Direct Listing or IPO?
The Anatomy of the Going-Public Market

Miles Zheng*

First Draft: February 29, 2020; This Draft: December 31, 2020

Abstract

This paper analyzes the impact of direct listing (DL) innovation on firms' going public decisions and the welfare consequences. Under adverse selection, DL and IPO markets cater to different types of firms. DL market is more vulnerable to breakdown. Imposing certification intermediaries is essential in maintaining a well-functioning DL market, which leads to more firm entry into the public market and improved social welfare. DL firms and intermediaries enjoy welfare gains, while public investors may face higher risks. The model rationalizes firm heterogeneity in the U.K. DL and IPO markets, low firm participation in the U.S. DL market, and investment banks' support for DL. The paper implies that better-developed private capital and stock trading markets motivate DL innovation. The paper also highlights the benefits of going-public other than capital-raising, the severe informational frictions in the going-public market, and the importance of regulation in protecting public investors and preventing market failure.

Keywords: Direct Listing, Adverse Selection, Certification, Financial Innovation, Regulation
JEL Codes: G24, G32

---

* Department of Finance, University of Illinois at Urbana-Champaign, Champaign, IL, 61820. E-mail: yzheng60@illinois.edu. I am grateful to Dimitrios Gounopoulos, Sean Higgins, Jiekun Huang, Matthias Lassak, Liheng Lei, Josh Lerner, Sida Li, Xiongshi Li, Shushu Liang, Angela Ma, Andrea Passalacqua, George Pennacchi, Joshua Pollet, Vincent Skiera, Fred Sun, Adi Sunderam, Jialan Wang, Yufeng Wu, Mao Ye, and participants at the HBS Entrepreneurship Ph.D. seminar, UIUC Brownbag, 17th Corporate Finance Day, and 2020 Boca Corporate Finance and Governance Conference for helpful discussions and suggestions. All errors are my own responsibility. Comments welcome.

1. Introduction

Going public is one of the most significant events in a firm's lifetime. In the U.S., firms traditionally go public through the initial public offering (IPO). In 2018, the Securities and Exchange Commission (SEC) approved an innovative going-public mechanism: direct listing (DL). The distinctions between DL and IPO markets provide an anatomy of the going-public market on the market functions for firms and the role of investment banks (Figure 1). First, the DL market decouples capital-raising from going public, where DL firms can choose to list only existing shares without raising capital.[1] Second, the DL market features disintermediation. In IPO, investment banks act as underwriters and perform three valuable functions: underwriting, distribution, and advising (Baron 1982). In comparison, investment banks only act as financial advisors in the DL market, and an opening auction in the listing stock exchange directly matches buy and sell orders, determining the initial trading price and allocating shares.

Insert Figure 1 about Here

Although wide interests and hot debates are around the DL market, research on this topic is scarce, and several important questions related to the economics of DL remain unanswered. What underlying economic factors drive DL innovation, does it solve any market inefficiencies, and does it create new ones? How does it affect firms' going-public decisions, and what are the welfare consequences? How do policy interventions affect market outcomes?

This paper provides both theoretical and empirical analyses to address these questions. I first develop a theoretical framework of DL in an environment with adverse selection and then test the model predictions using observations from U.S. and U.K. public markets, where firms have the choice of going public through DL or IPO. The model rationalizes several important empirical patterns, including firm heterogeneity in the U.K. DL and IPO markets, low firm participation in the U.S. DL market, and investment banks' support for DL. These results have crucial implications on the origin of DL innovation and the going-public market regulations.

[1] The initial approval of SEC on February 2, 2018 only allows direct listing firms to list existing shares, also called "Selling Shareholder Direct Floor Listing," available at https://www.sec.gov/rules/sro/nyse/2018/34-82627.pdf. The approval of SEC on December 22, 2020 allows direct listing firms to raise capital, also called "Primary Direct Floor Listing," available at https://www.sec.gov/rules/other/2020/34-90768.pdf. In this paper, "DL" generally refers to the Direct Listing market without raising capital. I refer to the Direct Listing market with Raising capital as the "DLR" market.

The DL framework has three new features relative to prior IPO literature. First, it introduces a two-dimensional firm heterogeneity. In addition to "quality," another heterogeneity introduced in this paper is "optimal firm size," reflecting *firm boundaries* (Coase 1937) or *span of control* (Lucas 1978). As a result, at the going-public stage, firms differ in "quality" and "opportunity," which affect valuation. On the opportunity dimension, some firms still have growth opportunities and demand capital (growth firms), while others have raised enough capital from private fundraising and reached optimal firm size (late-stage firms). Firms have private information about their types that public investors do not know. The second feature is the investment banking services. Certification service reveals firm types to public investors, reflecting investment banks' certification role (Booth and Smith 1986, Chemmanur and Fulghieri 1994, Brau and Fawcett 2006). Advisory service only assists firms in preparing for going public. In the baseline model, an investment bank provides both services in the IPO market and only advisory service in the DL market. The third feature is the unbundled roles of capital-raising and going public. Capital-raising deepens firm investment. Going public brings a tradeoff: public listing increases firm value,[2] while firm failure incurs deadweight losses.[3]

In this framework, adverse selection motivates the formation of certification intermediaries. In the benchmark symmetric information scenario, good growth firms (G/GR firms) go public and raise capital, good late-stage firms (G/LS firms) only go public, and bad firms remain private. Capital allocation is efficient, and there is no demand for certification. However, adverse selection leads to cross-subsidization or market breakdown (Akerlof 1970). In the IPO market, the investment bank certifies firm types. Under certain conditions, G/GR firms go public and raise capital through IPO, while other types of firms stay private. The equilibrium outcome that G/LS firms stay private is consistent with recent literature showing that more and

[2] There are several benefits of public listings: increased stock liquidity reduces illiquidity premium (Amihud and Mendelson 1986) and facilitate existing shareholders to diversify equity holdings and exit (Gompers and Lerner 1999); more information aggregated in stock prices helps managers make better investment decisions (Chen, Jiang, and Goldstein 2007) and provides better monitoring mechanisms (Holmström and Tirole 1993); public listings increase firms' publicity (Demers and Lewellen 2003). These are also the main benefits of DL advertised on NYSE's website: https://www.nyse.com/direct-listing.

[3] One example of the additional deadweight loss is bankruptcy costs (Hennessy and Whited 2007). There are other going public costs, such as loss of control (Zingales 1995), disclosure costs (Huddart, Hughes, and Brunnermeier 1999), and public-relation costs (Bushee and Miller 2012). I do not explicitly model these costs but implicitly assume they are lower than public listing benefits to justify the existence of the DL market.

more firms raise late-stage capital privately and remain private (Ewens and Farre-Mensa 2019, Davydiuk, Glover, and Szymanski 2020).

What are the consequences of introducing the DL market? First, the model adds the DL market where firms do not raise capital. In the baseline case, the market does not provide certification services. G/GR firms stay in the IPO market to raise capital and avoid pooling. G/LS firms face the same adverse selection problem that G/GR firms confront under asymmetric information without certification. By going public through the DL market, G/LS firms enjoy public listing benefits but incur adverse selection costs. However, without G/GR firms in the pool, the DL market requires a lower proportion of bad firms to avoid breakdown (compared to the IPO market). DL market breaks down when this proportion is higher than a critical value, i.e., when adverse selection is severe while the public listing benefits are relatively low. Otherwise, G/LS firms and bad firms both go public through the DL market. In this pooling equilibrium, DL firms are better off by deriving higher payoffs, reflecting firms' compatibility constraints. Financial intermediaries are better off from attracting new clientele and earning more fees. Public investors face higher investment risks. Social welfare improves as a result of the net increase in firm value, reflecting public investors' rationality constraints.

I evaluate two sets of policy interventions in the DL market, corresponding to the U.S. and U.K. DL market regulations. First, consider firm entry restrictions based on firm size.[4] Although this policy imposes no costs on firms, analyses suggest it has little impact on market equilibrium because investors infer the size effect on firm quality. Second, consider requiring investment banks to provide certifications in the DL market.[5] Because firms do not raise capital, certifiers only reveal firm quality, making it less costly. In equilibrium, G/GR firms go public and raise capital through IPO, G/LS firms go public through DL, while bad firms stay private. The two-tiered certification in the going-public market achieve efficient capital allocation as in the symmetric information scenario and improve social welfare.

Next, the model adds the direct listing market with raising capital (DLR). As in the previous scenario, G/GR firms stay in the IPO market because of adverse selection. The only firms

[4] NYSE requires minimum valuations of $40 million for firm-commitment underwriting IPOs and $100 million for all other types of IPOs. For the DL market, if a firm has no sustained trading history before listing, which is the case for most private firms (e.g., Spotify and Slack), the minimum valuation requirement is $250 million.
[5] This policy corresponds to the U.K. DL market regulation. I discuss more details in the model predictions.

having incentives to enter the DLR market are the G/LS firms and bad firms, and investors do not invest. As a result, the DLR market breaks down. The policy interventions considered above do not change market equilibrium.

