code Annotated. The initial definitions were broad meaning that entities engaged in virtual currency transmission may need licenses. In 2020, the statute was amended to exclude "Blockchain Token" from the definition of money transmission. All money transmitter licensing take place through NMLS.

Vermont: Vermont regulates money transmission under the Money Services Act, which requires entities engaged in money transmission to obtain a license from the Vermont Department of Financial Regulation (DFR). In 2017, Vermont chaned its money transmitter laws to define virtual

currency and require virtual currency businesses to obtain a license. In 2024, Vermont updated its Money Services Act to explicitly include virtual currencies within its regulatory framework. It did not adopt the framework put forth in the MTMA and instead, made its bespoke adding additional details about virtual currency kiosks. Otherwise, its updated Act incorporates substanial portions of the MTMA.

Virginia: Based on their existing definitions and guidance provided in 2021, the Virginia Bureau of Financial Institutions (BFI) does not regulate entities involved in the transmission of virtual currencies solely. However, if virtual currency transactions involve the transfer of fiat currency, such activities fall under the Money Order Sellers and Money Transmitters law, codified in Chapter 19 of Title 6.2 of the Code of Virginia. Entities engaged in money transmission involving fiat currency are required to obtain a license from the BFI. In 2024, legislation was introduced to modernize the regulation of money transmitters but it did not advance.

Washington: In 2017, Washington state updated its money services act via SB 5031. In 2018, Washington State Department of Financial Institutions (DFI) ammended its money service rules to conform to the updates. While the DFI's amended rules did not seek to regulate virtual currency activity in a many similar to BitLicense, the rules indicated an intent to regulate virtual currency activities. In 2021, Washington State offerred additional guidance that it would apply its existing licensing rules to cryptocurrency businesses and in particular, the Washington Uniform Money Services Act requires virtual currency exchanges to obtain a money transmitter license.

West Virginia: West Virginia's existing definitions of currency and money transmission do not explicitly mention virtual currencies but generally have a broad definition that would imply virtual currency businesses should be licensed by the Division of Financial Institutions and register through the NMLS. However, in 2020, the West Virginia Legislature introduced enabling legislation by enacting House Bill 4621, which implements a regulatory sandbox to enable entities that would normally require licensure in West Virginia to test an innovative financial product or service for a limited period of 24 months. After the end of the sandbox period, if the test of the product or service has been deemed successful, the entity would be able to continue operating in West Virginia subject to any licensure requirements at that time. Sandbox registrants also must register through

the NMLS system. The Sandbox was expanded in 2021. No guidance has been provided.

Wisconsin: In 2020, Wisconsin's Department of Financial Institutions (DFI) provided guidance that interpreted its authority under Wisconsin Statute (217.03) as not extending to the transmission of virtual currency only but for the transmission of virtual currency linked to sovereign fiat. On November 9, 2023, Wisconsin introduced legislation to change money transmitter laws and on April 4, 2024, Wisconsin enacted the Money Transmitter Modernization Act, replacing the previous Seller of Checks law. The new law, effective January 1, 2025, standardizes definitions, exemptions from licensing, the licensing process, and safety and soundness requirements. However, the Wisconsin version did not include the virtual currency component of the CSBS model law. As such, Wisconsin laws remain consistent with the prior guidance.

Wyoming: Wyoming switched from a restrictive to an enabling approach to digital asset legislation meant to attract businesses to Wyoming. Initially, in 2015, the Wyoming Division of Banking interpreted the state's Money Transmitter Act to require entities offering hosted wallet services to maintain fiat currency reserves equivalent to the aggregate value of all digital assets held on behalf of customers. This "double reserve" requirement was deemed impractical and inefficient by Coinbase, leading to their famous decision to leave the state in 2015. Then, as part of a series of Bills and Acts introduced and enacted, Wyoming created a Financial Technology Sandbox and amended its Money Transmitter Act to explicitly exempt virtual currency businesses from needing a money transmitter license.

