The Economics of Regulating Tokenized Securities

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June 14, 2026

Abstract

We develop an economic model to study the effect of regulation on tokenized securities markets. Tokenizing a security does not exempt it from securities laws, so in our framework token issuers must choose a compliance policy that restricts trading. We characterize the resulting trade-off between regulatory stringency and financial market outcomes, and we derive three main results. First, tighter regulation reduces the liquidity of the tokenized market. Second, tokenization is not commercially viable for sufficiently strict regulation. Third, the tightest level of regulation that tokenization can withstand depends on the characteristics of the tokenized asset.

Keywords: Tokenization, Regulation, Liquidity, DeFi, KYC/AML

JEL Classification: G18, G23, G28

1 Introduction

Tokenized securities are commonly described as freely tradable assets: securities wrapped as blockchain tokens that anyone can buy or sell at any time without intermediaries. However, this description is inaccurate. In particular, a security does not shed its legal status by being tokenized, and its transfers remain subject to securities laws (Peirce 2025).[1] Nonetheless, regulators have the authority to grant exemptive relief, implying that the level of regulatory stringency is a policy parameter (Securities Exchange Act 1934, Atkins 2025). To that end, our paper provides an economic model to study how regulatory policy affects economic outcomes within tokenized securities markets. Our results provide three main insights. First, we show that tighter regulation reduces equilibrium liquidity in the tokenized market. Second, we demonstrate that sufficiently strict regulation renders tokenization non-viable. Finally, we show that whether a given policy renders a tokenized security non-viable depends on the characteristics of the tokenized asset. The implication of our work is straightforward: whether tokenization is worthwhile depends heavily on regulatory policy, and a common policy affects each tokenized security differently.

Formally, we put forth an equilibrium model of a tokenized securities market with three types of agent: an issuer, investors, and traders. We assume that the issuer chooses whether to tokenize a security, and that choice depends on whether the expected profits from tokenization exceed the opportunity cost of the resources the issuer must immobilize. If the issuer decides to tokenize, then it selects a policy to ensure that trading is compliant with regulatory constraints. Investors decide whether and how much to invest in the tokenized asset. In particular, because tokenization entails risks for investors, the equilibrium onchain investment is determined endogenously as the level that equates investors' incremental return from onchain investment with the risk premium they require to hold the tokenized rather than the non-tokenized version of the asset. The return from onchain investment is primarily

[1] This legal classification is enforced in practice at the token-contract level: tokenized securities embed onchain identity registries and transfer restrictions that implement investor-eligibility and KYC/AML requirements under regimes such as Reg D and MiCA (Luo et al. 2026, Malinova and Park 2026).

a passive yield, which investors earn by supplying their onchain holdings as liquidity (Malinova and Park 2024). In turn, the onchain investment yield depends on regulatory policy, because this yield is generated by the trading that regulatory policy constrains.

Our first main result is that tighter regulation reduces equilibrium liquidity (Proposition 4.1). This is because regulatory policy imposes a cap on the total expected flow of illicit trading. Then, to meet a tighter cap, the issuer has two choice variables: it can screen arriving traders more precisely, or it can admit fewer traders in general. Precise screening is costly, so we show that a tighter cap leads the issuer to admit fewer traders. Fewer admitted traders mean less trading, and therefore less revenue for those who supply liquidity. That revenue compensates investors for the incremental risk of holding the security onchain, so when revenue falls, equilibrium investment in the tokenized security falls with it.

Our second main result is that sufficiently tight regulation renders tokenization non-viable (Proposition 4.5). This is because the issuer cannot perfectly screen out illicit traders without a prohibitively high screening cost. In more detail, screening costs are convex, so perfect screening would necessarily be prohibitively expensive. Then, because the revenue from tokenizing is bounded, the issuer's optimal screening precision is bounded as well. Bounded screening consequently cannot by itself satisfy a sufficiently tight regulatory cap, implying that regulatory policy tightening leads the issuer to reduce the overall flow of trading. Then, as the trading flow falls, the revenue to investors falls and so too does equilibrium investment. Crucially, the issuer earns revenue from tokenized investment by charging a proportional fee on assets under management. In turn, under a sufficiently tight regulatory policy, the tokenized investment falls sufficiently that the issuer's revenue no longer covers its opportunity cost, and the issuer therefore optimally declines to tokenize.

Our third main result is that the viability of tokenization depends on the characteristics of its underlying market (Propositions 4.8 and 4.9). Specifically, the level of stringency at which tokenization becomes non-viable is the level at which the issuer's profit no longer covers the issuer's opportunity cost of resources. Thus, an asset characteristic that lowers the

issuer's profit also lowers the stringency the asset can withstand before tokenization becomes non-viable. Since the issuer's profit is its revenue from tokenization net of screening costs, two families of asset characteristics affect this profit. The first governs the liquidity and thus the revenue of the tokenized market, and the second governs the cost of complying with the regulatory cap. On the former, equilibrium liquidity is lower when investors require a larger risk premium for holding the asset onchain, when liquidity providers bear greater adverse selection (Lehar and Parlour 2025, Capponi and Jia 2025), and when more value is extracted from traders (Park 2023, Capponi et al. 2025, Harvey et al. 2026a). Lower liquidity generates less fee revenue and therefore a lower issuer profit. On the latter, a larger share of legitimate traders and a cheaper screening technology each lower the cost of screening. An asset that is cheaper to hold, trade, and screen therefore withstands tighter regulation.

Of note, tokenized markets are not hypothetical, and they already display the trade-off we formalize. Tens of billions of dollars of real-world assets have been tokenized (Cook 2026, Chemla and Tinn 2026, Luo et al. 2026), yet their secondary markets remain thin, and thinnest where trading restrictions are most stringent. Tokenized Treasuries limited to qualified purchasers experience almost no secondary trading (Luo et al. 2026). More systematically, daily turnover across tokenized real-world assets falls sharply with onchain transfer restrictions: tokens without onchain restrictions trade approximately 5.6% of market capitalization per day, while whitelist-restricted tokens trade only approximately 1.1%.[2] Our work complements empirical studies that document this thinness (Laschinger et al. 2024, Leonhard et al. 2026, Cong et al. 2025, Mafrur 2026) by providing an economic model establishing the underlying channel. Moreover, our paper formalizes two informal arguments from prior work. Namely, Malinova and Park (2026) argue that compliance restrictions such as whitelisting reduce a token's value and market efficiency, which our first result formalizes as the relationship between regulation and liquidity (Proposition 4.1). Moreover, Cong et al.

[2]Authors' calculations are from Allium onchain data (`crosschain.rwa` tables, retrieved 9 June 2026). For each group, turnover is average daily transfer volume divided by average market capitalization over the 90 days ending 8 June 2026 (11 March–8 June 2026).

(2026) argue that regulation should be tailored to the asset rather than applied uniformly, which our third result formalizes as an asset-specific viability threshold (Propositions 4.8 and 4.9).

Our work also relates to the earlier literature on blockchain tokenization which focuses on tokenization of non-financial assets within the context of supply chains. This literature establishes efficiencies gained from employing tokenized inventory for financing (Chod et al. 2020) and from assets being tracked on a common ledger (Cui et al. 2023, Dong et al. 2023, Iyengar et al. 2024) while also highlighting difficulties with adoption (Iyengar et al. 2023). Importantly, the blockchain tokenization literature examining supply chain applications does not examine regulatory concerns since the assets being considered are non-financial.

The remainder of the paper proceeds as follows. Section 2 presents our model of a regulated tokenized securities market. Section 3 defines the equilibrium and solves the model. Section 4 establishes our three main results. Section 5 concludes. Finally, Appendix A collects the proofs.

2 Model

We provide a model to study the trade-off between regulatory stringency and market liquidity within a tokenized asset market. The regulator sets a cap on the intensity of admitted illicit trading. An *issuer* decides whether to tokenize a security and, if it does, how stringently to screen the traders it admits to comply with the regulatory cap. *Traders* who pass screening trade the asset and generate the fees and price impact that reward liquidity provision. *Investors* decide whether to invest in the tokenized asset and whether to provide it as liquidity.

The model timing is as follows. At $t = 0$, the issuer decides whether to tokenize the asset. If the issuer tokenizes, traders arrive according to a Poisson process with intensity $\lambda > 0$. A fraction $\mu \in (0, 1)$ of arriving traders are legitimate, while the remaining fraction $1 - \mu$ are

illicit traders who seek to circumvent KYC/AML regulations. The issuer screens arriving traders, and those who pass screening select an optimal trading volume for the tokenized asset. Trading generates fees and price impact revenue for investors who supply the tokenized asset as liquidity. Providing the tokenized asset as liquidity dominates holding it onchain passively, so in equilibrium, tokenized investment equals tokenized liquidity provision. In turn, equilibrium tokenized investment is determined by the level at which the investors' net return from liquidity provision equals their required risk premium.