Based on the analyses, I discuss model predictions and evidence from the largest stock exchanges in U.S. and U.K. public markets: the NYSE and the London Stock Exchange (LSE), where firms have the choice to go public through DL or IPO.[6] The first model prediction is on the firms' choice of going public ("*market-segmentation*"): DL market attracts late-stage firms, while the IPO market attracts growth firms. In LSE, the first DL was in 1995. In NYSE, the first DL took place in 2018, and there were only two DL firms (Spotify and Slack) until the end of 2019. Therefore, I test the model prediction on firms' choice of going public based on the LSE sample. Figure 2 plots the number of DL and IPO firms and the DL market share over the years. An average of ~137 (27) firms go public through IPO (DL) per year. The average DL market share is 17%, and the DL market share generally ranges from 10% to 30%. The figure shows that although most firms go public through IPO, DL is a non-negligible part of the going-public market. Cross-sectional tests show that DL firms are much larger, older, have more employees, pay more dividends, and invest less compared to IPO firms.[7]

Insert Figure 2 about Here

The second model prediction is on the role of policy interventions ("*regulation-relevance*"). The DL market is inherently vulnerable to breakdown; regulations on intermediaries are essential in shaping participation and outcomes. The difference between the exchange rules in the LSE and NYSE DL markets provides consistent evidence. LSE requires financial advisors (also called "sponsors") to assess firms' suitability and carry out due diligence. Advisors still play significant certification roles in the DL process. In comparison, financial advisors in the NYSE DL market do not carry out due diligence obligations and are not liable for investor lawsuits.[8] Their main role is advisory rather than certification.[9] The model predicts that the

[6] U.K. direct listing market does not allow firms to raise capital. Therefore, there is no DLR market in the U.K.

[7] The cross-sectional comparisons show correlations which is in line with model predictions, rather than causalities, which is an interesting avenue for future research.

[8] New York Stock Exchange, *NYSE Response Letter*, accessed on May 7, 2020. https://www.sec.gov/comments/sr-nyse-2019-67/srnyse201967-6960395-212779.pdf.

[9] Reputational concerns help incentivize investment banks to certify firm types. However, for a certification to be effective, the certifying agent's reputational capital must exceed the wealth transfer from a miscertification (Booth

LSE (NYSE) DL market is more likely to be in the separating (breakdown) equilibrium. Consistent with this prediction, ~27 (1) firms went public through the LSE (NYSE) DL market per year.[10]

The third model prediction is on welfare consequences ("*participant-welfare*"). The model suggests that firms and intermediaries are better off after the DL innovation. Firms enjoy the benefits of public listing; intermediaries earn more fees. But public investors may face higher investment risks when the market lacks certification intermediaries. The public debates around the NYSE DL markets shed light on this prediction. Startups, venture capitalists, stock exchanges, and investment banks (e.g., Goldman Sachs, Citigroup) all support the DL markets. Public investors, their associations (e.g., Council of Institutional Investors, American Securities Association), and even SEC Commissioners as regulators express strong concern about weak investor-protection for the DL market.[11]

The paper thus rationalizes two seemingly apparent puzzles in the U.S. DL market, which are difficult to explain in other theories. First, given DL provides cost-saving advantages over IPO, why do so few firms participate? Second, given DL undercuts the profitable underwriting business, why do investment banks support it? The adverse selection model suggests that the DL market is vulnerable to breakdown without certification intermediaries; investment banks can attract new clientele in the financial advisory business and earn more fees.

---

and Smith 1986). Without imposing litigation risks, the certification constraint may not be binding. The imposition of underwriter liabilities and the establishment of SEC in the 1930s provide strong support for this argument.

[10] One alternative explanation is the "young market hypothesis," i.e., the U.S. DL market is new, and firms are unfamiliar with the market. However, Figure 2 shows very active firm participation in the DL market during the first two years after the U.K. DL innovation, and there are wide media coverages and advertisements from exchanges and investment banks for the U.S. DL market, which do not support this alternative explanation.

[11] In a statement on December 23, 2020, SEC Commissioners Allison Herren Lee and Caroline A. Crenshaw oppose the DLR market and express concerns on weak investor protections in the direct listing market: "*Unfortunately, the rule fails to address very real concerns regarding protections for investors. As a result, we are unable to support this specific approach…Unfortunately, investors in primary direct listings under NYSE's approach will face at least two significant and interrelated problems: Loss of an Underwriter and Corresponding Due Diligence; Diminished Ability for Shareholders to Recover Damages… The Commission did in fact receive public comment asking that we clarify that financial advisors and others involved in a direct listing do incur statutory liability as underwriters, but the Commission has failed to address those concerns and provide clarity on this critical issue*." See https://www.sec.gov/news/public-statement/lee-crenshaw-listings-2020-12-23.

The paper implies two underlying economic factors that motivate U.S. DL innovation. The first factor is related to the better-developed private capital market.[12] More firms can raise multiple rounds of private capital and reach their firm boundaries. The primary benefit of going public for these firms is public listing rather than raising public capital. Relatedly, the second factor is the better-developed stock trading market. Over recent decades, stock liquidity has improved, and price discovery has become more efficient.[13] Late-stage private firms thus have stronger incentives to go public. DL is one financial innovation by stock exchanges on differentiated going-public mechanisms to attract more public listings.[14]

The paper has important policy implications. On the DL market regulation, the paper highlights the severe informational frictions in the going-public market and suggests that extreme disintermediation could cause market failure. The results suggest U.S. regulators impose quality assessment requirements and legal liabilities on financial advisors to ensure certifications ex-ante, protect public investors, and encourage value-creating firms to participate in the DL market.[15] The analyses also indicate that the DLR market may not work for the majority of firms because of its similar market functions as the IPO market but weaker certifications. The nonexistence of the DLR market in LSE is consistent with this implication. On the target policies to improve firm access to the public market, the number of U.S. publicly listed firms has declined since 2000 (Gao, Ritter, and Zhu 2013, Doidge, Karolyi, and Stulz 2017). Regulators have devoted great efforts to reverse this trend. The 2012 Jumpstart Our Business Startups (JOBS) Act helps generate more IPOs for *growth firms* by reducing disclosure costs (Dambra, Field, and Gustafson 2015). The paper implies that a well-

[12] For example, the increased supply of corporate venture capital (Chemmanur, Loutskina, and Tian 2014, Ma 2020), mutual fund venture capital (Kwon, Lowry, and Qian 2020, Chernenko, Lerner, and Zeng 2020), private equity (Ewens and Farre-Mensa 2019), and angel investments (Lerner et al. 2018).

[13] See, for example, Hasbrouck (2009), Chordia, Roll, and Subrahmanyam (2011), Hendershott, Jones, and Menkveld (2011), Brogaard, Hendershott, and Riordan (2014).

[14] Stock exchanges have also been offering differentiated trading mechanisms to attract trading volumes, for example, through inventing new order types (Bloomfield, O'Hara, and Saar 2015, Li, Ye, and Zheng 2020), providing faster data connections (Brogaard et al. 2015; Pagnotta and Philippon 2018), diverse make-take fees (Malinova and Park 2015, Chao, Yao, and Ye 2019), and diverse trading costs (Foucault and Parlour 2004).

[15] Intermediaries maximize profits when the DL market is in the pooling equilibrium, their profit-maximization incentive thus misaligns with the social objectives of social-welfare maximization and investor-protection. The potential conflicts of interest make policy interventions necessary to maintain a healthy DL market.

functioning DL market would help lead to more entry into the public markets for *late-stage* firms by decoupling capital-raising from going public.

The paper contributes to the corporate finance literature. It is a first pass at analyzing firms' choice between staying private, IPO, and DL. The paper also highlights the importance of the going-public benefits other than capital-raising, such as liquidity improvement and information aggregation in stock price, which classical corporate finance theories (e.g., the pecking order theory in Myers and Majluf 1984) overlook. Incorporating these nonconventional benefits into the classical theories may generate new testable predictions. The paper also contributes to the literature on certification intermediaries.[16] The DL innovations and the different regulatory environment between the U.K. and U.S. DL markets provide an ideal setting for testing the value of certification intermediaries in the going-public market. The paper shows that investment banks play valuable certification roles, supporting prior theoretical literature (Booth and Smith 1986, Chemmanur and Fulghieri 1994) and surveys (Brau and Fawcett 2006). This paper also shows tiered certifications in the going-public market. The differences in the market requirements between DL and IPO markets in LSE are consistent with this hypothesis. DL requires less costly certification from advisors on firm quality. In contrast, IPO requires more costly certification from underwriters on firm quality and opportunity on capital raising, as certifying opportunity could be much more difficult than certifying quality.

The remainder of the paper proceeds as follows. The next section outlines a baseline DL framework. Section 3 discusses model extensions and predictions. Section 4 shows evidence from the U.S. and U.K. public markets. Section 5 concludes.

2. A Baseline DL Framework

In this section, I set up a baseline DL framework, which extends Tirole (2010, Chapter 6.3) underwriter certification model with three new features: a two-dimensional firm heterogeneity, the role of financial intermediaries, and the unbundled roles of capital-raising and going public.

[16] See, for example, Biglaiser (1993), Lizzeri (1999), Puri (1999), Lerner and Tirole (2006), Farhi, Lerner, and Tirole (2013), Biglaiser et al. (2019).

2.1. Players and Assumptions

There are three types of players in the market: firms, public market investors, and an investment bank. All players are risk neutral. The interest rate in the economy is normalized at 0. The model has three periods. Figure 3 depicts the model timeline.

Insert Figure 3 about Here

Firms: On date 0, the firm obtains initial seed funding (endowment) and invests in the project. The initial investment is normalized at 1. Investment return is at the rate R in the case of success and 0 in the case of failure.

On date 1, the firm makes the going-public decisions: whether or not to go public, and if yes, through which going-public mechanism. If the firm goes public through DL, it only lists existing shares on the stock exchange. If the firm goes public through IPO, it raises an additional amount of capital I. On date 2, the investments' cash flows are realized and distributed.

