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Endogenous market choice, listing regulations, and IPO spread: Evidence from the London Stock Exchange

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Abstract

This study examines the endogenous market choice and its impact on underwriter spread if Alternative Investment Market (AIM) IPOs that meet Main Market (MM) listing requirements had issued equity in the MM during the 1995–2021 period. We find that the spread is 1.33% higher in the AIM than the MM for IPO listings that meet the MM listing requirements. This finding suggests that AIM companies, meeting the MM listing requirements, could have saved more than £100 million by going public through the MM than the AIM market. We also find that this spread differential is attributed to the issuing firms' market self-selection. We demonstrate that listing requirements in the MM have an impact on the gross spread. The Propensity score matching results show that AIM firms that meet the MM market listing requirements pay a 0.921% higher spread which is significant at a 1% level compared to the MM market IPOs.

KEYWORDS

gross spread, Heckman selection model, listing requirements, propensity score matching, underwriter fixed effects

> *36% of executives cited the costs of going and being public as a cause of the decline in popularity of equity markets. (Price Waterhouse Coopers, 2019)*[1]

1 | INTRODUCTION

The Alternative Investment Market (AIM) of the London Stock Exchange is one of the most successful second markets in the world in terms of new listings. The first motivation of the paper is, despite the enormous growth of the AIM since its initiation in 1995, no attention has been given to the cost of raising capital in this market. The cost of raising capital is an important issue for understanding the popularity of AIM. The AIM IPOs are characterized as small, new, and risky companies while Main Market (MM) listed companies are large, old, and established companies. Given the differences in characteristics of companies across AIM and MM, the fees paid to underwriters from IPO proceeds on small IPOs in the AIM and how that relates to their counterparts at the MM remains unknown. This is an interesting question as it helps to understand the popularity of AIM and the growth of markets for small companies across the globe. Secondly, the listing requirements are different in the AIM and the MM. Some of the firms that meet MM listing requirements float in AIM. To the best of our knowledge, no

study has examined the fees charged by book runners in the AIM relative to the MM for firms that meet the listing requirements of MM and their AIM counterpart issuing firms that do not meet the MM listing requirements. What is the role of listing requirements, if any, on the IPO spread? This paper seeks to fill this gap in the literature.

Previous empirical evidence shows that US underwriters charge 7% on moderate-size IPOs (Abrahamson et al., 2011; Chen & Ritter, 2000) and 13.9% on small IPOs (Garner & Marshall, 2014). In addition, Abrahamson et al. (2011) report that the US underwriters charge higher fees compared to the European counterparts for IPOs in major exchanges. While the previous literature sheds light on the cost of raising capital in the major markets, the cost of raising capital in second markets, such as the AIM of the London Stock Exchange, has not been the focus of the previous empirical IPO studies.

The UK institutional setting is much different than the US institutional framework (Khurshed et al., 2016). For example, there is no limit on commission paid in the UK, while there are limits on commission in the US. US regulation places a reasonable level on the underwriter compensation, whereas UK regulation is silent on that. Nevertheless, previous studies (e.g., Abrahamson et al., 2011; Torstila, 2001) show that US gross spreads are much higher than in other countries. In this paper, we further add to the literature by addressing the question: what is the level of underwriter gross spread for small IPOs, mainly issued on the AIM, where there is no restriction on commission paid to the underwriters?

London Stock Exchange has two markets: the MM, also known as the official list, a market for large and established companies, and the AIM, a market for small growth companies. MM has three listing requirements: 3 years of age (published accounts), a minimum float of 25%, and a market value at the admission of 750,000. In comparison, AIM does not have any listing requirements. AIM is an exchange regulated market, whereas the Financial Services Authority (FSA) regulates MM. It is believed that the growth of AIM is due to the lack of listing requirements in that market.[2] However, recently Doukas and Hoque (2016) show that at least half of the companies that join AIM could have joined the MM because they fulfil the MM listing requirements. Therefore, these companies have the choice of listing in the AIM or in the Main market since they meet the MM listing requirements. Like other corporate finance decisions, the market choice is a self-selection decision for the AIM firms that satisfy MM listing requirements. To address this issue, we employ the Heckman (1979) two-step process and find that the inverse Mills ratio estimates suggest that there are observable and unobservable characteristics in the AIM IPOs for which underwriters charge more. Then, we estimate the endogenous switching regression models to answer the 'what if' type of question since we are interested to find out whether AIM firms that meet the MM listing requirements could be better off in terms of paying lower spreads if they joined the MM and vice versa.[3] The novelty of this empirical inquiry is designed to shed light on the unanswered question of what would have been the underwriter spread if AIM IPOs that meet MM listing requirements had issued equity in the MM.