2.1 Issuer

The issuer employs a screening system characterized by two parameters: the *screening precision* $\rho \geq 1$ and the *acceptance rate* $\pi \in (0, 1]$. The screening precision ρ is the ratio of the true positive rate to the false positive rate, following the signal detection framework of Peterson et al. (1954). At $\rho = 1$, screening is uninformative; higher ρ corresponds to greater ability to distinguish legitimate from illicit traders. The acceptance rate π is the unconditional probability that an arriving trader passes screening, regardless of type.

Given the triplet (ρ, π, μ), the probability that a legitimate trader passes screening is implied as follows[3]

$$q_L(\rho, \pi) = \frac{\rho}{\mu\rho + (1 - \mu)} \cdot \pi, \tag{2.1}$$

whereas the probability that an illicit trader passes screening is

$$q_I(\rho, \pi) = \frac{1}{\mu\rho + (1 - \mu)} \cdot \pi. \tag{2.2}$$

Equations (2.1) and (2.2) imply $q_L = \rho\, q_I$: a legitimate trader is ρ times as likely to pass as is an illicit trader. Also, note that $\mu q_L + (1 - \mu) q_I = \pi$, so the total flow of admitted traders

[3]To derive (2.1) and (2.2), recall that q_L and q_I are the pass probabilities for legitimate and illicit traders, respectively. The screening precision requires $q_L/q_I = \rho$, i.e., $q_L = \rho\, q_I$. The acceptance rate requires $\mu q_L + (1 - \mu) q_I = \pi$. Substituting the first condition into the second yields $q_I[\mu\rho + (1 - \mu)] = \pi$, which delivers (2.2). Equation (2.1) then follows from $q_L = \rho\, q_I$.

depends only on the acceptance rate π, not on the screening precision ρ. Screening precision thus determines the composition of admitted traders without affecting the total admission rate.

Since q_L is a probability, the screening parameters must satisfy $q_L \leq 1$, which using (2.1) requires

$$\pi \leq \mu + \frac{1-\mu}{\rho}. \tag{2.3}$$

In turn, full acceptance ($\pi = 1$) is feasible only with uninformative screening ($\rho = 1$), and improving screening precision tightens the upper bound on the acceptance rate.

The regulator imposes a cap $\psi > 0$ on the flow intensity of illicit trading. Since illicit traders arrive at rate $(1-\mu)\lambda$ and each passes screening with probability q_I, this cap requires

$$(1-\mu)\lambda\, q_I(\rho, \pi) = \frac{(1-\mu)\lambda}{\mu\rho + (1-\mu)} \cdot \pi \leq \psi. \tag{2.4}$$

Equation (2.4) constrains the acceptance rate and the screening precision jointly: the admitted illicit flow is increasing in π and decreasing in ρ. The issuer can therefore comply with the cap either by admitting fewer traders or by screening those it admits more precisely. The feasible set of screening parameters, which depends on the regulatory cap ψ through (2.4), is given explicitly as

$$\mathcal{S}(\psi) = \{(\pi, \rho) \in (0, 1] \times [1, \infty) : (2.3) \text{ and } (2.4) \text{ hold}\}. \tag{2.5}$$

The regulatory cap ψ restricts the issuer's choices only when it falls below the rate at which illicit traders arrive, given explicitly as follows:

$$\psi_0 := (1-\mu)\lambda. \tag{2.6}$$

In more detail, the admitted illicit flow $(1-\mu)\lambda\, q_I(\rho, \pi)$ is largest at full acceptance with uninformative screening ($\pi = 1$, $\rho = 1$), where it equals ψ_0, so every policy satisfies any cap

$\psi \geq \psi_0$. We hereafter restrict attention to the non-trivial case $\psi < \psi_0$.

The issuer bears increasing costs for screening with higher screening precision ρ. More concretely, the screening cost is given by $\mathcal{C}(\rho)$ where $\mathcal{C} : [1, \infty) \to \mathbb{R}_+$. We impose that uninformative screening is costless (i.e., $\mathcal{C}(1) = 0$) and that the marginal cost of improving precision is positive and increasing ($\mathcal{C}' > 0$ and $\mathcal{C}'' > 0$).

The issuer earns a fee rate $\phi > 0$ on assets under management and selects screening parameters to maximize fee revenue net of screening costs. The issuer's problem is therefore given explicitly as

$$(\pi^\star, \rho^\star) = \arg \max_{(\pi,\rho)\in\mathcal{S}(\psi)} \phi\, L^\star(\pi) - \mathcal{C}(\rho), \tag{2.7}$$

where $L^\star(\pi)$ denotes equilibrium assets under management. As we discuss in Section 2.3, investors rationally supply their entire tokenized holdings as liquidity in equilibrium, so assets under management coincide with the liquidity of the tokenized market. The objective function in (2.7) splits into a revenue term, $\phi L^\star(\pi)$, and a cost term, $\mathcal{C}(\rho)$. The revenue term depends only on the acceptance rate π as implied by the equilibrium liquidity provision condition (2.11). Intuitively, this is because liquidity provision depends on the revenues earned from trading, which depend on the share of traders admitted π. Relatedly, the screening precision ρ changes only the composition of the trading flow between legitimate and illicit traders, so it does not affect revenue. The screening precision enters the objective only through the cost term $\mathcal{C}(\rho)$. In our model, the issuer has an opportunity cost of resources $\underline{U} > 0$. The issuer's equilibrium profit at the regulatory cap ψ is given explicitly by

$$U^\star(\psi) := \sup_{(\pi,\rho)\in\mathcal{S}(\psi)} \left[\phi\, L^\star(\pi) - \mathcal{C}(\rho)\right], \tag{2.8}$$

and the issuer issues the token only if $U^\star(\psi) > \underline{U}$. We restrict attention to the non-trivial case in which the asset is worth tokenizing in the absence of regulation, namely $\underline{U} < \phi L^\star(1)$. If this condition were not to hold, then the issuer would refrain from tokenizing at every regulatory cap.

2.2 Traders

A trader accrues utility through surplus from trading. More concretely, trading a volume $V \geq 0$ generates a utility $\Pi(V)$ for any trader, where $\Pi : \mathbb{R}_+ \to \mathbb{R}_+$ is infinitely differentiable. Additionally, a zero trade size implies no utility ($\Pi(0) = 0$) whereas utility increases at a decreasing rate with trade size ($\Pi' > 0$ and $\Pi'' < 0$). Finally, $\lim_{V \to 0^+} \Pi'(V) = +\infty$ which implies that all traders find a strictly positive trade size to be optimal, and $\lim_{V \to +\infty} \Pi'(V) = 0$ which implies that as trade size becomes arbitrarily large, the marginal utility goes to zero.

Trading is costly, and the total cost has two components. The first is the cost paid to liquidity providers, which subsumes both trading fees and price impact. In particular, given a trade size $V \geq 0$ and aggregate liquidity $L > 0$, $\kappa(V/L)$ denotes the cost per unit traded, where $\kappa : \mathbb{R}_+ \to \mathbb{R}_+$ is infinitely differentiable, strictly increasing and strictly convex. This assumption is consistent with the cost structure of decentralized exchanges (see, e.g., Cartea et al. (2024b), Hasbrouck et al. (2025)) and holds more generally in traditional markets (see, e.g., Glosten (1994), Biais et al. (2000)). The second component, $\gamma \cdot V$ with $\gamma \geq 0$, captures value extracted by profit-seekers through actions such as sandwich attacks (see, e.g., Park (2023), Capponi et al. (2025, 2026), Harvey et al. (2026b)).

Traders select trading volumes to maximize their utility minus costs. More formally, the optimal trade size given liquidity L is given explicitly as

$$V^\star(L) = \arg\max_{V \geq 0} \ \Pi(V) - \kappa\left(\frac{V}{L}\right) V - \gamma V. \tag{2.9}$$

As we establish in Section 2.3, equilibrium liquidity $L^\star(\pi)$ depends on the issuer's acceptance rate π. We therefore define $V^\star(\pi) := V^\star(L^\star(\pi))$ to make explicit that the acceptance rate affects trading volume through its effect on the supply of liquidity.