Firms exhibit two-dimensional heterogeneity: "quality" and "optimal firm size." Firms first differ regarding the probabilities of success for their investments. The probability that a good firm succeeds equals p; the probability that a bad firm succeeds equals q; $p>q$. Firms also differ in "optimal firm size," where some firms have large optimal firm size of $1 + I$ and other firms have small optimal firm size of 1. As a result, at the going-public stage on date 1, firms differ in "opportunity." Firms with large optimal firm size have deepening investment opportunity I, they are the growth firms. Firms with small optimal firm size has reached its boundary and have no deepening investment opportunity, they are the late-stage firms. The net return on late-stage firms' additional investment is negative, which can be viewed as a result of agency costs of free cash flow (Jensen 1986) or limited managerial ability (Lucas 1978). For simplicity, I assume the probability of success for the deepening investment is q. Moral hazard is assumed away in order to focus on the effects of adverse selection.

There is a measure 1 of firms. There are essentially three types of firms in the market: the proportion of good growth (G/GR) firm is $\alpha\beta$, the proportion of good late-stage (G/LS) firm is $\alpha(1-\beta)$, the proportion of bad firm is $1-\alpha$.

Public market investors: The public capital market is competitive, and investors demand an expected rate of return equal to 0. In the presence of asymmetric information, public market

investors do not know firm types, although the distribution of firm type (α, β) is common knowledge. There is no asymmetric information among public market investors.

Investment bank: One profit-maximizing investment bank provides financial advisory and certification services to firms.[17] Financial advisory assists firms in preparing for the going-public process and plays no certification role. The investment bank charges exogenous fees l for providing financial advisory service. The certification service reveals firm types. The investment bank charges endogenous fees h for certification service. The fees are assumed to be proportional to the dollar listing amount.[18] I make three assumptions to simplify the analyses and focus on the effect of adverse selection: (1) there are no moral hazard or agency issues between the investment bank and firms, the investment bank always truthfully reveals firm types; (2) the investment bank has the technology to perfectly detect firm types; (3) the costs of services are normalized at 0, i.e., the investment bank always provides services.

There are two effects of going public on firm value. Public listing increases firm value, I assume the probability of success increases by τ. If the project of the public firm fails, there is a deadweight cost f (proportional to total investments).

In the baseline model, the investment bank provides both financial advisory services and certification services in the IPO market, and provides only financial advisory services in the DL market. I assume that $(p+\tau)R>1+l+(1-p-\tau)f$, $(q+\tau)R<1+l+(1-q-\tau)f$, such that only good firms are creditworthy; $l+(1-p-\tau)f<\tau R<l+(1-q-\tau)f$, such that going public of good (bad) firms increases (decreases) value.

2.2. Symmetric Information: Benchmark

First, consider a benchmark model where there is no asymmetric information, i.e., public investors know the firm types in the market. In this case there is no demand for certification to reveal firm types. Firms pay the investment bank only for financial advisory services. A DL market that allows firms to raise capital would be the optimal market design because certification services are costly and redundant.

[17] The results hold when the investment banking industry is monopolistic or perfectly competitive. Therefore, I do not emphasize the market power of investment banks or the surplus split between firms and investment banks.
[18] The results are the same if investment banking fees are proportional to the capital-raising amount in IPO process.

In this hypothetical benchmark case, G/GR firms go public and raise capital. They secure the highest possible level of payoff $V^{G/GR}$,[19] consistent with investors' breakeven on average: $V^{G/GR}=(p+\tau)(R+RI)-[1+l+(1-p-\tau)f](1+I)$. Similarly, G/LS firms go public but raise no capital. They secure the highest level of payoff, $V^{G/LS}$, consistent with investors' breakeven on average: $V^{G/LS}=(p+\tau)R-[1+l+(1-p-\tau)f]$.

Bad firms do not go public because they would experience negative net present value (NPV), and investors would not invest in these firms. Bad firms have payoff $V^{B}=qR-1$. $V^{G/GR} > V^{G/LS} > V^{B}$.

Social welfare (W) is calculated as the aggregate cash flow realized on date 2. When there is no going-public market, all firms stay private, and social welfare is: $W_{np} = \alpha(pR-1)+(1-\alpha)(qR-1)$.

PROPOSITION 1 (Symmetric Information):

Separating equilibrium: When there is no asymmetric information and public investors know the firm types in the market, G/GR firms go public and raise capital, G/LS firms go public but do not raise capital, and bad firms remain private. No firms buy certification services. Social welfare is $W_{si} = \alpha\beta(1+I)[(p+\tau)R-1-(1-p-\tau)f]+\alpha(1-\beta)[(p+\tau)R-1-(1-p-\tau)f]+(1-\alpha)(qR-1) > W_{np}$.

Capital allocation is efficient. A DL market that allows firms to raise capital is the optimal market design.

2.3. Asymmetric Information without Certification

Adverse selection is a common feature of transactions and contracts in any market (Spulber 1999) and is particularly pronounced in financial markets (Leland and Pyle 1977, Myers and Majluf 1984). I next incorporate information asymmetry into the model, where only firms know their types. The outcomes of the symmetric information scenario no longer hold. By mimicking G/GR firms, other types of firms have incentives to go public and raise capital so that they can obtain greater payoffs than they would if they were to reveal their types.

[19] The payoff for going-public firms can be viewed as offering price, assuming a measure 1 of offering amount.

If all firms go public and raise capital, we can set the only difference across firms is the average probability of success (per unit of investment) to simplify the calculation. For a G/GR firm, the average probability of success is $p + \tau$. For a G/LS firm, the average probability of success is $n + \tau$, where $n = \frac{p+qI}{1+I}$. For a bad firm, the average probability of success is $q + \tau$. $p > n > q$.

Under asymmetric information, investors do not know the types of firms. Set $m = [\alpha\beta(p + \tau) + \alpha(1 - \beta)(n + \tau) + (1 - \alpha)(q + \tau)]$, which is the prior average probability of success. $m < (p + \tau)$. Set firms' payoff at V_m. Investors' average payoff is $[mR - 1 - l - (1 - m)f](1 + I) - V_m$. There are two conditions on all firms' going public and capital-raising: (1) Investors' participation constraint: the average payoff is positive, $mR \geq 1 + l + (1 - m)f$. We can obtain $m \geq \frac{1+l+f}{R+f}$. (2) Firms' incentive compatibility constraint: the payoff for good firms with pooling is higher than the payoff they would receive by remaining private, such that $V_m \geq pR - 1$.[20]

The incentive compatibility constraint is stricter than the investors' participation constraint. The incentive compatibility constraint can be rewritten as $[mR - 1 - l - (1 - m)f](1 + I) \geq pR - 1$. Set m^* be the critical value of m when the constraint is binding $m^* = \frac{pR-1}{(1+I)(R+f)} + \frac{1+l+f}{R+f}$. Whether all firms can go public and raise capital depends on whether $m \geq m^*$. This is similar to the "market-for-lemon" condition in Akerlof (1970).

If $m \geq m^*$, all firms go public and raise capital. Public investors invest in all firms. All firms are priced the same. Firms' payoff V_m is set so that public investors break even on average: $[mR - 1 - l - (1 - m)f](1 + I) - V_m = 0$. Therefore $V_m = [mR - 1 - l - (1 - m)f](1 + I)$. The market is in the *pooling equilibrium*. There is *overinvestment*. G/GR firms obtain lower payoff than in the presence of symmetric information. Payoff for G/GR firms is V_m, where $V_m < V^{G/GR}$.

If $m < m^*$, public investors lose money if they finance the firms, and therefore do not invest in any firm. The market is in *breakdown equilibrium*. No firms go public. There is

[20] The incentive compatibility constraints of bad firms would be satisfied. Another possible equilibrium is that only G/GR and bad firms pool in the going-public market, G/LS firms stay private. The main results do not change.

underinvestment. Payoff for G/GR firms is *pR-1*, where $pR - 1 < V^{G/GR}$.

PROPOSITION 2 (Asymmetric Information without Certification Agent):

Pooling equilibrium: When $m \geq m^*$*, all firms go public and raise capital. Social welfare is* $W_{ai\_pooling} = \alpha\beta[(p+\tau)R - 1 - (1-p-\tau)f](1+I) + \alpha(1-\beta)[(n+\tau)R - 1 - (1-n-\tau)f](1+I) + (1-\alpha)[(q+\tau)R - 1 - (1-q-\tau)f](1+I) < W_{si}$.

Breakdown equilibrium: When $m < m^*$*, market breaks down, and no firms go public. Social welfare is* $W_{ai\_breakdown} = W_{np} < W_{si}$.

Capital allocation is inefficient. A DL market that allows firms to raise capital is no longer the optimal market design. G/GR firms demand for certifications to separate from other firms.

2.4. Asymmetric Information with Certification: the IPO-Only Market

The adverse selection problem motivates the existence of financial intermediation. G/GR firms have incentives to purchase certification services to mitigate the adverse selection problem. In the IPO market, the investment bank certifies firm types on quality and opportunity. Note that, in this Section, IPO market is the only mechanism that firms can use to go public. G/LS firms and bad firms have no incentives to pay certification fees to reveal their types. G/GR firms thus separate themselves from other types of firms and obtain payoff $\hat{V}^{G/GR}$, as given by $(p+\tau)(1+I)R - \hat{V}^{G/GR} = [1 + l + h + (1-p-\tau)f](1+I)$. In equilibrium, G/GR firms go public through the IPO market, while G/LS and bad firms remain private.[21]

The incentive compatibility constraint that G/GR firms pay for certification services is that the payoff in the separating equilibrium is higher than payoff if they were to remain private: $\hat{V}^{G/GR} > pR - 1$.