Our evidence shows that AIM companies that could list on the MM by meeting its listing requirements would have saved a significant amount of money (£102 million), representing 1.33% of proceeds if they had issued equity capital in the MM.[4] The higher cost of issuance for this group of AIM firms could be attributed to the issuing firms' market self-selection due to different firm characteristics and dissimilar post-listing investment and financing priorities between AIM and MM firms (Doukas & Hoque, 2016). Specifically, our results show that the mean (median) spread in the MM is 4.23% (4.00%), whereas the mean (median) spread in AIM is 6.29% (6.00%). The average spread wedge in these two markets is 2.09%.

Furthermore, we examine whether the absence of regulation impacts the underwriter spread in the AIM by dividing the AIM companies into two groups: AIM companies that could list on the MM by meeting the MM listing requirements and AIM companies that do not meet the MM listing requirements. Half of the AIM firms do not fulfil the MM listing requirements, whether the gross spread is similar for the AIM firms that meet the MM listing requirements relative to their AIM counterparts that do not meet such requirements. Our evidence points out that the gross spread in the former group is 5.84% and 8.02% in the latter group. The 2.18% spread difference between these two AIM IPO groups is statistically and economically significant in the regressions after controlling for other factors. The lower spread of AIM IPOs that meet the MM listing requirements suggests that book-runners view these IPOs as less risky than their counterparts that do not meet the MM listing requirements.

As regulators have tightened regulations[5] regarding AIM companies and nominated advisors (NOMADs),[6] more rigorous due diligence in the AIM IPO market might increase the cost of raising funds through IPOs. We find that tightening the regulations had a positive impact on IPO gross spreads in the AIM. We then examine whether the strict regulations impact the gross spread through the AIM firms that do not fulfil MM listing requirements. The regulation was likely more relevant to the firms that do not meet MM listing requirements, and

hence we observe that it had a greater impact on the AIM firms that do not meet MM listing requirements. In sum, with increases in due diligence procedures after the regulatory changes, AIM firms that do not meet the MM listing requirements are associated with higher spreads.

The contribution of our paper is as follows. First, as AIM was successful as a secondary market, what is the cost of raising money in AIM compared to the MM in the LSE? We have addressed this interesting question. Several European exchanges have developed a second market after the success of AIM such as AIM Italia, the Alternext market launched by NYSE-Euronext, and First North, part of the NASDAQ-OMX group of exchanges, which serves the Nordic and Baltic regions. In 2009, by following AIM, LSE and the Tokyo Stock Exchange formed a joint venture called 'Tokyo AIM'. After the Sarbanes Oxley act in the US, AIM has become even more popular market. Our study has implications for the gross spreads in the stock exchanges in developed and emerging markets in countries like Japan, Canada, Hong Kong, Malaysia, India, etc.

Second, half of the companies that join AIM could have joined the MM because they fulfil the MM listing requirements. Hence, the market choice is a self-selection decision. We are the first to examine the impact of self-selection on listing fees. We find that mills inverse ratio (self-selection parameter), which measures the observable and unobservable risk of AIM firms, has an impact on the gross spread. This is in line with Piotroski (2013), who notes several attributes (such as growth prospects, and inherent risk) that differ in the AIM and MM market that could lead underwriters to charge different spreads even for two identical companies.