2.3 Investors

Investors holding the tokenized asset can supply their holdings as liquidity. Given a liquidity level $L > 0$, the implied net return from liquidity provision is

$$r(L) = \lambda\pi \frac{\kappa(V^\star(L)/L) \cdot V^\star(L)}{L} - \delta - \phi. \tag{2.10}$$

To understand (2.10), recall that a trader who executes a volume of V pays liquidity providers $\kappa(V/L)$ per unit traded, so the total revenue of providers for this transaction is $\kappa(V/L) \cdot V$. Accepted traders arrive at rate $\lambda\pi$ and each trades the equilibrium volume $V^\star(L)$. Liquidity providers therefore earn $\lambda\pi \cdot \kappa(V^\star(L)/L) \cdot V^\star(L)$ in aggregate, which is the transfer from traders to liquidity providers. Dividing by aggregate liquidity L gives the first term in (2.10), the gross yield per unit of liquidity. Liquidity providers bear two costs: an adverse selection cost at rate $\delta \geq 0$ per unit of liquidity (see Cartea et al. (2024a), Drissi et al. (2025), Capponi and Jia (2025)), and the issuer's fee ϕ per unit of liquidity. Subtracting these costs from the gross yield gives the net return $r(L)$.

Notably, tokenization entails risks for investors both due to settlement issues (see John et al. (2025a,b), Harvey et al. (2025)) and due to smart contract risk (see John et al. (2023), Harvey et al. (2026a)). In turn, investors require a risk premium $\xi > 0$ to hold the tokenized rather than a non-tokenized version of the asset. This risk premium can be earned through the return from liquidity provision (see Malinova and Park (2024)), whereas holding the tokenized asset without supplying it as liquidity generates no return while still bearing the tokenization risk. As a consequence, in equilibrium, all tokenized asset holders optimally supply their entire holdings as liquidity. Then, following the standard optimal-investment principle, equilibrium investment adjusts until the return from liquidity provision equals the required premium (see, e.g., Malinova and Park (2024), Cao et al. (2025), Hasbrouck et al.

(2026)). Equilibrium liquidity $L^\star(\pi)$ is therefore given explicitly as the solution to

$$r\left(L^\star(\pi)\right) = \xi. \tag{2.11}$$

3 Model solution

The definition of equilibrium of the tokenized market is given explicitly as follows.

Definition 3.1. An equilibrium consists of an optimal trading volume $V^\star : \mathbb{R}_{++} \to \mathbb{R}_+$ by traders, equilibrium investment $L^\star : (0,1] \to \mathbb{R}_{++}$ by investors, a decision $\chi^\star \in \{0,1\}$ to tokenize by the issuer, and a policy $(\pi^\star, \rho^\star)$ by the issuer such that:

(i) For all $L \in \mathbb{R}_{++}$, $V^\star(L)$ solves (2.9).

(ii) For all $\pi \in (0,1]$, $L^\star(\pi)$ satisfies (2.11).

(iii) If $U^\star(\psi) > \underline{U}$, where $U^\star(\psi)$ is defined in (2.8), then $\chi^\star = 1$ and the policy $(\pi^\star, \rho^\star) \in \mathcal{S}(\psi)$ solves (2.7). Otherwise, $\chi^\star = 0$.

We solve the model by backwards induction. First, traders and investors take the issuer's acceptance rate π as given, and they determine the equilibrium trading volume $V^\star(\pi)$ and equilibrium tokenized investment $L^\star(\pi)$. Then, assuming that the issuer rationally anticipates optimal trading and investment, the issuer derives its optimal policy $(\pi^\star, \rho^\star)$. The following result solves for equilibrium trading and investment when the issuer tokenizes.

Proposition 3.1. *For any acceptance rate $\pi \in (0,1]$, there exists a unique pair*

$$(V^\star(\pi), L^\star(\pi)) \in \mathbb{R}^2_{++}$$

satisfying conditions (i) and (ii) of Definition 3.1. These are given explicitly by:

$$V^\star(\pi) = (\Pi')^{-1}\Big(\kappa\left(z(\pi)\right) + z(\pi)\,\kappa'\left(z(\pi)\right) + \gamma\Big), \tag{3.1}$$

$$L^\star(\pi) = V^\star(\pi)/z(\pi), \tag{3.2}$$

where

$$\eta(z) := \kappa(z)\cdot z \qquad \textit{and} \qquad z(\pi) := \eta^{-1}\left(\frac{\xi+\delta+\phi}{\lambda\pi}\right). \tag{3.3}$$

Moreover, $V^\star$ and $L^\star$ are $C^2((0,1])$ with $V^{\star\prime}(\pi) > 0$ and $L^{\star\prime}(\pi) > 0$ on $(0,1]$.

In equilibrium, liquidity is pinned down by equating the investor's return from liquidity provision, per unit of supplied liquidity, to the risk premium ξ that they require. The return from liquidity provision is generated by the aggregate transfer from traders to liquidity providers at the issuer's acceptance rate π, given explicitly as follows:

$$T^\star(\pi) := \lambda\pi\,\kappa(V^\star(\pi)/L^\star(\pi))\,V^\star(\pi). \tag{3.4}$$

In particular, note that the transfer (3.4) scales with the admitted flow $\lambda\pi$. A higher acceptance rate π therefore raises the investors' return. The higher return then endogenously generates higher liquidity. Both trading volume and liquidity therefore strictly increase in the acceptance rate π. The relationship between regulation and liquidity is developed in more detail in Section 4.

Next, we solve for the issuer's optimal compliance policy. The issuer rationally anticipates the trading and liquidity of Proposition 3.1 and selects its policy accordingly. The following result establishes that the issuer always has a well-defined optimal policy, and hence that an equilibrium always exists.[4]

Proposition 3.2. *An equilibrium exists. Specifically, for every regulatory cap $\psi \in (0, \psi_0)$:*

[4]Where the equilibrium is non-unique, $\pi^\star$ and $\rho^\star$ denote arbitrary equilibrium selections. In this case, all monotonicity statements of Section 4 hold in the strong set order.

(i) The issuer's problem (2.7) admits a maximizer $(\pi^\star, \rho^\star) \in \mathcal{S}(\psi)$, and the supremum $U^\star(\psi)$ in (2.8) is attained.

(ii) The issuer's tokenization decision is well-defined: $\chi^\star = 1$ if $U^\star(\psi) > \underline{U}$ and $\chi^\star = 0$ otherwise.

(iii) If $\chi^\star = 1$, then the equilibrium trading volume and investment $V^\star(\pi^\star)$ and $L^\star(\pi^\star)$ are characterized in Proposition 3.1.

4 Results

We now study how regulatory stringency shapes the tokenized market. The regulator caps the intensity of admitted illicit trading at the level ψ, so a lower cap corresponds to tighter regulation. We establish three main results. The first is that tighter regulation reduces token liquidity (Proposition 4.1). The second is that sufficiently tight regulation renders tokenization non-viable (Proposition 4.5). The third is that the effect of regulation is asset-specific: a common level of stringency can leave one asset viable while rendering another non-viable (Propositions 4.8 and 4.9).

4.1 Regulation and liquidity

Proposition 4.1. *Equilibrium liquidity $L^\star(\pi^\star(\psi))$ is strictly increasing in the regulatory cap ψ. Equivalently, tighter regulation (a lower cap ψ) strictly reduces token liquidity.*

Proposition 4.1 establishes the relationship between regulation and liquidity, namely that tighter regulation reduces liquidity in the tokenized market. The underlying channel is that tighter regulation (i.e., lower ψ) endogenously leads the token issuer to reduce the flow of admitted traders $\lambda\pi^\star(\psi)$. This then lowers the aggregate transfer $T^\star(\pi^\star(\psi))$ from traders to liquidity providers, which reduces equilibrium liquidity provision $L^\star(\pi^\star(\psi))$. We formalize this intuition with Propositions 4.2–4.4. More explicitly, Proposition 4.2 establishes that the

issuer's optimal acceptance rate $\pi^\star(\psi)$ falls as regulation tightens, implying that the flow of admitted traders $\lambda\pi^\star(\psi)$ also falls. Proposition 4.3 then establishes that a lower acceptance rate π lowers the aggregate transfer to liquidity providers $T^\star(\pi)$. Finally, Proposition 4.4 establishes that equilibrium liquidity $L^\star(\pi)$ is proportional to that aggregate transfer.

Proposition 4.2. *The issuer's optimal acceptance rate $\pi^\star(\psi)$ is strictly increasing in the regulatory cap ψ.*

Proposition 4.2 establishes that tighter regulation (i.e., lower ψ) lowers the issuer's optimal acceptance rate $\pi^\star(\psi)$. The issuer prefers to admit a larger flow of traders because a higher acceptance rate π raises liquidity and thereby fee revenue. The regulatory cap, however, limits the flow of illicit traders the issuer can admit while remaining compliant. A tighter cap (i.e., a lower ψ) lowers that limit, causing the issuer to lower the acceptance rate $\pi^\star(\psi)$ and thereby the admitted illicit flow $(1-\mu)\lambda\, q_I(\rho, \pi^\star(\psi))$.