LEMMA 1: *Upper bound of certification fees on firm quality and opportunity in the IPO market:*

[21] For G/GR firms, the incentive compatibility constraint requires that the IPO benefits (value of public listing plus net gains of additional investments) are higher than or equal to IPO costs (the listing, advisory, and certification fees, plus deadweight losses if the firm's project fails). For G/LS firms, I assume the IPO benefits (value of public listing) are lower than IPO costs (the listing, advisory, and certification fees, plus net losses of additional investments and deadweight losses if the firm's project fails).

$$h < (p+\tau)(R+f) - 1 - l - f - \frac{pR-1}{1+I}$$

In the IPO market, the upper bound of certification fees is increasing in τ and I. The more capital the firm raises in the market, and the higher are the benefits of going public, the higher the certification fees investment bank can charge.

Proof: see Appendix A.1.

Note that LEMMA 1 determines the upper bound of the certification fees on both firm quality and opportunity. In the actual going-public process, the bargaining powers of the investment banks and IPO firms affect the actual split of the going-public surplus between them and thus the certification fees that investment banks charge.

PROPOSITION 3 (Asymmetric Information with IPO only Market):

Separating equilibrium: Given LEMMA 1 holds, in the presence of asymmetric *information where the IPO market is the only mechanism that firms can use to go public, G/GR firms resort to the investment bank for certification and separate themselves from other types of firms. Only G/GR firms go public and raise additional capital. G/LS firms and bad firms remain private. Social welfare is* $W_{ai\_ipo} = \alpha\beta(1+I)[(p+\tau)R - 1 - (1-p-\tau)f] + \alpha(1-\beta)[pR - 1] + (1-\alpha)(qR-1) > W_{ai\_pooling}$; $W_{ai\_ipo} > W_{ai\_breakdown}$.

However, G/LS firms do not go public, which could create value, i.e., $W_{ai\_ipo} < W_{si}$.

2.5. Adding the DL Market Not Allowing Firms to Raise Capital

In this section, we introduce the DL market where DL firms are not allowed to raise capital. First, consider the case that the DL market does not provide certification service, and therefore investors do not know firm types.

G/GR firms have no incentives to deviate from the IPO market to the DL market, which would reduce their payoffs compared with staying in the IPO market. G/LS firms have incentives to enter the DL market because going public increases firms' payoffs. Bad firms have incentives to mimic G/LS firms to obtain higher valuations.

The equilibrium in the DL market is similar to the asymmetric information without

certification scenario, but with two main differences. First, G/GR firms are not in the DL market pool. Second, there is no capital-raising in the market. The proportion of G/LS firms in the market is $\frac{\alpha(1-\beta)}{1-\alpha\beta}$ and the proportion of bad firms in the market is $\frac{(1-\alpha)}{1-\alpha\beta}$. The prior average probability of success in the DL market is $m' = \frac{\alpha(1-\beta)}{1-\alpha\beta}(p+\tau) + \frac{(1-\alpha)}{1-\alpha\beta}(q+\tau)$. The investors' average payoff is: $m'R - V_m' - [1 + l + (1-m')f]$. Firms' payoff V_m' is set such that investors breakeven on average: $m'R - V_m' = [1 + l + (1-m')f]$. $V_m' = m'R - [1 + l + (1-m')f]$.

G/LS firms pool with bad firms on the condition that they obtain higher payoff than if they were to remain private: $V_m' > pR - 1$. $m'R - [1 + l + (1-m')f] > pR - 1$. We get $m' \geq \frac{pR+l+f}{R+f}$. Set $m'^* = \frac{pR+l+f}{R+f}$. Similar to the asymmetric information scenario, there are two equilibrium outcomes in the DL market based on whether m' is higher than m'^*. If $m' \geq m'^*$, G/LS firms and bad firms go public through the DL market. Ex post, investors make money on G/LS firms and lose money on bad firms. If $m' < m'^*$, the DL market breaks down.

PROPOSITION 4: (Asymmetric Information with IPO + DL markets):

Pooling equilibrium: When $m' \geq m'^*$*, G/GR firms go public and raise capital through the IPO market, while G/LS firms and bad firms go public through the DL market. Social welfare is* $W_{ai\_ipo\_dl\_pooling} = \alpha\beta[(p+\tau)R - 1 - (1-p-\tau)f](1+I) + \alpha(1-\beta)[(p+\tau)R - 1 - (1-p-\tau)f] + (1-\alpha)[(q+\tau)R - 1 - (1-q-\tau)f] > W_{ai\_ipo}$.

Breakdown equilibrium: When $m' < m'^*$*, G/GR firms stay in the IPO market while other types of firms remain private, and the DL market breaks down. Social welfare is* $W_{ai\_ipo\_dl\_breakdown} = W_{ai\_ipo}$.

I consider two sets of policy interventions and analyze their effectiveness in mitigating adverse selection problems in the DL market. These two sets of policy interventions correspond to the existing regulatory requirements in the U.S. and U.K. DL markets, which I provide details in the model predictions.

First, suppose the DL market regulates firm entry by imposing a larger minimum firm size.

Assume the entry requirement for minimum firm size is $Entry_{min}$. Because firm sizes are homogenous at the going-public stage in the baseline model, this policy has no effect on market equilibrium. In the extended model, I analyze the effectiveness of the policy where firm sizes are heterogenous at the going-public stage.

COROLLARY 1: *Effect of imposing heightened standards on firm size: the policy does not change market equilibrium. Moreover, when* $Entry_{min} > 1$*, this policy screens out bad firms and good firms as well, and no firm DL.*

Next, consider the market requires firm quality certifiers in the DL market. Because firms do not raise capital in the DL market, there is no demand for certification on firm opportunity. Assume G/LS firms pay the certifier h_{DL}. G/LS firms are separated from bad firms and obtain payoff $\hat{V}^{G/LS}$, as given by $(p+\tau)R - \hat{V}^{G/LS} = 1 + l + h_{DL} + (1-p-\tau)f$. The incentive compatibility constraint that G/LS firms pay for certification services is the payoff in the separating equilibrium is higher than payoff would be if they were to remain private: $\hat{V}^{G/LS} > pR - 1$.

COROLLARY 2: *Effects of introducing certifiers who reveal firm quality in the DL market:*

The upper bound of certification fees on firm quality in the DL market: $h_{DL} < \tau(R+f) - l - 1 + pf$*. The upper bound of certification fees is increasing in* τ*. The higher is the benefits of going public, the higher the certification fees the investment bank can charge.*

Given the certification fees on firm quality are lower than the upper bound, the DL market is in the separating equilibrium, G/GR firms go public and raise capital through the IPO market, G/LS firms go public through the DL market, and bad firms remain private.

Capital allocation is efficient, as in the symmetric information scenario. Social welfare is $W_{ai\_ipo\_dl\_separating} = \alpha\beta(1+I)[(p+\tau)R - 1 - (1-p-\tau)f] + \alpha(1-\beta)[(p+\tau)R - 1 - (1-p-\tau)f] + (1-\alpha)(qR-1) = W_{si} > W_{ai\_ipo\_dl\_pooling}$.

Proof: see Appendix A.2.

COROLLARY 2 shows that introducing quality certifiers in the DL market achieves

efficient capital allocation as in the symmetric information scenario. This policy also protects public investors by reducing their investment risks compared to the pooling equilibrium outcomes in PROPOSITION 5.

I then compare the different equilibrium outcomes of the DL market for intermediaries. When the DL market is in the breakdown equilibrium, i.e., $m' < m'^*$, no firms are in the DL market. When the DL market is in the pooling equilibrium, i.e., $m' \geq m'^*$, $\alpha(1-\beta)$ G/LS firms and $1-\alpha$ bad firms are in the DL market. The investment bank earns $(1-\alpha\beta)l$ advisory fees in the DL market when the DL market is in the pooling equilibrium, and $\alpha(1-\beta)(h_{DL}+l)$ certification and advisory fees in the DL market when the DL market is in the separating equilibrium. If $(1-\alpha\beta)l \geq \alpha(1-\beta)(h_{DL}+l)$, i.e., $h_{DL} \leq \frac{1-\alpha}{\alpha(1-\beta)}l$, the investment bank maximizes fees when the DL market is in the pooling equilibrium. If $(1-\alpha\beta)l < \alpha(1-\beta)(h_{DL}+l)$, i.e., $h_{DL} > \frac{1-\alpha}{\alpha(1-\beta)}l$, the investment bank maximizes fees when the DL market is in the separating equilibrium.

Assume a stock exchange acts as the going-public market mechanism designer and provides listing services with charging listing fees proportional to the listing amount. The stock exchange maximizes fees when the DL market is in the pooling equilibrium, i.e., when the number of DL firms is maximal. The analyses suggest that profit-maximizing intermediaries' incentives are potentially misaligned with the social objectives of social-welfare maximization and investor-protection, highlighting the importance of policy interventions in the DL market.

COROLLARY 3: *Policy interventions vs. laissez-faire in the DL market:*

Intermediaries' profit-maximization incentive is potentially misaligned with the social objectives of social-welfare maximization and investor-protection, making policy interventions necessary.