Third, there are three measurable listing requirements for the admission of the MM. But there is no such regulation for the AIM. We show that there is an impact of listing regulation on the gross spread. AIM firms that do not fulfil MM listing requirements pay more compared to the firms that fulfil MM listing requirements but join the AIM. It seems that underwriters charge knowingly different fees to different AIM companies (that fulfil vs do not fulfil MM listing requirements) as their listing poses significant reputation risk to the underwriter, which is in line with Gerakos et al. (2013).

Finally, we contribute to the alternative risk mitigation mechanisms apart from the gross spread which is underpricing and lockup length. AIM firms that do not fulfil MM listing requirements are associated with higher underpricing, longer lockups, and higher fees than the AIM firms that meet MM listing requirements. These findings might also imply that the NOMADs have higher power to charge higher gross spreads and impose longer lockups for the AIM IPOs that do not satisfy MM listing requirements because these IPOs are perceived as risky.

The rest of the paper is organized as follows. In Section 2, we discuss the institutional background and develop hypotheses. Section 3 describes the data and methodology. Section 4 presents the descriptive statistics. In Section 5, we examine the determinants of gross spread. In Section 6, we model the self-selection of the market through the Heckman (1979) model and estimate endogenous switching regressions. Section 7 investigates whether AIM firms that do not meet the MM listing requirements pay higher fees. Section 8 addresses the intertemporal variation in regulation and gross IPO spread. In Section 9, we examine the underpricing and lockup length. Finally, Section 10 concludes.

2 | INSTITUTIONAL SETTING AND TESTABLE HYPOTHESES

2.1 | Institutional background

The London Stock Exchange (LSE) has two major segments: the MM (i.e., The Official List of the London Stock Exchange) and the AIM. LSE regulated and looked after the requirements for new companies wishing to list on the LSE until 2000. After 2000, this regulatory and supervisory function was delegated to the UK Listing Authority (UKLA), a part of the UK Financial Services Authority (FSA). Historically, larger and more mature companies join the MM. The EU Investment Services Directive defines the MM as a regulated market and AIM as an exchange regulated market, also known as an unregulated market. This, in turn, means that companies wishing to list on the MM need to fulfil the listing requirements of the UKLA and the LSE, while the companies wanting to list on the AIM need to meet the admission requirements of the UKLA. However, a company wishing to be listed on the AIM needs to find a Nominated Advisor (NOMAD), who acts as a middleman between the company and the Stock Exchange.

The lighter regulatory environment in the AIM makes it one of the most successful markets for growth companies in the world (Doukas & Hoque, 2016; Vismara et al., 2012). AIM is a market for smaller and younger companies that raise funds that they need for expansion. AIM was launched in June 1995, and it experienced enormous growth over the 25 subsequent years, attracting more than 3900 UK and foreign new companies,[7] raising £114 billion through new and further issues.[8] By end of 2021, this included 967 UK and 225 international companies. Following the success of AIM, other stock exchanges launched similar sections. For instance, NYSE-Euronext launched the Alternext market, and the NASDAQ OMX group launched NASDAQ OMX First North.

2.2 | Testable hypotheses

Most of the previous studies examined the IPO gross spread for the Main Markets. Starting with the seminal work of Chen and Ritter (2000), several studies have tried to examine why book-runners charge a fixed fee of 7% for US IPOs. Chen and Ritter (2000) explained the 7% spread as collusion among the book runners. Hansen (2001), however, did not find any evidence of collusive behaviour by the book-runners; instead, he attributes the 7% to efficient contracting of IPOs (7% covers cost plus normal profit for underwriters). According to Hansen (2001), investment banks compete in pricing 7% IPOs, based on reputation, placement service, and underpricing. Using an international sample of IPOs, Torstila (2003) finds evidence of clustering in IPO gross spreads beyond the US Clustering is typical in many countries worldwide at lower levels of a spread than 7%. His results indicate that evidence of clustering does not reflect collusive practices by the book runners.

Additionally, an analysis of abnormal gross spreads following Hansen (2001) indicates that few clusters contain abnormal positive surpluses.[9] Analysing European IPOs, Torstila (2001) reports that the IPO gross spread is lower for the European IPOs relative to the US IPOs. More recently, Abrahamson et al. (2011) show that the 7% spread charged by the underwriters in the US market has become more common practice in recent years and represents the norm for IPOs raising up to $250 million. However, when they compare the US to the European IPO fees, they find that underwriters charge about 3% less the European issuers than US issuers and attribute the difference to strategic pricing.