Proposition 4.3. *The aggregate transfer to liquidity providers $T^\star(\pi)$, defined in (3.4), is strictly increasing in the acceptance rate π.*

Proposition 4.3 establishes that a higher acceptance rate π raises the aggregate transfer to liquidity providers $T^\star(\pi)$. The intuition is that liquidity providers receive yield through fees and price impact from admitted traders. A higher acceptance rate π implies a larger flow of traders $\lambda\pi$ which leads to a larger aggregate transfer $T^\star(\pi)$ to liquidity providers.

Proposition 4.4. *Equilibrium liquidity $L^\star(\pi)$ is proportional to the aggregate transfer to liquidity providers $T^\star(\pi)$, given explicitly as follows:*

$$L^\star(\pi) = \frac{T^\star(\pi)}{\xi + \delta + \phi}. \tag{4.1}$$

Proposition 4.4 establishes that equilibrium liquidity $L^\star(\pi)$ is proportional to the aggregate transfer $T^\star(\pi)$. This result arises from the competitive liquidity provision condition (2.11), which equates the equilibrium return from liquidity provision with the required risk

premium. Notably, since liquidity provider returns are proportional to the transfer $T^\star(\pi)$ per unit capital invested $L^\star(\pi)$, the transfer $T^\star(\pi)$ and the liquidity provision level $L^\star(\pi)$ necessarily co-move in equilibrium.

To summarize, tighter regulation lowers the issuer's optimal acceptance rate $\pi^\star(\psi)$ (Proposition 4.2). A lower acceptance rate $\pi^\star(\psi)$ then lowers the aggregate transfer to liquidity providers $T^\star(\pi^\star(\psi))$ (Proposition 4.3). Since equilibrium liquidity $L^\star(\pi^\star(\psi))$ is proportional to that transfer in equilibrium (Proposition 4.4), equilibrium liquidity falls as well. Tighter regulation therefore reduces token liquidity (Proposition 4.1).

4.2 Viability of tokenization

We turn next to the viability of tokenization.

Proposition 4.5. *There is a threshold $\psi^\star \in (0, \psi_0)$ such that no equilibrium involves tokenization ($\chi^\star = 0$) whenever regulation is stricter than the threshold ($\psi < \psi^\star$). Equivalently, sufficiently tight regulation renders tokenization non-viable.*

Proposition 4.5 establishes that tokenization is non-viable when regulation is sufficiently strict (i.e., $\chi^\star = 0$ when $\psi < \psi^\star$). The reason is that sufficiently strict regulation forces the issuer's equilibrium profit $U^\star(\psi)$ below its opportunity cost, implying that the issuer optimally refrains from tokenizing (i.e., $\chi^\star = 0$). This result arises because the issuer cannot rely on screening alone to remain compliant and therefore must lower the acceptance rate π to the point where tokenization is less profitable than its opportunity cost. We formalize this intuition with Propositions 4.6 and 4.7. In Proposition 4.6, we show that the issuer's optimal acceptance rate $\pi^\star(\psi)$ declines to zero as regulation becomes arbitrarily strict (i.e., as $\psi \to 0^+$), and that the issuer's equilibrium profit declines to zero along with it (i.e., $\lim_{\psi \to 0^+} U^\star(\psi) = 0$). This decline in equilibrium profit arises because a vanishing acceptance rate drives equilibrium liquidity, and hence issuer fee revenue, to zero (i.e., $\phi L^\star(\pi^\star(\psi)) \to 0$). Proposition 4.7 then explains why the issuer's optimal acceptance rate $\pi^\star(\psi)$ declines to zero

by demonstrating that the optimal screening precision is bounded by a finite threshold $\bar{\rho}$. The finite threshold $\bar{\rho}$ for screening precision implies that the optimal acceptance rate $\pi^\star(\psi)$ vanishes with regulatory stringency (i.e., as $\psi \to 0^+$) because regulatory compliance implies that the maximal feasible acceptance rate vanishes as regulation tightens, and thus the optimal acceptance rate must also vanish.

Proposition 4.6. *As regulation tightens, the issuer's optimal acceptance rate and equilibrium profit both vanish: every solution $(\pi^\star(\psi), \rho^\star(\psi))$ to the issuer's problem (2.7) satisfies*

$$\lim_{\psi \to 0^+} \pi^\star(\psi) = 0 \qquad \textit{and} \qquad \lim_{\psi \to 0^+} U^\star(\psi) = 0. \tag{4.2}$$

Proposition 4.6 establishes that tightening regulation (i.e., lower ψ) drives both the issuer's optimal acceptance rate $\pi^\star(\psi)$ and its equilibrium profit $U^\star(\psi)$ to zero. Equilibrium profit vanishes because the acceptance rate vanishes. In particular, as the acceptance rate $\pi^\star(\psi)$ vanishes, the flow of admitted traders falls, which drives equilibrium liquidity, and hence issuer fee revenue, to zero (i.e., $\phi L^\star(\pi^\star(\psi)) \to 0$). Then, since equilibrium profit cannot exceed fee revenue (i.e., $U^\star(\psi) \leq \phi L^\star(\pi^\star(\psi))$), equilibrium profit declines to zero as well.

Proposition 4.7. *The issuer's optimal screening precision is uniformly bounded: there is a finite $\bar{\rho}$ such that every solution to (2.7) satisfies $\rho^\star(\psi) < \bar{\rho}$ for all $\psi > 0$. Moreover, the largest acceptance rate feasible with precision at most $\bar{\rho}$,*

$$\pi_{\sup}(\psi; \bar{\rho}) := \sup\{\pi \in (0, 1] : (\pi, \rho) \in \mathcal{S}(\psi) \textit{ for some } \rho \leq \bar{\rho}\}, \tag{4.3}$$

vanishes as regulation tightens:

$$\lim_{\psi \to 0^+} \pi_{\sup}(\psi; \bar{\rho}) = 0. \tag{4.4}$$

Proposition 4.7 demonstrates that the optimal screening precision $\rho^\star(\psi)$ is uniformly bounded and that this implies the issuer's maximum feasible acceptance rate π vanishes

as regulation tightens (i.e., as $\psi \to 0^+$) thereby implying that the optimal acceptance rate $\pi^\star(\psi)$ also vanishes. The screening precision is bounded because the issuer can always earn positive profit at no screening cost (by setting $\rho = 1$), so it would never screen at a precision whose cost would exceed the most it could earn. Because the issuer will not screen beyond this upper bound $\bar{\rho}$, it can maintain regulatory compliance only by admitting fewer traders, so the acceptance rate π it can sustain shrinks as the cap tightens. More explicitly, the regulatory constraint (2.4) implies the following upper bound

$$\pi \leq \frac{\mu\rho + (1-\mu)}{(1-\mu)\lambda}\,\psi, \tag{4.5}$$

which, evaluated at $\bar{\rho}$, provides the cruder bound

$$\pi \leq \frac{\mu\bar{\rho} + (1-\mu)}{(1-\mu)\lambda}\,\psi \tag{4.6}$$

for the acceptance rate π. This bound vanishes as the regulatory cap goes to zero (i.e., as $\psi \to 0^+$), implying that any feasible acceptance rate π goes to zero and therefore so too does the optimal acceptance rate $\pi^\star(\psi)$.

To summarize, the issuer does not tokenize if regulation is too strict. The issuer would never screen above a finite precision $\bar{\rho}$, so the maximal feasible acceptance rate vanishes as regulation tightens (Proposition 4.7). Since the optimal acceptance rate must remain feasible, it vanishes as well, and with it the issuer's equilibrium profit (Proposition 4.6). Then, since the issuer has a positive opportunity cost, sufficiently tight regulation renders tokenization non-viable (Proposition 4.5).

4.3 Asset-specificity of the viability threshold

Section 4.2 shows that tokenization is non-viable when regulation is sufficiently strict. We now show that a common regulatory policy can keep tokenization viable for one asset while rendering it non-viable for another. Specifically, we study how the asset's market character-

istics affect the level of stringency that the tokenized market can withstand. Two families of characteristics shape this level, and we take them in turn: those that govern the liquidity of the tokenized market (Proposition 4.8), and those that govern the cost of complying with the regulatory cap (Proposition 4.9).