2.6. Adding the DL Market with Allowing Firms to Raise Capital (DLR)

Finally, this section considers the scenario in which direct listing firms are allowed to raise capital (the DLR market). If G/GR firms deviate from the IPO market to the DLR market, G/LS and bad firms have incentives to pool with G/GR firms in the DLR market to obtain a higher

payoff. Therefore, G/GR firms remain in the IPO market to avoid pooling. When the DL market is in the pooling equilibrium, no firms apply for DLR. When the DL market is in the separating equilibrium, investors then know that the only firms applying for DLR are the bad firms. When the DL market is in the breakdown equilibrium, investors do not put additional capital to invest in the G/LS firms or bad firms in the DLR market. In all the above scenarios, the DLR market breaks down, and there would be no change in social welfare.[22]

PROPOSITION 5 (Asymmetric Information with IPO + DL + DLR):

Breakdown equilibrium: G/GR firms remain in the IPO market, and the DLR market breaks down. There is no change in social welfare.

COROLLARY 4: *Effect of introducing entry restriction on firm size or adding certifiers who reveal firm quality in the DLR market: these regulations do not alter the breakdown equilibrium.*

In summary, the DL market provides more going-public options for firms and more investment options for public investors. Certification intermediaries help maintain a well-functioning DL market. DLR market breaks down because of its similar market functions but weaker certifications compared with the IPO market, and policy interventions have no effects on market participation and outcomes.

3. Model Extensions and Predictions

In the baseline model presented in the previous sections, I implicitly assume private market investors provide only seed funding (endowment). In this section, I first extend the model by

[22] Although the DLR market breaks down in all scenarios and social welfare does not change, under certain conditions, the establishment of the DLR market potentially reduces IPO costs for G/GR firms. If $m \geq m^*$, the DLR market provides an option for G/GR firms to pool with other types of firms, and impose a more binding incentive compatibility constraint for G/GR firms to pay for certification services, i.e., $\hat{V}^{G/GR} > V_m$, resulting in a lower upper bound of certification fees. The potential cost reductions represent welfare transfers from investment banks to G/GR firms. If $m < m^*$, the establishment of the DLR market does not affect participants' welfare.

incorporating more interactions between firms and the private markets and then discuss model predictions on firms' going-public choices, the role of policy interventions, and welfare implications.

3.1. Model Extensions

I extend the model along two dimensions related to the role of the private capital market. First, the extended model adds another private capital-raising stage before the going-public stage. Between the seed-funding stage and the going-public stage, firms may raise additional capital I_1 from private investors. Figure 4 depicts the extended model's timeline.

Insert Figure 4 about Here

Second, firms incur costs of capital when they raise funding from private investors (r_1) and public investors (r_2), $R > r_1, and\ R > r_2$. There are limited supplies of private capital on date 1. The maximum total private capital supply is *S*. In the extended model, a proportion μ of firms have a large optimal firm size of $1 + I_1 + I_2$ and a proportion $1 - \mu$ of firms have a small optimal firm size of $1 + I_1$. Assume $I_1 \geq I_2$. On date 1, a proportion of κ_1 good firms with large optimal size (G/L), κ_2 good firms with small optimal size (G/S), κ_3 bad firms with large optimal size (B/L), and κ_4 bad firms with small optimal size (B/S) obtain additional private capital funding. $\kappa_1 > \kappa_3, \kappa_2 > \kappa_4$. This asymmetry reflects certification by private investors (Barry et al. 1990, Megginson and Weiss 1991). The proportions of firms that obtain additional private capital funding are determined by two factors. Firms decide whether or not to apply for the additional round of private capital by comparing the net benefit of raising public capital and the net benefit of raising private capital (and also the potential going-public options). Also, total funding raised by firms from private investors cannot exceed the maximum supply. Figure 5 illustrates the composition of firm types at the going-public stage.

Insert Figure 5 about Here

After the extended model adds the DL market, $\alpha(1 - \mu)\kappa_2$ G/LS firms and $1 - \alpha$ bad firms have incentives to go public through DL. Yet only large G/LS firms and bad firms of size $1 + I_1$, are in the pool because investors infer that small firms of size 1 are bad firms. The equilibrium results are similar to those of PROPOSITION 4, and the DL market is in pooling or breakdown equilibrium depending on the relative proportions of G/LS firms and the

remaining bad firms.

Regarding the policy implications of DL market regulation, first suppose that market imposes firm entry restrictions on minimum firm size $Entry_{min}$. The heightened minimum firm size standards can hardly solve the adverse selection problem, with one side-effect being that it may freeze when the required minimum firm size is set too high.

COROLLARY 5: *Effect of imposing heightened standards on firm size: the proportion of bad firms screened out by this policy is 0. When* $Entry_{min} \leq 1 + I_1$*, there is no effect on firm entry. Moreover, when* $Entry_{min} > 1 + I_1$*, this policy screens out bad firms and good firms as well, and no firm DL.*

Then consider the market imposes certification policies on firm quality, the market is in separating equilibrium, as in COROLLARY 2, and capital allocation is efficient, as in the symmetric information scenario.

One implication of the extended model is that DL firms (G/LS firms) are larger than IPO firms (G/GR firms) on average because they are more likely to be late-stage firms (firms who have reached their firm boundaries when they go public). In the separating equilibrium, $\alpha(1-\mu)\kappa_2$ G/LS firms go public through the DL market; in the pooling equilibrium, large G/LS firms and bad firms of size $1 + I_1$ go public through the DL market. In both cases, the average DL firm size is $1 + I_1$, and the average IPO firm size is $\frac{\alpha\mu\kappa_1}{\alpha\mu\kappa_1+\alpha\mu(1-\kappa_1)+\alpha(1-\mu)(1-\kappa_2)}(1 + I_1) + \frac{\alpha\mu(1-\kappa_1)+\alpha(1-\mu)(1-\kappa_2)}{\alpha\mu\kappa_1+\alpha\mu(1-\kappa_1)+\alpha(1-\mu)(1-\kappa_2)} < 1 + I_1$.

Another implication is related to the underlying economic factors that motivate DL innovation. Again, suppose there is a stock exchange acting as the mechanism designer of the market, providing listing services and charging listing fees proportional to the listing amount. The stock exchange is the mechanism designer in the going-public market, and there is a one-time cost (c) to establish the DL market. The exchange would have incentives to create the DL market when the additional profits brought by DL firms are higher than the one-time cost. In summary, when private capital is in greater supply and less costly, firms are more likely to raise additional private funding. These late-stage private firms do not demand additional public

capital. They still demand going-public to enjoy the benefits of public listings. Therefore, the analyses suggest that the greater abundance (high *S*) and lower costs of private capital (low r_1) and better-developed stock trading markets (high τ) motivate DL innovation.

3.2. Model Predictions

There are three central predictions from the model:

(1) *Market-segmentation (firms' choice of going public)*

The model suggests that the DL market and the IPO market provide a two-tiered going-public market for different types of firms. Growth firms with more deepening investment opportunities go public through the IPO market, while late-stage firms with fewer deepening investment opportunities go public through the DL market.

(2) *Regulation-relevance (the role of policy interventions)*

The model suggests that the DL market is inherently vulnerable to breakdown; regulations are essential in shaping participation and outcomes. The model predicts that the DL market with stricter certification policies is more likely to be in the separating equilibrium, while the DL market with weaker certification policies is more likely to be in the breakdown equilibrium.

(3) *Participant-welfare (welfare implications)*

Regarding the impact of the DL innovation on market participants' welfare, the model predicts that DL firms (entrepreneurs and private market investors) enjoy welfare gains by going public. Intermediaries such as stock exchanges and investment banks enjoy welfare gains by attracting new clientele and earning more fees. Public investors face higher investment risks under loose regulations.

4. Evidence from U.S. and U.K. Markets

The data sample is from the largest stock exchanges in U.S. and U.K. public markets: the NYSE and the London Stock Exchange (LSE), where firms have the choice to go public through DL or IPO. In the LSE going-public market, DL firms are only allowed to list existing shares. The

DL market is also called the "Introduction" market and has been available since 1995.[23] The sample period is from 1995 through 2019. The first DL in the U.S. NYSE occurred in 2018. There were only two DL firms (Spotify and Slack) until the end of 2019.[24] Therefore, I first test the "market-segmentation" prediction by comparing the characteristics of DL and IPO firms in LSE. Then, I test the "regulation-relevance" prediction by comparing the DL markets' regulatory and participation differences between LSE and NYSE. Finally, I test the "participant-welfare" prediction by analyzing the public debates around the DL markets and the comment letters on the NYSE proposal for establishing a DLR market.

I obtain public listing information from the LSE, including firm name, listing type, country of the firm, the market cap on the first day of listing, and capital raised (for IPO firms). I collect firm fundamentals information from Worldscope. The detailed sample screening process is in Appendix A.3.

4.1. Market-Segmentation

Table 1 presents the number of DL and IPO firms, the total number of firms going public, and the DL market share over the years. The table shows the total number of firms going public in this sample period is 4,092, of which 678 went public through the DL market, and 3,414 went public through the IPO market. The average DL market share is 17%. The DL market share is generally stable, ranging from 10% to 30% over the years. Therefore, although most firms go public through IPO, DL is a non-negligible part of the going-public market

Insert Table 1 about Here

Table 2 presents the heterogeneity among DL and IPO going-public firms in the London Stock Exchange. *Market Cap* is market capitalization right before the firm goes public. The units are in £ million. *Age* is the firm age from the incorporated year to the listing year. *Employee* is the number of employees in the first year after listing. The units are in hundreds. *Dividend Payout* is the dividend payout divided by net income in the first year after listing. *Investment Rate* is the capital expenditure divided by total assets in the first year after listing.