In the context of the UK market, a few empirical studies are using mostly pre-AIM data. For example, Chen and Mohan (2002) analyse underwriter reputation, underwriter spread, and IPO underpricing during the 1990–1992 period. They hypothesize that underwriter spread is the explicit price for IPOs, and underpricing is the implicit price for IPOs. They find that higher underpricing is associated with higher underwriter spread. Armitage (2000), using a sample that ends just 1 year after the start of AIM, examines the direct cost of UK rights and open offers and finds that the average is 5.78% and the median is 4.28% for the period of 1985–1996.

According to Affleck-Graves et al. (1993), the underpricing of IPOs on the NYSE, AMEX, NASDAQ/NMS, and NASDAQ/non-NMS exchanges differs. The reasons IPOs select the NASDAQ, or the NYSE are analysed by Corwin and Harris (2001), who reports that the two venues have different listing costs and other market procedures. Mendoza (2008) makes the case that AIM fills a funding need for businesses whose characteristics prevent them from being listed on senior markets like the LSE, NASDAQ, or NYSE. In a more recent study, Doukas and Hoque (2016) report that AIM and MM attract companies with different characteristics, post-listing investment, and financing priorities. As the companies that list on AIM are riskier, younger, and smaller compared to the MM companies, hence the underwriters charge more for companies that join AIM. Hence, we hypothesize that:

> **H1.** AIM companies pay a higher gross spread compared to the MM companies.

NOMADs are fundamental to AIM's regulatory model. NOMADs provide firms wishing to list in the market with necessary advice regarding the rules and regulations they need to follow. In this way, the UKLA tries to reduce the cost of regulating AIM-listed companies. NOMADs provide corporate advisory services to firms on Mergers and Acquisitions, Seasoned Equity offerings, Insider trading, etc. One of the conditions for firms to be listed and traded in the AIM is to have a NOMAD. If a firm does not have a NOMAD, it needs to find one as soon as possible; otherwise, it faces the risk of being delisted. In sum, the NOMADs are essential in the AIM, and there is a special relationship between the company and the NOMAD. Usually, companies keep their book-runners as NOMADs in the AIM (Hoque & Lasfer, 2016), unlike in the US, where they change the corporate broker based on their performances (Krigman et al., 2000). This suggests that NOMADs in the AIM have more power to charge higher fees to the AIM companies seeking to be listed in the AIM.

There are considerable regulatory differences between the two markets regarding (i) admission criteria and (ii) continuing obligations.[10] There are three measurable listing requirements in the MM: age, float, and market value. For admission in the MM, the company's minimum age needs to be 3 years (published accounts), at least 25% of shares are floated, and £750,000 of market value at entry. If a company does not meet the MM listing requirements, it needs to list on the AIM. There are differences between the two markets in that the MM is subject to considerably higher levels of compliance and greater ongoing obligations concerning disclosure and transparency.

The stricter listing requirements in the MM mean that some of the companies could not join the MM for not meeting its listing requirements. Firms that fail to meet the MM listing requirements are forced to join the AIM. On the other hand, other companies list on the AIM while they meet the MM listing requirements. Obviously, this decision is by choice. Book runners know

which companies fulfil the MM listing requirements and which do not. For the latter group, book runners have higher power to charge higher fees, as these companies can only list in the AIM because they do not satisfy the MM listing requirements. Thus, the listing requirements in the MM have implications for the gross spread charged in the AIM. Taken together, the need for companies to keep their book-runners as NOMADs in the AIM and the listing requirements in the MM suggests that the book-runners potentially could charge higher fees to companies that do not meet the MM listing requirements. Therefore, the UK IPO market structure allows us to address whether the listing requirements and market self-selection have any implications on the level of spread charged by the underwriters. Hence, we propose:

> **H2.** AIM companies that do not meet the MM listing criteria pay higher fees.