Proposition 4.8. *The regulatory cap $\psi^\star$ below which tokenization becomes non-viable is weakly increasing in the risk premium ξ required by investors, the adverse-selection cost δ borne by investors, and the value γ extracted from traders.*

Proposition 4.8 establishes that a security that commands a larger onchain risk premium ξ withstands less regulatory stringency before tokenization becomes non-viable. This is because the risk premium is the return investors require on each unit of liquidity they supply. As a result, investors decrease equilibrium investment until the return from liquidity provision rises to meet the larger premium. In turn, a thinner tokenized market earns the issuer less fee revenue, and hence lowers the issuer's equilibrium profit $U^\star(\psi)$, irrespective of the level of regulation. As a result, the viability threshold $\psi^\star$ rises: a lower profit makes it harder for the issuer to cover its opportunity cost, so a looser cap is necessary to raise the issuer's profit and preserve the viability of tokenization.

Proposition 4.8 also establishes that a security withstands less regulatory stringency when its liquidity providers bear a larger adverse-selection cost δ and when more value γ is extracted from its traders. This is because each cost reduces the equilibrium liquidity of the tokenized market, so the issuer earns less fee revenue and, by the channel described above, the viability threshold $\psi^\star$ rises.

The two frictions described in Proposition 4.8 reduce the liquidity of the tokenized market through the following economic channels. First, a higher adverse selection cost δ lowers the net return that liquidity providers earn on the trading flow they intermediate, so they require a higher transfer from traders per unit of supplied liquidity. As a result, investors decrease equilibrium investment. Second, a higher value γ extracted from traders raises the cost of trading each unit of the tokenized asset, so traders trade smaller volumes (Proposition 3.1).

Smaller volumes shrink the transfer that rewards liquidity provision, thereby thinning the market in equilibrium (see Cartea et al. (2025)).

Proposition 4.9. *The viability threshold $\psi^\star$ is weakly decreasing in the share μ of legitimate traders and weakly increasing in any pointwise increase of the screening-cost schedule $\mathcal{C}$.*

Proposition 4.9 establishes that a tokenized asset whose traders are more likely to be legitimate and whose trading is cheaper to screen withstands more regulatory stringency. This is because each of these properties lowers the issuer's cost of complying with the regulatory cap, raising its equilibrium profit $U^\star(\psi)$ irrespective of the level of regulation. Since the issuer tokenizes only while profit from tokenization covers its opportunity cost $\underline{U}$, cheaper compliance keeps tokenization worthwhile under tighter regulation.

The two properties in Proposition 4.9 lower the issuer's cost of complying through distinct channels: one lowers the precision that compliance requires, and the other lowers the cost of attaining any given precision. First, a larger share of legitimate traders (a higher μ) leaves fewer illicit traders to screen out, so, at any acceptance rate, the issuer complies with the cap at a lower precision ρ. Second, a cheaper screening technology (a pointwise lower schedule $\mathcal{C}$) reduces the cost $\mathcal{C}(\rho)$ of whatever precision the issuer chooses.

To summarize, an asset's market frictions reduce the liquidity, and hence the revenue, of its tokenized market (Proposition 4.8), while a larger share of illicit traders or a costlier screening technology raises the cost of complying (Proposition 4.9). Both lower the issuer's profit, so tokenization requires looser regulation to be a viable investment. The effect of regulatory stringency on tokenization is therefore asset-specific, so the appropriate regulatory policy, and the case for exemptions, varies by asset.

5 Conclusion

The transfer of tokenized securities must comply with securities laws, and how stringently that compliance is enforced is a regulatory choice. We develop an equilibrium model of

a tokenized securities market to evaluate the trade-off that this choice creates. Stricter enforcement reduces the admitted flow of illicit trades, but tighter regulation also reduces the liquidity of the tokenized market, and sufficiently strict regulation renders tokenization commercially non-viable. Moreover, the level of stringency that tokenization withstands varies by asset: a security that is cheaper to hold, trade, and screen remains viable under tighter regulation.

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A Proofs

A.1 Equilibrium characterization

A.1.1 Trading volume and investment

We first prove preliminary results underlying the equilibrium characterization, then prove Proposition 3.1.

Lemma A.1. *The function $\eta : \mathbb{R}_+ \to \mathbb{R}_+$ defined by $\eta(z) := \kappa(z) \cdot z$ is a bijection.*

Proof. Use $\kappa > 0$ and $\kappa' > 0$, to write

$$\eta'(z) = \kappa(z) + z\,\kappa'(z) > 0 \qquad \text{for all } z > 0. \tag{A.1}$$

Equation (A.1) implies that η is strictly increasing, and hence, η is injective. The intermediate value theorem, with $\eta(0) = 0$ and $\lim_{z\to\infty} \eta(z) = +\infty$ (since $\eta(z) \geq z\,\kappa(1)$ for $z \geq 1$ and $\kappa(1) > 0$), implies η maps $\mathbb{R}_+$ onto $\mathbb{R}_+$. Therefore η is a bijection. □

Lemma A.2. *For any $L > 0$, the solution to (2.9) is unique and satisfies*

$$\Pi'(V^\star(L)) = \kappa\left(\frac{V^\star(L)}{L}\right) + \frac{V^\star(L)}{L}\,\kappa'\left(\frac{V^\star(L)}{L}\right) + \gamma. \tag{A.2}$$

Proof. Use $\Pi'' < 0$ and $\kappa'' > 0$, to obtain that the objective (2.9) is strictly concave in V. Its derivative is

$$D(V) := \Pi'(V) - \kappa(V/L) - (V/L)\,\kappa'(V/L) - \gamma. \tag{A.3}$$

The assumptions $\lim_{V\to 0^+}\Pi'(V) = +\infty$ and $\kappa(0) + \gamma < \infty$, together with $\kappa'(0) < \infty$ give

$$\lim_{V\to 0^+} D(V) = +\infty. \tag{A.4}$$

The assumptions $\kappa' > 0$ and $\kappa'' > 0$ give $\kappa(V/L) \to +\infty$ as $V \to +\infty$. Moreover, $\Pi'' < 0$ makes Π' decreasing and hence bounded above. Therefore

$$\lim_{V\to +\infty} D(V) = -\infty. \tag{A.5}$$

D is continuous because Π', κ, and κ' are continuous. Moreover, strict concavity of the objective makes D strictly decreasing, so the intermediate value theorem, with (A.4) and (A.5), gives a unique $V^\star(L) \in (0, \infty)$ with

$$D(V^\star(L)) = 0, \tag{A.6}$$

which gives (A.2) and proves the result. □

Proof of Proposition 3.1. Substitute $z = V/L$ into (2.10)-(2.11) to obtain

$$\eta(z) = \frac{\xi + \delta + \phi}{\lambda\pi}. \tag{A.7}$$

Lemma A.1 implies (A.7) has the unique solution $z(\pi)$ in (3.3). Use the assumptions

$$\lim_{V\to 0^+} \Pi'(V) = +\infty \qquad \text{and} \qquad \lim_{V\to+\infty} \Pi'(V) = 0,$$

and that Π' is continuous and strictly decreasing ($\Pi'' < 0$), to obtain that Π' is a strictly decreasing bijection from $(0,\infty)$ onto $(0,\infty)$. Thus, $(\Pi')^{-1}$ is defined on all of $(0,\infty)$. Next, because $z(\pi) > 0$ and $\kappa' > 0$, the argument $\kappa(z(\pi)) + z(\pi)\,\kappa'(z(\pi)) + \gamma$ is finite and strictly positive, hence lies in $(0,\infty)$. Lemma A.2 and $\Pi'' < 0$ therefore give $V^\star(\pi)$ as the unique solution (3.1), which is well-defined for every $\pi \in (0,1]$, and $L^\star(\pi) = V^\star(\pi)/z(\pi)$ gives (3.2). The formulas (3.1)–(3.3) and the infinite differentiability of Π and κ imply $V^\star$ and $L^\star$ are $C^2((0,1])$. Equation (3.3) and $\eta' > 0$ (see (A.1)) give

$$z'(\pi) < 0. \tag{A.8}$$

The assumptions $\kappa' > 0$ and $\kappa'' > 0$ give $\eta''(z) = 2\kappa'(z) + z\kappa''(z) > 0$, so η' is strictly increasing. Equation (3.1), (A.8), the strict monotonicity of η', and $\Pi'' < 0$ give

$$V^{\star\prime}(\pi) > 0. \tag{A.9}$$

Equations (A.8) and (A.9), with (3.2), give

$$L^{\star\prime}(\pi) = \frac{V^{\star\prime}(\pi)\,z(\pi) - V^\star(\pi)\,z'(\pi)}{z(\pi)^2} > 0. \tag{A.10}$$

Conditions (i) and (ii) of Definition 3.1 follow by substitution. □

A.1.2 Issuer policy

We first prove a preliminary result, then prove Proposition 3.2.