[23] In 2020, LSE changed the primary name of the DL market from "introduction" to "Direct Listing" on its official website: https://www.londonstockexchange.com/raise-finance/equity/how-list-equity-listing-journey. LSE has two sub-markets: Main Market and Alternative Investment Market (AIM). The data includes both sub-markets.
[24] In 2020, another two companies, Asana and Palantir, went public through DL in NYSE.

All variables are winsorized at the 1% and 99% levels to remove extreme values. Column (1) shows the means for IPO firms. Column (2) shows the difference between DL firms and IPO firms. These are coefficients from regressions that control for the going-public year, industry, and country of incorporation.[25] Column (3) shows the difference over the means for IPO firms.

Insert Table 2 about Here

Table 2 shows that DL firms are £266 million larger (243% compared to the mean of IPO firms), six years older than IPO firms (94% compared to the mean of IPO firms), and have ~2,174 more employees (152% compared to the mean of IPO firms). The average dividend payout ratio is 24.90% higher than that of IPO firms (104% compared to the mean of IPO firms). The average investment rate of DL firms is 11.12% lower than that of IPO firms (52% compared to the mean of IPO firms). Column (4) shows the *p*-values. All these differences are statistically significant, with *p*-values<0.01. Therefore, compared to IPO firms, DL firms are much larger, older, have more employees, pay more dividends, and have lower investment rates compared to IPO firms.

In summary, the results in this subsection support the model prediction on a two-tiered going-public market: growth firms go public through the IPO market, while late-stage firms go public through the DL market.

4.2. Regulation-Relevance

The model suggests that regulations in the DL market are essential for market participation and outcomes. The DL markets in the NYSE and the LSE both only allow firms to list existing shares. The critical regulatory difference is the certification role of financial advisors.

In the U.K. DL market, the regulatory requirements for advisors are similar to those that apply to underwriters in the IPO market. Regulations require going-public firms to appoint nominated advisors (or "sponsors"). Advisors are required to assess firms' suitability for the public market.[26] They provide certification, due diligence, and coordination with other participants to ensure sufficient investor interest for a viable market (Derrien and Kecskes

[25] The results are robust when industry fixed effect is excluded, when dependent variables are log transformed, or when the variables are winsorized at the 2.5% and 97.5% levels.

[26] London Stock Exchange, *A Guide to Listing on London Stock Exchange*, accessed on February 22, 2020. https://www.londonstockexchange.com/companies-and-advisors/main-market/documents/gudetolisting.pdf.

2007). The nominated advisor leads a company's team of professional advisors and coordinates their roles, and is obliged to consider whether "the admission of the equity shares would be detrimental to investors' interests." Some other advisors include registrars, a legal counsel, and public relations advisors.

In the U.S., the Securities Act of 1933 imposed legal liabilities on underwriters. Underwriters have strong incentives to reduce expected litigation costs (Tinic 1988, Hughes and Thakor 1992, Johnson and McLaughlin 2019). They conduct due diligence before an IPO by investigating a firm's business, finances, management, and projections and discussing their findings with public investors through roadshows and IPO prospectus. Under the current U.S. DL market structure, financial advisors play little certification role. According to NYSE, only a company's board of directors and accountants carry out due diligence in the DL process. Firm managers cannot credibly certify their information because they have incentives to misrepresent their information by mimicking those with the highest valuations. Although accountants may help ensure the accuracy of disclosure, they cannot guarantee full disclosure, especially potential risks. Financial advisors do not have due diligence obligations to assess listing firms. Therefore, in the DL process, investment banks can hardly have deep involvement in communicating with firms to generate intensive knowledge about the firm. They also have little reputational concerns. The main role of financial advisors is advisory rather than certification. In 2019, there was already a lawsuit from investors on Slack, alleging that the firm failed to disclose certain risks in its DL process (Osipovich 2020). Financial advisors were not in the defendants, consistent with they have little legal liabilities and reputational concerns in the DL process.

In summary, the market functions for firms in the U.K. and U.S. DL markets are similar. However, advisors in the U.K. DL market play more significant certification roles than advisors in the U.S. DL market. Figure 6 maps the market functions for firms and the role of investment banks in the LSE and NYSE going-public markets to the model. The differences in certification policies explain the relatively less participation in the U.S. DL market than the U.K. DL market. An average of 27 firms per year went public through the LSE DL market, consistent with the separating equilibrium. An average of only one firm per year went public through the NYSE DL, which is consistent with the breakdown equilibrium.

Insert Figure 6 about Here

4.3. Participant-Welfare

The model predicts that conditional on the DL market is not in the breakdown equilibrium, firms (entrepreneurs and private market investors), stock exchanges, and even investment banks benefit from introducing the DL market. Stock exchanges and investment banks are better off because the DL market brings new clientele, enabling them to earn higher fees. These predictions rationalize the observations that these market participants all support the DL market. A DL conference was held in San Francisco in October 2019, backed by startups and Venture Capitalists.[27] The comment letters from investment banks (e.g., Goldman Sachs, Citigroup), stock exchanges stated that they fully supported the proposal.[28]

The model also predicts that introducing the DL market may bring higher risks for public investors when the DL market does not impose certification intermediaries (when the DL market is in the pooling equilibrium). It is consistent with both retail and institutional investors express strong concerns about investor protections in the DL market. Comment letters from the Council of Institutional Investors and the American Securities Association expressed concerns regarding the weak investor protections of the existing DL market and opposed the proposal.[29] One commenter stated: "*Direct listings ??? They are a method for insiders to rip off IPO investors.*" Another commenter states: "*Allowing companies to raise primary capital through a direct listing would create a massive loophole in the regulatory regime that governs the offerings of securities to the public.*"

These unanimous expressions of support from startup firms, venture capitalists, investment

[27] See https://de.reuters.com/article/us-tech-venturecapital-ipo-idUSKBN1WG3JO.

[28] Comment letters from Goldman Sachs, Citigroup, and NYSE to support DL market: https://www.sec.gov/comments/sr-nyse-2019-67/srnyse201967-6788706-208240.pdf; https://www.sec.gov/comments/sr-nyse-2019-67/srnyse201967-6873859-210634.pdf; https://www.sec.gov/comments/sr-nyse-2019-67/srnyse201967-6960395-212779.pdf. The archive of all comment letters is available at https://www.sec.gov/comments/sr-nyse-2019-67/srnyse201967.htm. Bloomberg, 2019, *Morgan Stanley, Goldman Make Their Own Direct-Listing Pitches*, available at https://www.bloomberg.com/news/articles/2019-10-04/morgan-stanley-to-woo-startups-at-its-own-direct-listing-event.

[29] Comment letters from the Council of Institutional Investors and the American Securities Association express concerns on fewer investor-protection policies in the DL market: https://www.sec.gov/comments/sr-nyse-2019-67/srnyse201967-7435112-220582.pdf and https://www.sec.gov/comments/sr-nyse-2019-67/srnyse201967-6911312-211231.pdf.

banks, and stock exchanges on the DL market, and public investors' concerns about investor protections in the DL market show consistent evidence of the model's welfare implications.

Overall, evidence from the U.S. and U.K. public market provides strong support for the model predictions related to "market-segmentation," "regulation-relevance," and "participant-welfare."

5 Conclusion

Investment banks have been playing a critical "gatekeeping" role in the IPO process. This paper highlights the severe informational problem in the going-public market and suggests that extreme disintermediation could cause market failure. Imposing certification and investor-protection policies are important in promoting participation and improving market outcomes. In a time of rampant disintermediation, it is also crucial to preserve the certification role of intermediaries in maintaining a well-functioning going-public market and protecting public investors. The paper also shows that the DL market caters to late-stage firms by decoupling capital-raising from going public. With better-developed private capital and stock trading markets, a well-functioning DL market provides firms more options to go public and helps narrow the "U.S. listing gap."

This paper takes the first step in studying the consequences of the DL innovation and opens many avenues for future research. This paper focuses on the effects of disintermediation and the decoupling of capital-raising from going public in the DL market. There are other characteristics of the DL market that merit attention. In an IPO, shares are first allocated to investors by investment banks (Chemmanur, Hu, and Huang 2010). There are lockup periods that restrict pre-public insiders from selling their shares for a period following IPOs (Brav and Gompers 2003). In the DL market, opening auctions in the stock exchange directly allocate shares, and there are no lockup periods. It would be interesting to study the impacts of these characteristics. Finally, testing the implications of the DL innovation on other related research fields such as entrepreneurship and asset pricing would be another fruitful research area.

REFERENCES

Akerlof, George A, 1970, The market for "lemons": Quality uncertainty and the market mechanism, *Quarterly Journal of Economics* 84, 488-500.

Amihud, Yakov, and Haim Mendelson, 1986, Asset pricing and the bid-ask spread, *Journal of Financial Economics* 17, 223-249.

Baron, David P, 1982, A model of the demand for investment banking advising and distribution services for new issues, *Journal of Finance* 37, 955-976.

Barry, Christopher B., Chris J. Muscarella, John W. Peavy, and Michael R. Vetsuypens, 1990, The role of venture capital in the creation of public companies. Evidence from the going-public process, *Journal of Financial Economics* 27, 447-471.

Biglaiser, Gary, 1993, Middlemen as experts, *RAND Journal of Economics* 24, 212-223.

Biglaiser, Gary, Fei Li, Charles Murry, and Yiyi Zhou, 2019, Intermediaries and Product Quality in Used Car Markets, *RAND Journal of Economics*, Forthcoming.

Bloomfield, Robert, Maureen O'Hara, and Gideon Saar, 2015, Hidden liquidity: Some new light on dark trading, *Journal of Finance* 70, 2227-2274.