B Variable Definitions

Industry: Crunchbase designates industry based on a set of tags. There are 800 unique tags. Startups provide as few as one industry and as many as 26 industries. Table B.1 provides a list of the most popular industries sorted from those with the most startups to the fewest. When doing analyses at the industry level, the treated industries include blockchain, cryptocurrency, paas. ethereum, funding platform, bitcoin, mobile payments, payments, financial exchanges, foreign exchange trading, transaction processing, virtual currency, and web3.

Blockchain, crypto, payments startup: I analyze the business description. For example, this is the current business description for Ripple. "Ripple is a technology company that provides solutions for cross-border payments, crypto liquidity, and central bank digital currency." Similarly, this is the current business description for Coinbase, "Coinbase is a crypto exchange and wallet platform that allows merchants and consumers to buy, sell, and store digital currencies." Consistent with the short description, the median description length is only 99 characters. Given that some startups' descriptions indicate a business model involving cryptocurrencies, but these same startups do not select cryptocurrency as their industry. When doing analyses at the firm level, the treated startups include all whose industry would indicate treatment plus any business descriptions with the following key words or phrases: crypto, cryptocurrency, bitcoin, virtual currency, digital currency, stablecoin, digital asset, token, blockchain, web3, nft, smart contract, decentralized finance, blockchain, distributed ledger, ethereum, on-chain, off-chain, platform, exchange, web3, defi, nft, depin, fwa, protocol, solana, payments, foreign exchange, fintech, transaction processing, cross-border.

Abnormal returns: I calculate abnormal returns using two separate approaches for equities and crypto while maintaining methodological consistency across each. I first calculate excess returns for both asset classes by subtracting the risk-free rate (measured as the one-month U.S. Treasury bill rate) from raw returns. For equities, I estimate abnormal returns using the **?** four-factor model: $R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,MKT}(R_{m,t} - R_{f,t}) + \beta_{i,SMB}SMB_t + \beta_{i,HML}HML_t + \beta_{i,MOM}MOM_t + \epsilon_{i,t}$ where $(R_{i,t})$ is the return on asset i at time t, $(R_{f,t})$ is the risk-free rate, $(R_{m,t})$ is the market

return, (SMB_t) is the size factor return, (HML_t) is the value factor return, and (MOM_t) is the momentum factor return. I obtain these factors from the WRDS Fama French data library. Factor loadings ($\beta_{i,j}$) are estimated using rolling regressions with a 252-trading-day window to account for time variation in risk exposures. The abnormal return for equities is calculated as the regression residual ($\epsilon_{i,t}$). For cryptocurrencies, I follow Yukun et al. (2022) and estimate abnormal returns using their three-factor crypto model: $R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,CMKT} CMKT_t + \beta_{i,CSMB} CSMB_t + \beta_{i,CMOM} CMOM_t + \eta_{i,t}$ where ($CMKT_t$) is the cryptocurrency market factor (constructed as the value-weighted return of all cryptocurrencies in the sample with a market cap greater than \$10 million minus the risk-free rate), ($CSMB_t$) is the cryptocurrency size factor (constructed as the return difference between small and large market capitalization cryptocurrencies), and ($CMOM_t$) is the cryptocurrency momentum factor (constructed as the return difference between high and low past 60 day return). Similar to the equity approach, I estimate factor loadings using 252-day rolling regressions. The crypto abnormal return is calculated as the regression residual ($\eta_{i,t}$). For both models, I require a minimum of 63 trading days (one quarter) of non-missing returns in each rolling window to estimate the factor loadings. When this requirement is not met, the abnormal return is set to missing.

Startup status: Crunchbase provides data on the date a startup was founded and the date a startup was closed and funding round dates. We consider a startup to be closed if either the closed date is filled in, an acquisition or other type of exit has occurred, or if it has been more than 60 months since either the latest funding round or the founding date.