Lemma A.3. *Define* $U : (0,1] \times [1,\infty) \to \mathbb{R}$ *by*

$$U(\pi,\rho) := \phi\, L^\star(\pi) - \mathcal{C}(\rho), \tag{A.11}$$

where $L^\star(\pi)$ *is given in* (3.2)*. Then:*

(i) U *is continuous on* $(0,1] \times [1,\infty)$*.*

(ii) $\lim_{\rho\to\infty} U(\pi,\rho) = -\infty$ *for all* $\pi \in (0,1]$*.*

(iii) $\lim_{\pi\to 0^+} U(\pi,\rho) = -\mathcal{C}(\rho)$ *for all* $\rho \geq 1$*.*

Proof. To prove part (i), use that $\mathcal{C}$ is continuous and $L^\star$ is continuous by (3.1)–(3.3). Thus, U is continuous on $(0,1] \times [1,\infty)$. To prove part (ii), use that $\mathcal{C}' > 0$ and $\mathcal{C}'' > 0$ to obtain $\mathcal{C}'(\rho) \geq \mathcal{C}'(1) > 0$ for all $\rho \geq 1$, hence

$$\lim_{\rho\to\infty} \mathcal{C}(\rho) = +\infty. \tag{A.12}$$

For fixed π, $\phi L^\star(\pi)$ is finite, so (A.12) gives

$$\lim_{\rho\to\infty} U(\pi,\rho) = -\infty.$$

To prove part (iii), use (3.3) to obtain

$$\lim_{\pi\to 0^+} z(\pi) = +\infty. \tag{A.13}$$

Equation (A.13), with (3.1) and (3.2), gives

$$\lim_{\pi\to 0^+} V^\star(\pi) = 0 \qquad \text{and} \qquad \lim_{\pi\to 0^+} L^\star(\pi) = 0. \tag{A.14}$$

Thus, $\phi L^\star(\pi)$ goes to zero as $\pi \to 0^+$, and we conclude

$$\lim_{\pi \to 0^+} U(\pi, \rho) = -\mathcal{C}(\rho).$$

□

Proof of Proposition 3.2. Define $\bar{\rho} := \mathcal{C}^{-1}\big(\phi L^\star(1)\big)$,[5] which is finite because $\mathcal{C}(1) = 0$, $\mathcal{C}' > 0$, and (A.12) make $\mathcal{C}$ a strictly increasing bijection from $[1, \infty)$ onto $[0, \infty)$.

We first prove part (i), i.e., that the supremum $U^\star(\psi)$ in (2.8) is attained. The policy $(\underline{\pi}(\psi), 1)$, where $\underline{\pi}(\psi) := \psi/\psi_0$, is costless, lies in $\mathcal{S}(\psi)$, and yields

$$U(\underline{\pi}(\psi), 1) = \phi L^\star(\underline{\pi}(\psi)) > 0.$$

Thus, by optimality of $U^\star$ we write

$$U^\star(\psi) \geq U(\underline{\pi}(\psi), 1) > 0.$$

For $\rho > \bar{\rho}$, the bound

$$\mathcal{C}(\rho) > \phi L^\star(1) \geq \phi L^\star(\pi)$$

gives $U(\pi, \rho) < 0$. For $\pi < \underline{\pi}(\psi)$, the bound $\mathcal{C} \geq 0$ and the strict monotonicity of $L^\star$ give

$$U(\pi, \rho) \leq \phi L^\star(\pi) < \phi L^\star(\underline{\pi}(\psi)).$$

Every policy in $\mathcal{S}(\psi)$ outside the set $K(\psi) := \mathcal{S}(\psi) \cap \big([\underline{\pi}(\psi), 1] \times [1, \bar{\rho}]\big)$ therefore yields strictly less than $U(\underline{\pi}(\psi), 1)$. The set $K(\psi)$ is closed and bounded, hence compact, and nonempty because it contains $(\underline{\pi}(\psi), 1)$. Lemma A.3(i) and the extreme value theorem thus give a maximizer $(\pi^\star, \rho^\star) \in K(\psi)$ of U over $\mathcal{S}(\psi)$, so $U^\star(\psi) = U(\pi^\star, \rho^\star)$ is attained for every $\psi \in (0, \psi_0)$.

[5] The bound $\bar{\rho}$ corresponds to the bound in Proposition 4.7.

We next prove part (ii). Comparing the attained value $U^\star(\psi)$ to the opportunity cost $\underline{U}$ gives a well-defined tokenization decision: if $U^\star(\psi) > \underline{U}$ the issuer tokenizes ($\chi^\star = 1$) and deploys the maximizer from part (i); if $U^\star(\psi) \le \underline{U}$ the issuer does not tokenize ($\chi^\star = 0$), so no token is issued. Part (iii) then follows from Proposition 3.1 when $\chi^\star = 1$, while when $\chi^\star = 0$ no tokenized market forms. □

A.2 Proof of the first main result

To prove the first main result we first establish a preliminary lemma and the supporting propositions, then prove the result itself (Proposition 4.1).

Lemma A.4. *For $\psi < \psi_0$, where ψ_0 is defined in (2.6), every solution to (2.7) has the regulatory constraint (2.4) binding, so that*

$$\rho = \rho_{\min}(\pi;\psi) := \frac{1-\mu}{\mu}\left(\frac{\lambda\pi}{\psi} - 1\right), \tag{A.15}$$

and (2.7) reduces to

$$\max_{\pi\in[\underline{\pi}(\psi),\,\bar{\pi}(\psi)]} G(\pi;\psi) := \phi L^\star(\pi) - \mathcal{C}\big(\rho_{\min}(\pi;\psi)\big), \qquad \underline{\pi}(\psi) = \frac{\psi}{\psi_0}, \quad \bar{\pi}(\psi) = \mu + \frac{\psi}{\lambda}. \tag{A.16}$$

The function G has strictly increasing differences in (π,ψ), the endpoints $\underline{\pi}(\psi)$ and $\bar{\pi}(\psi)$ are strictly increasing in ψ, and $\bar{\pi}(\psi) < 1$.

Proof. The objective in (2.7) is strictly increasing in π through $L^\star$ (Proposition 3.1) and strictly decreasing in ρ through $\mathcal{C}$. Suppose the constraint (2.4) does not bind the issuer at an optimum. If $\rho > 1$, then reducing ρ raises the objective, which contradicts that we are at an optimum. If $\rho = 1$ and $\pi < 1$, then raising π is feasible and raises the objective, which also contradicts optimality. If $\rho = 1$ and $\pi = 1$, then the admitted illicit flow is

$$(1-\mu)\lambda = \psi_0 > \psi, \tag{A.17}$$

which violates (2.4). Hence (2.4) binds for $\psi < \psi_0$, and with equality it is equivalent to (A.15). Substituting (A.15) into (2.7) gives (A.16). The constraint $\rho_{\min}(\pi;\psi) \geq 1$ is equivalent to $\pi \geq \psi/\psi_0$, and the constraint (2.3) under (A.15) is equivalent to $\pi \leq \mu + \psi/\lambda$, which gives the endpoints in (A.16). Both endpoints are strictly increasing in ψ, and $\bar{\pi}(\psi) < \mu + \psi_0/\lambda = 1$. Write $B := (1-\mu)\lambda/\mu$, and use (A.15) to obtain

$$\frac{\partial \rho_{\min}}{\partial \pi} = \frac{B}{\psi}, \qquad \frac{\partial \rho_{\min}}{\partial \psi} = -\frac{B\pi}{\psi^2}. \tag{A.18}$$

Next, use (A.18) and $G = \phi L^\star - \mathcal{C}(\rho_{\min})$ to obtain

$$\frac{\partial^2 G}{\partial \pi \, \partial \psi} = \frac{B}{\psi^2}\left[\mathcal{C}''(\rho_{\min})\,\frac{B\pi}{\psi} + \mathcal{C}'(\rho_{\min})\right] > 0, \tag{A.19}$$

where the inequality uses $\mathcal{C}' > 0$ and $\mathcal{C}'' > 0$, so the function G has strictly increasing differences in (π, ψ). □