Bond, Eric W, 1982, A direct test of the Lemons model: The market for used pickup trucks, *American Economic Review* 72, 836-840.

Booth, James R., and Richard L. Smith II, 1986, Capital raising, underwriting and the certification hypothesis, *Journal of Financial Economics* 15, 261-281.

Brau, James C., and Stanley E. Fawcett, 2006, Initial public offerings: An analysis of theory and practice, *Journal of Finance* 61, 399-436.

Brav, Alon, and Paul A. Gompers, 2003, The role of lockups in initial public offerings, *Review of Financial Studies* 16, 1-29.

Brogaard, Jonathan, Terrence Hendershott, and Ryan Riordan, 2014, High-frequency trading and price discovery, *Review of Financial Studies* 27, 2267-2306.

Brogaard, Jonathan, Björn Hagströmer, Lars Nordén, and Ryan Riordan, 2015, Trading fast and slow: Colocation and liquidity, *Review of Financial Studies* 28, 3407-3443.

Buchak, Greg, Gregor Matvos, Tomasz Piskorski, and Amit Seru, 2018, Fintech, regulatory arbitrage, and the rise of shadow banks, *Journal of Financial Economics* 130, 453-483.

Bushee, Brian J., and Gregory S. Miller, 2012, Investor relations, firm visibility, and investor following, *Accounting Review* 87, 867-897.

Chao, Yong, Chen Yao, and Mao Ye, 2019, Why discrete price fragments US stock exchanges and disperses their fee structures, *Review of Financial Studies* 32, 1068-1101.

Chemmanur, Thomas J., and Paolo Fulghieri, 1994, Investment bank reputation, information production, and financial intermediation, *Journal of Finance* 49, 57-79.

Chemmanur, Thomas J., Gang Hu, and Jiekun Huang, 2010, The role of institutional investors in initial public offerings, *Review of Financial Studies* 23, 4496-4540.

Chemmanur, Thomas J., Elena Loutskina, and Xuan Tian, 2014, Corporate venture capital, value creation, and innovation, *Review of Financial Studies* 27, 2434-2473.

Chen, Qi, Itay Goldstein, and Wei Jiang, 2007, Price informativeness and investment sensitivity to stock price, *Review of Financial Studies* 20, 619-650.

Chernenko, Sergey, Josh Lerner, and Yao Zeng, 2020, Mutual funds as venture capitalists? Evidence from unicorns, *Review of Financial Studies*, Forthcoming.

Chordia, Tarun, Richard Roll, and Avanidhar Subrahmanyam, 2011, Recent trends in trading activity and market quality, *Journal of Financial Economics* 101, 243-263.

Coase, R. H, 1937, The nature of the firm, *Economica* 4, 386-405.

Dambra, Michael, Laura Field, and Matthew Gustafson, 2015, The JOBS Act and IPO volume: Evidence that disclosure costs affect the IPO decision, *Journal of Financial Economics* 116, 121-143.

Davydiuk, Tetiana, Brent Glover, and Rachel Szymanski, 2020, The decline in public firms. Working Paper, Carnegie Mellon University.

Demers, Elizabeth, and Katharina Lewellen, 2003, The marketing role of IPOs: Evidence from internet stocks, *Journal of Financial Economics* 68, 413-437.

Derrien, François, and Ambrus Kecskes, 2007, The initial public offerings of listed firms, *Journal of Finance* 62, 447-479.

Doidge, Craig, G. Andrew Karolyi, and René M. Stulz, 2017, The US listing gap, *Journal of Financial Economics* 123, 464-487.

Ewens, Michael, and Joan Farre-Mensa, 2019, The deregulation of the private equity markets and the decline in IPOs, *Review of Financial Studies*, Forthcoming.

Farhi, Emmanuel, Josh Lerner, and Jean Tirole, 2013, Fear of rejection? Tiered certification and transparency, *RAND Journal of Economics* 44, 610-631.

Foucault, Thierry, and Christine A. Parlour, 2004, Competition for listings, *RAND Journal of Economics* 35, 329-356.

Gao, Xiaohui, Jay R. Ritter, and Zhongyan Zhu, 2013, Where have all the IPOs gone? *Journal of Financial and Quantitative Analysis* 48, 1663-1692.

Gompers, Paul, and Josh Lerner, 1999, An analysis of compensation in the US venture capital partnership, *Journal of Financial Economics* 51, 3-44.

Hasbrouck, Joel, 2009, Trading costs and returns for US equities: Estimating effective costs from daily data, *Journal of Finance* 64, 1445-1477.

Hendershott, Terrence, Charles M. Jones, and Albert J. Menkveld, 2011, Does algorithmic trading improve liquidity?, *Journal of Finance* 66, 1-33.

Hennessy, Christopher A., and Toni M. Whited, 2007, How costly is external financing? Evidence from a structural estimation, *Journal of Finance* 62, 1705-1745.

Holmström, Bengt, and Jean Tirole, 1993, Market liquidity and performance monitoring, *Journal of Political Economy* 101, 678-709.

Huddart, Steven, John S. Hughes, and Markus Brunnermeier, 1999, Disclosure requirements and stock exchange listing choice in an international context, *Journal of Accounting and Economics* 26, 237-269.

Hughes, Patricia J., and Anjan V. Thakor, 1992, Litigation risk, intermediation, and the underpricing of initial public offerings, *Review of Financial Studies* 5, 709-742.

Jensen, Michael C., 1986, Agency costs of free cash flow, corporate finance, and takeovers, *American Economic Review* 76, 323-329.

J.P. Morgan, 2018, *Corporate Finance Advisory Trending Topics*.

Johnson, Charles, and Joseph McLaughlin, 2019, *Corporate finance and the securities laws*, Wolters Kluwer.

Kwon, Sungjoung, Michelle Lowry, and Yiming Qian, 2020, Mutual fund investments in private firms, *Journal of Financial Economics*, 136, 407-443.

Leland, Hayne E., and David H. Pyle, 1977, Informational asymmetries, financial structure, and financial intermediation, *Journal of Finance* 32, 371-387.

Lerner, Josh, and Jean Tirole, 2006, A model of forum shopping, *American Economic Review* 96, 1091-1113.

Lerner, Josh, Antoinette Schoar, Stanislav Sokolinski, and Karen Wilson, 2018, The globalization of angel investments: Evidence across countries, *Journal of Financial Economics* 127, 1-20.

Levine, Matt, 2019, Soon direct listings will raise money, Bloomberg Opinion.

Levy, Ari, 2019, The end of the traditional IPO: Airbnb, GitLab and others consider direct listings as banks begin to come around, CNBC Tech.

Li, Sida, Mao Ye, and Miles Zheng, 2020, Who uses which order type and why? Working Paper, University of Illinois at Urbana-Champaign.

Lizzeri, Alessandro, 1999, Information revelation and certification intermediaries, *RAND Journal of Economics*, 214-231.

Lucas Jr, Robert, 1978, On the size distribution of business firms, *Bell Journal of Economics*, 508-523.

Ma, Song, 2020, The life cycle of corporate venture capital, *Review of Financial Studies* 33, 358-394.

Malinova, Katya, and Andreas Park, 2015, Subsidizing liquidity: The impact of make/take fees on market quality, *Journal of Finance* 70, 509-536.

Megginson, William L., and Kathleen A. Weiss, 1991, Venture capitalist certification in initial public offerings, *Journal of Finance* 46, 879-903.

Myers, Stewart C., and Nicholas S. Majluf, 1984, Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics* 13 187-221.

Nimalendran, Mahendrarajah, Jay R. Ritter, and Donghang Zhang, 2007, Do today's trades affect tomorrow's IPO allocations? *Journal of Financial Economics* 84, 87-109.

Osipovich, Alexander, 2020, Investor advocates see risks in silicon valley's favorite IPO alternative, Wall Street Journal.

Pagnotta, Emiliano S., and Thomas Philippon, 2018, Competing on speed, *Econometrica* 86, 1067-1115.

Puri, Manju, 1999, Commercial banks as underwriters: Implications for the going public process, *Journal of Financial Economics* 54, 133–163.

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

Sorkin, Ross Andrew, 2019, Slack CEO explains why the company chose direct listing over IPO, CNBC.

Spulber, Daniel F, 1999, *Market microstructure: intermediaries and the theory of the firm*, Cambridge University Press.

Subrahmanyam, Avanidhar, and Sheridan Titman, 1999, The going-public decision and the development of financial markets, *Journal of Finance* 54, 1045-1082.

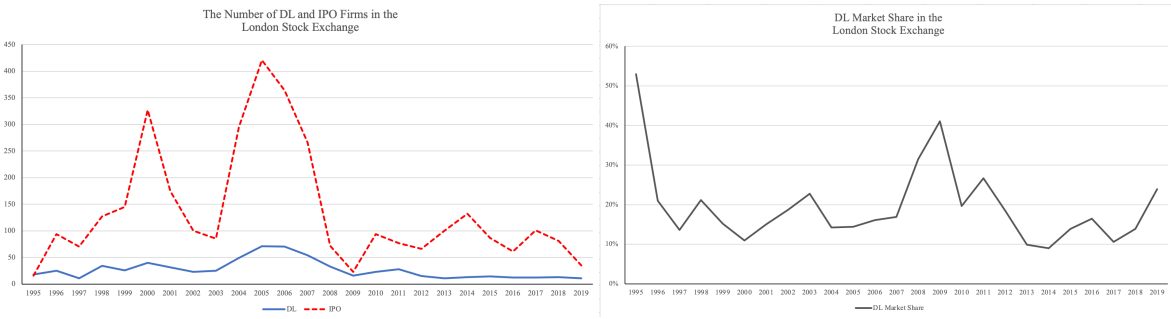
Tinic, Seha M, 1988, Anatomy of initial public offerings of common stock, *Journal of Finance* 43, 789-822.