Employment: Revelio individual user profiles are akin to resume data. You can see the start and end date of every job the individual user has had. We have both raw job titles, job descriptions (if available), and Revelio's uniform classification of the job type into 1 of 8 categories, which include Admin, Marketing, Sales, Scientist, Engineering, etc... For the Compliance jobs, we did a keyword search. The keywords were: For all other job categories, we used the Revelio uniform classification. We then used the geographic location associated with the job to create state-industry-job-type buckets on a quarterly basis. The industry definition matched the crunchbase definition as we had matched crunchbase to Revelio. The processes for matching Crunchbase and Revelio were threefold.

We matched on startup URL, LinkedInURL, and Company name.

Innovation: The U.S. Patent and Trademark Office (USPTO) data is matched to public firms using the method put forward in Kogan et al. (2017). For private firms, we use a combination of Crunchbase patent application indicators and fuzzy name matching to USPTO application data. We focus on applications rather than grants given that there tend to be meaningful delays between when an idea is conceived and it actually becomes a granted patent.

Industry concentration (HHI): We calculate a traditional HHI measure of industry concentration using employment shares. Namely, HHI$ist = \sum j = 1^{N_{ist}} \left(\frac{Employees_{jist}}{TotalEmployees_{ist}} \right)^2 \times 10,000$ where $Employees_{jist}$ is the number of employees at firm j in industry i in state s at time t and $TotalEmployees_{ist} = \sum_{j=1}^{N_{ist}} Employees_{jist}$ is the total employment in industry i in state s at time t. The multiplication by 10,000 follows the conventional scaling that results in HHI ranging from 0 to 10,000. Higher numbers represent more monopolistic industries and higher concentration.

Industry concentration (firm dynamics): Given that a key prediction of the model is the size distribution by industry will change, we look at changes in firm status. First, we look at a ratio of firm closures relative to the number of stayers in industry i in state s at time t. Second we look at more successful versions of exits, namely, initial public offerings (IPOs) and trade sales (i.e., M&A activity that could involve either a sale to an operating firm or a private equity buyer) in an industry i in state s at time t.

News coverage: Using Messari's crypto news API, all articles that had the keyword "Bitlicense" or "Virtual Currency Business Act" were downloaded. An RA then summarized the article and assigned it a sentiment of positive, negative, and neutral. Any firms mentioned in the articles were also put into the list of public and crypto entities likely to be impacted by the legislation.

NYDFS press releases: Data was pulled directly from the NYDFS webpage.

Table B.1. Popular Industries

Industry	Startup Freq.	Crypto Startup Freq.
(1)	(2)	(3)
software	49738	1089
information technology	36514	933
health care	27219	66
financial services	22905	1242
consulting	22897	244
e-commerce	17467	200
advertising	16078	97
internet	15705	431
marketing	13068	115
artificial intelligence (ai)	10575	417
saas	10329	177
manufacturing	9866	17
finance	9676	483
real estate	9578	97
education	9389	88
medical	9297	13
apps	9074	208
mobile	8930	120
analytics	8557	111
biotechnology	8347	9
machine learning	7590	190
social media	7553	111
mobile apps	7324	161
web design	6832	59
professional services	6692	30
fintech	6625	1070
web development	6583	121
retail	6577	25
food and beverage	6304	12
digital marketing	5909	57
enterprise software	5857	85
wellness	5359	12
information services	4997	93

Notes. This table lists the 33 most common industries in Crunchbase listed during the sample period from 2009Q1 to 2024Q2. The number of unique startups with headquarters in the U.S. within that industry is reported in column 2, and the number of unique startups with headquarters in the U.S. within that industry whose business description indicates it is a cryptocurrency business are reported in column 3.