Proof of Proposition 4.2. By Lemma A.4, for $\psi < \psi_0$ the issuer maximizes $G(\pi;\psi)$ over the interval $[\underline{\pi}(\psi), \bar{\pi}(\psi)]$, whose endpoints are strictly increasing in ψ, and G has strictly increasing differences in (π, ψ) by (A.19). The interval is therefore ascending in the strong set order, so Topkis's monotonicity theorem (see Topkis (1978), Milgrom and Shannon (1994)) gives that the set of maximizers $\Pi^\star(\psi)$ is weakly increasing in ψ in the strong set order, that is, for $\psi_1 < \psi_2$,

$$\pi_1 \in \Pi^\star(\psi_1),\ \pi_2 \in \Pi^\star(\psi_2) \implies \min\{\pi_1, \pi_2\} \in \Pi^\star(\psi_1) \quad \text{and} \quad \max\{\pi_1, \pi_2\} \in \Pi^\star(\psi_2). \tag{A.20}$$

Next, we rule out $\pi_1 = \pi_2$ for any selections $\pi_1 \in \Pi^\star(\psi_1)$ and $\pi_2 \in \Pi^\star(\psi_2)$, where $\psi_1 < \psi_2$. Suppose $\pi_1 = \pi_2 =: \pi$:

- if the maximizer π is interior to $[\underline{\pi}(\psi_1), \bar{\pi}(\psi_1)]$, the first-order condition gives $\partial_\pi G(\pi;\psi_1) = 0$, so $\partial_\pi G(\pi;\psi_2) > 0$ by (A.19). Since $\pi \leq \bar{\pi}(\psi_1) < \bar{\pi}(\psi_2)$, π is not the right endpoint

at ψ_2, so $\partial_\pi G(\pi;\psi_2) > 0$ implies that G strictly increases to the right of π at ψ_2, contradicting optimality of π at ψ_2.

- if $\pi = \bar{\pi}(\psi_1)$, then since $\bar{\pi}$ is strictly increasing (Lemma A.4) $\pi < \bar{\pi}(\psi_2)$, and right-optimality at ψ_1 gives $\partial_\pi G(\pi;\psi_1) \geq 0$, so $\partial_\pi G(\pi;\psi_2) > 0$ by (A.19), so G strictly increases to the right of π at ψ_2, contradicting optimality of π at ψ_2;

- if $\pi = \underline{\pi}(\psi_1)$, then $\underline{\pi}(\psi_2) = \psi_2/\psi_0 > \psi_1/\psi_0 = \pi$, so $\pi < \underline{\pi}(\psi_2)$ lies outside the feasible interval at ψ_2, contradicting $\pi \in \Pi^\star(\psi_2)$.

Hence $\pi_1 < \pi_2$ for all such selections, which is the strict comparison in the strong set order on $(0, \psi_0)$. □

Proof of Proposition 4.4. Evaluate (2.11) using (2.10) at $L = L^\star(\pi)$, with $T^\star(\pi)$ as defined in (3.4), to obtain

$$\frac{T^\star(\pi)}{L^\star(\pi)} - \delta - \phi = \xi. \tag{A.21}$$

Equation (A.21) is equivalent to (4.1). □

Proof of Proposition 4.3. Proposition 4.4 shows that $T^\star(\pi) = (\xi + \delta + \phi)\, L^\star(\pi)$. Proposition 3.1 shows that $L^{\star\prime}(\pi) > 0$. Differentiating,

$$T^{\star\prime}(\pi) = (\xi + \delta + \phi)\, L^{\star\prime}(\pi) > 0. \tag{A.22}$$

□

Proof of Proposition 4.1. Proposition 3.1 shows that $L^\star$ is strictly increasing in π using (A.10). Proposition 4.2 shows that $\pi^\star(\psi)$ is strictly increasing in ψ on $(0, \psi_0)$. Composition of strictly increasing maps gives $L^\star(\pi^\star(\psi))$ is strictly increasing in ψ on $(0, \psi_0)$. When the optimal acceptance rate is not unique, applying the strictly increasing $L^\star$ to the strong set order comparison of Proposition 4.2 preserves it, so equilibrium liquidity is strictly increasing in ψ in the strong set order. □

A.3 Proof of the second main result

To prove the second main result we first establish a preliminary lemma and the two supporting propositions, then prove the result itself (Proposition 4.5).

Lemma A.5. *The issuer's equilibrium profit $U^\star(\psi)$ is weakly increasing in the regulatory cap ψ.*

Proof. Let $\psi_1 \le \psi_2$. The constraint (2.4) relaxes as ψ increases and (2.3) does not depend on ψ, so the feasible sets are nested:

$$\mathcal{S}(\psi_1) \subseteq \mathcal{S}(\psi_2). \tag{A.23}$$

Taking the supremum of $\phi L^\star(\pi) - \mathcal{C}(\rho)$ over the nested sets in (A.23) gives $U^\star(\psi_1) \le U^\star(\psi_2)$ using (2.8). □

Proof of Proposition 4.7. For the uniform bound, choosing $\rho = 1$ is costless ($\mathcal{C}(1) = 0$) and admits a positive acceptance rate, so $U^\star(\psi) > 0$ for every ψ. Proposition 3.1 shows that $L^\star$ is increasing, so at any solution we have

$$\mathcal{C}(\rho^\star(\psi)) = \phi L^\star(\pi^\star(\psi)) - U^\star(\psi) < \phi L^\star(\pi^\star(\psi)) \le \phi L^\star(1).$$

The assumptions $\mathcal{C}(1) = 0$, $\mathcal{C}' > 0$, and (A.12) make $\mathcal{C}$ a continuous strictly increasing bijection from $[1, \infty)$ onto $[0, \infty)$, so

$$\rho^\star(\psi) < \mathcal{C}^{-1}\big(\phi L^\star(1)\big) < \infty \qquad \text{for all } \psi. \tag{A.24}$$

For the acceptance rate limit, fix any finite $\bar\rho$ and take $(\pi, \rho) \in \mathcal{S}(\psi)$ with $\rho \le \bar\rho$. The regulatory constraint (2.4) gives

$$\pi \le \frac{\mu\rho + (1-\mu)}{(1-\mu)\lambda}\,\psi \le \frac{\mu\bar\rho + (1-\mu)}{(1-\mu)\lambda}\,\psi,$$

so take the supremum over such (π, ρ) in (4.3) to obtain

$$\pi_{\sup}(\psi; \bar{\rho}) \leq \frac{\mu\bar{\rho} + (1-\mu)}{(1-\mu)\lambda}\,\psi \xrightarrow[\psi \to 0^+]{} 0. \tag{A.25}$$

□

Proof of Proposition 4.6. By Proposition 4.7 there is a finite $\bar{\rho}$, where $\rho^\star(\psi) < \bar{\rho}$ for all ψ. Therefore, each solution $(\pi^\star(\psi), \rho^\star(\psi))$ satisfies $\rho^\star(\psi) \leq \bar{\rho}$, hence $\pi^\star(\psi) \leq \pi_{\sup}(\psi; \bar{\rho})$ by definition (see (4.3)). Proposition 4.7 also shows that $\pi_{\sup}(\psi; \bar{\rho}) \to 0$ as $\psi \to 0^+$, so we also obtain that $\pi^\star(\psi) \to 0$ as $\psi \to 0^+$. For the profit limit, use $\mathcal{C} \geq 0$ and (2.8) to write

$$U^\star(\psi) = \phi L^\star(\pi^\star(\psi)) - \mathcal{C}(\rho^\star(\psi)) \leq \phi L^\star(\pi^\star(\psi)).$$

Choosing $\rho = 1$ is costless and admits a positive acceptance rate, so $U^\star(\psi) > 0$. Since $\pi^\star(\psi) \to 0$ as $\psi \to 0^+$, (A.14) gives $\phi L^\star(\pi^\star(\psi)) \to 0$ as $\psi \to 0^+$, so $U^\star(\psi) \to 0$ as $\psi \to 0^+$. □

Proof of Proposition 4.5. Define

$$\psi^\star := \inf\{\psi > 0 : U^\star(\psi) > \underline{U}\}, \tag{A.26}$$

with the convention $\inf \emptyset = \infty$. For $\psi < \psi^\star$, the infimum gives

$$U^\star(\psi) \leq \underline{U},$$

so $\chi^\star = 0$ by Definition 3.1. That is, no equilibrium involves tokenization. Proposition 4.6 gives

$$\lim_{\psi \to 0^+} U^\star(\psi) = 0,$$

and $\underline{U} > 0$, so there exists $\bar{\psi} > 0$ such that $U^\star(\psi) < \underline{U}$ for all $\psi \in (0, \bar{\psi})$. Use (A.26) to obtain $\psi^\star \geq \bar{\psi} > 0$.