Tirole, Jean, 2010, *The theory of corporate finance*, Princeton University Press.

Zingales, Luigi, 1995, Insider ownership and the decision to go public, *Review of Economic Studies* 62, 425-448.

	Market Functions for Firms	The Role of Investment Banks
Initial Public Offering (IPO)	Capital raising + going public	Underwriter + distributor + financial advisor
Direct Listing with Raising capital (DLR)	Capital raising + going public	Financial advisor
Direct Listing without raising capital (DL)	Going public	Financial advisor

Figure 1. The Anatomy of the Going-Public Market on the Market Functions for Firms and the Role of Investment Banks.



Panel A: The number of DL and IPO firms in the LSE

Panel B: DL market share in the LSE

Figure 2. Time-Series of the Number of DL and IPO Firms and DL Market Share in the London Stock Exchange. Panel A plots the number of DL and IPO firms. Panel B plots the DL market share.

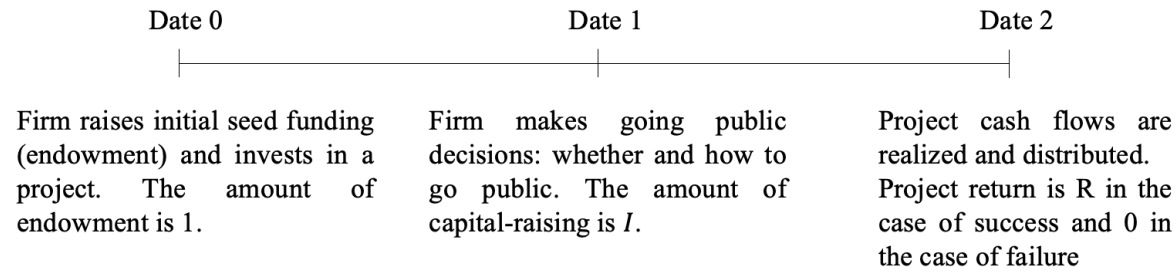


Figure 3. Timeline of the Baseline Model.

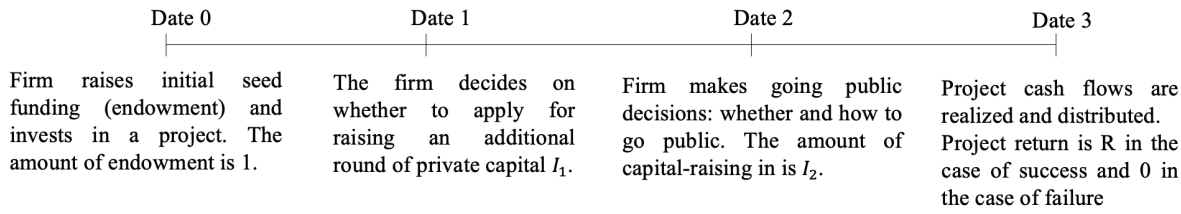


Figure 4. Timeline of the Extended Model.

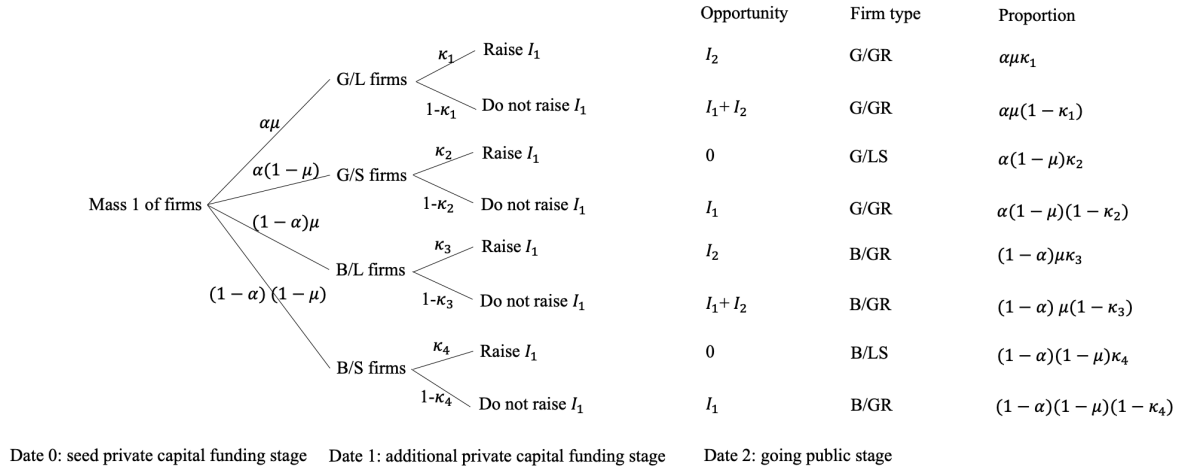


Figure 5. Firm Compositions at the Going-Public Stage in the Extended Model.

	Market Functions for Firms	The Role of Investment Banks
Initial Public Offering (IPO) in LSE and NYSE	Capital raising + going public	Certification on quality and opportunity + advisory
Direct Listing with Raising capital (DLR) in NYSE	Capital raising + going public	Advisory
Direct Listing without raising capital (DL) in LSE	Going public	Certification on quality + advisory
Direct Listing without raising capital (DL) in NYSE	Going public	Advisory

Figure 6. Mapping the Market Functions for Firms and the Role of Investment Banks in the LSE and NYSE Going-Public Markets to the Model.

Table 1

Composition of Going-Public Firms in the London Stock Exchange

This table presents the number of DL firms, the number of IPO firms, the number of going-public firms (the sum of the number of DL and IPO firms), and the DL market share in the London Stock Exchange.

Listing Year	DL	IPO	DL+IPO	DL Market Share
(1)	(2)	(3)	(4)	(5)
1995	18	16	34	53%
1996	25	94	119	21%
1997	11	70	81	14%
1998	34	127	161	21%
1999	26	145	171	15%
2000	40	327	367	11%
2001	31	175	206	15%
2002	23	100	123	19%
2003	25	85	110	23%
2004	49	295	344	14%
2005	71	421	492	14%
2006	70	364	434	16%
2007	54	266	320	17%
2008	33	72	105	31%
2009	16	23	39	41%
2010	23	94	117	20%
2011	28	77	105	27%
2012	15	66	81	19%
2013	11	100	111	10%
2014	13	132	145	9%
2015	14	87	101	14%
2016	12	61	73	16%
2017	12	101	113	11%
2018	13	81	94	14%
2019	11	35	46	24%
Total	678	3414	4092	-
Average	27	137	164	17%

Table 2

Heterogeneity of DL and IPO Firms in the London Stock Exchange

This table presents the heterogeneity of DL and IPO firms in the London Stock Exchange. *Market Cap* is market capitalization right before the firm goes public. The units are in £ million. *Age* is the firm age from the incorporated year to the listing year. *Employee* is the number of employees in the first year after listing. The units are in hundred. *Dividend Payout* is the dividend payout divided by net income in the first year after listing. *Investment Rate* is the capital expenditure divided by total assets in the first year after listing. Column (1) shows the means for IPO firms. Column (2) shows the difference between DL firms and IPO firms. These are coefficients from regressions that control for the going-public year, industry, and country of incorporation. Column (3) shows the difference over the means for IPO firms. Column (4) shows *p*-values. All variables are winsorized at the 1% and 99% levels.

Heterogeneity of DL and IPO Firms in the London Stock Exchange				
	Mean (IPO)	Diff (DL vs. IPO)	Diff/Mean (IPO)	*p*-value
	(1)	(2)	(3)	(4)
Market Cap	109.72	266.27	243%	<0.01
Age	6.18	5.83	94%	<0.01
Employee	14.26	21.74	152%	<0.01
Dividend Payout	23.86%	24.90%	104%	<0.01
Investment Rate	21.27%	-11.12%	-52%	<0.01

APPENDIX

A.1. Proof of LEMMA 1: The condition $\hat{V}^{G/GR} > pR - 1$ can be rewritten as $(p+\tau)(1+I)R - [1 + l + h + (1-p-\tau)f](1+I) > pR - 1$; $[(p+\tau)R - 1 - l - h - (1-p-\tau)f](1+I) > pR - 1$; $(p+\tau)R - 1 - l - h - (1-p-\tau)f > \frac{pR-1}{1+I}$; $h < (p+\tau)R - 1 - l - (1-p-\tau)f - \frac{pR-1}{1+I}$; $h < (p+\tau)(R+f) - 1 - l - f - \frac{pR-1}{1+I}$.

A.2. Proof of COROLLARY 2: The condition $\hat{V}^{G/LS} > pR - 1$ can be rewritten as $(p+\tau)R - 1 - l - h_{DL} - (1-p-\tau)f > pR - 1$; $h_{DL} < \tau R - l - (1-p-\tau)f$; $h_{DL} < \tau(R+f) - l - 1 + pf$.

A.3. Sample Screening Process:

Sample Screening Process	Observations
Initial public listing sample from the London Stock Exchange	5,789
Exclude reverse takeovers, mergers, and schemes of arrangements	5,743
Exclude market transfers	5,138
Exclude re-admissions	4,149
Exclude misclassifications*	4,092

*misclassifications include 11 firms classified as "introduction" or "Not IPO" firms but are with new money raised, as well as 46 firms classified as IPO firms but are without new money raised.