Table B.2. Entrepreneurial Activity in Entrepreneurial States

	Any	Seed	Early-stage VC	Late-stage VC	
Panel A: Introduced	(1)	(2)	(3)	(4)	
Introduced		-0.235***	-0.370***	0.051	0.241***
	(0.024)	(0.041)	(0.054)	(0.064)	
Panel B: Enacted					
Enacted	0.088***	0.265***	0.900***	0.250***	
	(0.030)	(0.050)	(0.067)	(0.079)	
Panel C: Effective					
Effective	0.134***	0.382***	1.048***	0.274***	
	(0.029)	(0.050)	(0.067)	(0.078)	
Panel D: Guidance					
Guidance	0.072***	0.104**	0.703***	0.220***	
	(0.024)	(0.041)	(0.055)	(0.064)	
Adjusted R^2	0.746	0.457	0.457	0.371	
Panel E: License Needed					
License Needed	0.099***	0.076**	0.582***	0.146**	
	(0.022)	(0.038)	(0.050)	(0.059)	
Adjusted R^2	0.812	0.630	0.506	0.379	
Observations	278,070	278,070	278,070	278,070	
State × Ind. FE	✓	✓	✓	✓	
Time FE	✓	✓	✓	✓	

Notes. This table presents results from difference-in-differences regressions examining entrepreneurial activity in industries influenced by the protective "Bit"-Licensing regulatory activity using an alternative subsample of high entrepreneurial states. The sample is limited to startups headquartered in California, Massachusetts, New York, Texas, Washington, and Florida. In column 1, the dependent variable is the log of the number of startups. In column 2, the dependent variable is the log of the number of seed-stage startups. In column 3, the dependent variable is a log of the number of early-stage startups, and in column 4, the dependent variable is a log of the number of late-stage startups. The panels vary by the legislative event. Panel A is protective bills introduced. Panel B is protective bills enacted. Panel C is protective bills in effect. Panel D is regulatory guidance, and Panel E is based on the date at which it is reasonable to assume a license is needed, whether through guidance or enacting a protective bill. Observations are at the state-industry-quarter level, and the sample spans 2009Q1 to 2024Q2. Fixed effects and observations for all panels are reported at the end of the table. Standard errors are reported in parentheses and are clustered by state. Statistical significance of 10%, 5%, and 1% is denoted by *, **, and ***, respectively.

Table B.3. Protective Regulation and Employee Seniority: Uncertainty vs. Clarity

	Employment based on seniority, where 1 = rank-and-file and 7 = executives						
	Seniority 1	2	3	4	5	6	Seniority 7
Panel A: Uncertainty	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Introduced	-0.004***	-0.002***	-0.002**	0.001	-0.003***	0.001	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Panel B: Clarity							
License Needed	-0.005***	0.006***	-0.002*	-0.005***	0.004***	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Adjusted R^2	0.054	0.091	0.055	0.049	0.036	0.015	0.021
Observations	35,941,366	35,941,366	35,941,366	35,941,366	35,941,366	35,941,366	35,941,366
Firm FE	✓	✓	✓	✓	✓	✓	✓
State × Ind. FE	✓	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓	✓

Notes. This table presents estimates of how protective licensing regulatory actions influenced employment based on difference-in-differences analyses that account for variations across states and time. Unlike the main specification, which focused on job title, this table focuses on seniority associated with the job title. Moving from column 1 to 7, the seniority rank of the employee increases, with 1 representing rank-and-file employees and level 7 representing c-suite executives. The analyses uses within-firm variation. Panel A focuses on regulatory uncertainty, which is brought about by introducing protective legislation. In contrast, Panel B focuses on regulatory clarity, which is brought about by regulatory guidance or enacted protective legislation. Controls for the within-firm regressions include log(firm age), an indicator for being a public firm, and an indicator for receiving a new round of VC funding in the last 4 quarters. Observations are at the firm-state-industry-quarter level, and the sample spans 2009Q1 to 2024Q2. Fixed effects and observations for all panels are reported at the end of the table. Standard errors are reported in parentheses and are clustered by state. Statistical significance of 10%, 5%, and 1% is denoted by *, **, and ***, respectively.