For $\psi < \psi_0$, the policy $(\bar{\pi}(\psi), \rho_{\min}(\bar{\pi}(\psi); \psi))$ lies in $\mathcal{S}(\psi)$, and $\rho_{\min}(\bar{\pi}(\psi); \psi) = \psi_0/\psi$. Use (2.8) to obtain

$$U^\star(\psi) \geq \phi L^\star(\bar{\pi}(\psi)) - \mathcal{C}(\psi_0/\psi).$$

As $\psi \uparrow \psi_0$, the right-hand side converges to $\phi L^\star(1) - \mathcal{C}(1) = \phi L^\star(1) > \underline{U}$, using $\mathcal{C}(1) = 0$, the continuity of $L^\star$ and $\mathcal{C}$, and the restriction $\underline{U} < \phi L^\star(1)$. Hence $U^\star(\psi) > \underline{U}$ on a left-neighborhood of ψ_0, so (A.26) gives $\psi^\star < \psi_0$. Therefore $\psi^\star \in (0, \psi_0)$. Moreover, use Lemma A.5 to obtain that $U^\star$ is weakly increasing, so $U^\star(\psi) > \underline{U}$ for every $\psi > \psi^\star$. Thus, every equilibrium involves tokenization above the threshold, and the interval of regulatory caps such that tokenization is viable contains $(\psi^\star, \infty)$. □

A.4 Proof of the third main result

To prove the third main result we first establish a preliminary lemma, then prove the two propositions on which it rests (Propositions 4.8 and 4.9).

Lemma A.6. *Let θ denote a primitive of the model, and write $U^\star(\psi; \theta)$ for the issuer's equilibrium profit (2.8) and $\psi^\star(\theta)$ for the viability threshold (A.26) as functions of θ. If $U^\star(\psi; \theta)$ is weakly increasing in θ at every regulatory cap ψ, then $\psi^\star(\theta)$ is weakly decreasing in θ. If $U^\star(\psi; \theta)$ is weakly decreasing in θ at every regulatory cap ψ, then $\psi^\star(\theta)$ is weakly increasing in θ.*

Proof. Suppose $U^\star(\psi; \theta)$ is weakly increasing in θ at every regulatory cap ψ, and let $\theta_1 \leq \theta_2$, so that

$$U^\star(\psi; \theta_1) \leq U^\star(\psi; \theta_2) \qquad \text{for every } \psi > 0. \tag{A.27}$$

Equation (A.27) implies the nesting of sets

$$\{\psi > 0 : U^\star(\psi; \theta_1) > \underline{U}\} \subseteq \{\psi > 0 : U^\star(\psi; \theta_2) > \underline{U}\}, \tag{A.28}$$

since any ψ in the left-hand set of (A.28) satisfies $U^\star(\psi; \theta_2) \geq U^\star(\psi; \theta_1) > \underline{U}$ by (A.27). The

threshold (A.26) is the infimum of the set, and the infimum of a larger set is no larger, so (A.28) implies

$$\psi^\star(\theta_2) \le \psi^\star(\theta_1). \tag{A.29}$$

Equation (A.29) establishes that $\psi^\star(\theta)$ is weakly decreasing in θ. The case where $U^\star(\psi;\theta)$ is weakly decreasing in θ follows by exchanging the roles of θ_1 and θ_2 in (A.27)–(A.29). □

Proof of Proposition 4.8. Write $w := \xi + \delta + \phi$ for the wedge appearing in the liquidity-provision return. We first show that equilibrium liquidity $L^\star(\pi)$ is strictly decreasing in w and in γ at every acceptance rate $\pi \in (0, 1]$.

By (3.3), $z(\pi)$ is given by

$$z(\pi) = \eta^{-1}\big(w/(\lambda\pi)\big). \tag{A.30}$$

Equation (A.1) gives η strictly increasing, so (A.30) gives $z(\pi)$ strictly increasing in w. By (3.1),

$$V^\star(\pi) = (\Pi')^{-1}\big(\eta'(z(\pi)) + \gamma\big), \qquad \eta'(z) = \kappa(z) + z\kappa'(z). \tag{A.31}$$

The assumptions $\kappa' > 0$ and $\kappa'' > 0$ give

$$\eta''(z) = 2\kappa'(z) + z\kappa''(z) > 0, \tag{A.32}$$

so η' is strictly increasing by (A.32), and $(\Pi')^{-1}$ is strictly decreasing by $\Pi'' < 0$. Equation (A.31) then gives $V^\star(\pi)$ strictly decreasing in $z(\pi)$ and strictly decreasing in γ. With $z(\pi)$ strictly increasing in w from (A.30), $V^\star(\pi)$ is strictly decreasing in w. By (3.2), $L^\star(\pi) = V^\star(\pi)/z(\pi)$, whose numerator is strictly decreasing in w and whose denominator is strictly increasing in w, so

$$L^\star(\pi) \text{ is strictly decreasing in } w. \tag{A.33}$$

Since $z(\pi)$ does not depend on γ by (A.30), (3.2) and the dependence of $V^\star(\pi)$ on γ in (A.31)

give

$$L^\star(\pi) \text{ is strictly decreasing in } \gamma. \tag{A.34}$$

Because $w = \xi + \delta + \phi$, Equations (A.33) and (A.34) give $L^\star(\pi)$ strictly decreasing in each of ξ, δ, and γ.

The frictions ξ, δ, γ enter the issuer's problem (2.7) only through $L^\star$, as neither the screening cost $\mathcal{C}$ nor the feasible set $\mathcal{S}(\psi)$ depends on them. Equations (A.33) and (A.34) therefore give, through the issuer's equilibrium profit (2.8),

$$U^\star(\psi) \text{ is weakly decreasing in each of } \xi,\ \delta,\ \gamma \text{ at every regulatory cap } \psi. \tag{A.35}$$

Equation (A.35) and Lemma A.6 give $\psi^\star$ weakly increasing in each of ξ, δ, and γ. □

Proof of Proposition 4.9. We treat the screening-cost schedule $\mathcal{C}$ and the legitimate share μ in turn, in each case signing the effect on the issuer's equilibrium profit (2.8) at every regulatory cap ψ and applying Lemma A.6.

Screening cost. Let $\widetilde{\mathcal{C}} \geq \mathcal{C}$ pointwise. Neither $L^\star$ nor the feasible set $\mathcal{S}(\psi)$ depends on the screening-cost schedule, so for every (π, ρ)

$$\phi L^\star(\pi) - \widetilde{\mathcal{C}}(\rho) \leq \phi L^\star(\pi) - \mathcal{C}(\rho). \tag{A.36}$$

Taking the supremum of (A.36) over $(\pi, \rho) \in \mathcal{S}(\psi)$ in (2.8) gives $U^\star(\psi)$ weakly lower under $\widetilde{\mathcal{C}}$ at every regulatory cap ψ, so Lemma A.6 gives $\psi^\star$ weakly increasing in a pointwise increase of $\mathcal{C}$.

Legitimate share. Let $\mu_1 \leq \mu_2$. We first show the feasible sets are nested,

$$\mathcal{S}(\psi; \mu_1) \subseteq \mathcal{S}(\psi; \mu_2), \tag{A.37}$$

and fix $(\pi, \rho) \in \mathcal{S}(\psi; \mu_1)$. The feasibility bound (2.3) has right-hand side

$$\mu + \frac{1-\mu}{\rho} = \mu\Big(1 - \frac{1}{\rho}\Big) + \frac{1}{\rho}, \tag{A.38}$$

which is nondecreasing in μ since $\rho \geq 1$, so (2.3) continues to hold at μ_2. The regulatory bound (2.4) has left-hand side

$$\frac{(1-\mu)\lambda\pi}{\mu\rho + 1 - \mu} = \frac{(1-\mu)\lambda\pi}{1 + \mu(\rho - 1)}, \tag{A.39}$$

whose numerator is decreasing in μ and whose denominator is nondecreasing in μ (as $\rho \geq 1$), so (A.39) is nonincreasing in μ and (2.4) continues to hold at μ_2. Hence $(\pi, \rho) \in \mathcal{S}(\psi; \mu_2)$, which establishes (A.37). The objective does not depend on μ: by (3.3) the ratio $z(\pi)$ depends on the primitives only through $(\xi + \delta + \phi)/(\lambda\pi)$, so (3.1) and (3.2) give

$$L^\star(\pi) \text{ is independent of } \mu. \tag{A.40}$$

By (A.37) and (A.40), taking the supremum of the μ-independent objective (2.8) over the larger set $\mathcal{S}(\psi; \mu_2)$ gives $U^\star(\psi)$ weakly increasing in μ at every regulatory cap ψ. Lemma A.6 then gives $\psi^\star$ weakly decreasing in μ. □