3 | DATA AND DESCRIPTIVE STATISTICS

3.1 | Data

In this study, we collect the IPOs in the Main and AIM markets of the London Stock Exchange for the period starting from 1995 to 2021. We have only included the IPOs that are new admissions incorporated in the United Kingdom. As the behaviour of the financial and investment firms differ from other firms in the market, we have excluded 617 IPOs of financial and investment firms.

The data in this study have been collected from several sources. The initial list of IPOs and issuing markets comes from the London Stock Exchange. The initial list contained 2456 IPOs. We excluded 361 companies due to missing information. The final list included 2095 IPOs, out of which 1410 joined AIM and 685 raised capital in the MM. We use the perfect Filings database to obtain the prospectuses. The fees, lockup dates, venture capital presence, number of book runners, proceeds, and issue price are hand collected from the IPO prospectuses. The trading prices after the IPO are collected from DataStream.

Following Derrien and Kecskes (2007), we classified underwriters to be either prestigious or other. A broker is classified as "prestigious" if it is a global investment bank. In instances in which prestige is not apparent, we consult the 1997–2003 editions of Thomson's Extel Survey" (Derrien & Kecskes, 2007), as well as the 2013 Thomson's Extel Survey. All the variables are defined in Appendix A (Table A1).

3.2 | Descriptive statistics

In this section, we describe the sample. Table 1 displays the summary statistics of the data used in the analysis. The mean (median) spread is 5.82% (5.00%) for the whole sample of IPOs. The maximum is 21.02%, and the minimum is 1.16% (not reported), which shows a wide variation in the fees charged by book runners. The mean (median) proceeds are £56.60 (£5.79) million. The mean (median) number of book-runners is 1.20 (1.0), implying that a single book-runner manages most IPOs. However, one of the IPOs has eight book runners. The results show that 47% of companies hire prestigious investment banks. The mean (median) lockup length is 391(365) days. The mean (median) underpricing is 15.90% (7.58%). The results also show that 28% of companies join the MM, and 20% are venture capital-backed.

Table 1 also reports statistics across the two markets, AIM and MM. The results show that the mean (median) spread is lower in the MM. Proceeds are higher in the MM, which is also reflected by the higher number of book runners in the MM. 88% of the book runners are prestigious in the MM, whereas only 39% are prestigious in the AIM. Lockup length and underpricing are lower in the MM in comparison to the AIM. These statistic patterns highlight that the IPO characteristics between the AIM and MM are considerably different.

4 | EMPIRICAL RESULTS

4.1 | Do AIM companies pay more fees?

In this section, we ask the question of whether AIM companies pay more compared to MM companies. Following Abrahamson et al. (2011), we include the log of proceeds and number of book runners in the baseline regression model of the determinants of gross IPO spread (*Spread*). In addition, we examine the effects of the prestigious book runner, lockup length, underpricing, venture capital backing, and AIM dummy (AIM equals 1). The OLS regression is specified as follows:

$$\begin{aligned} Spread_i = {} & \alpha + \beta_1 Log\,Proceeds_i + \beta_2 No\ of\ book\ runners_i \\ & + \beta_3 Prestigious_i + \beta_4 VC_i + \beta_5\, AIM\ dummy_i \\ & + \beta_6 \log lockup\ length_i + \beta_7 Underpricing_i + \varepsilon_i \end{aligned} \tag{1}$$

Spread represents the book-runners fees scaled by gross proceeds, and the first explanatory variable is the log proceeds.[11] Proceeds are in £ million. No. of book-runners is the number of investment banks as book

TABLE 1 Descriptive statistics

	Spread (%)	Proceeds (£mil)	No. of book runners	Prestigious	Lockup length (days)	Underpricing	Main market (MM)	VC	Tech	Book runners who are active in main and AIM	AIM only underwriters
All IPOs											
N	2095	2095	2095	2095	2095	2095	685	419	348	140	561
Mean	5.82	56.60	1.20	0.47	391	15.90	0.28	0.20	0.16	1	1
Median	5.00	5.79	1.00	0.00	365	7.58	0.00	0.00	0	1	1
MM											
N	685	685	685	685	685	685	685	137	165	115	
Mean	4.23	218.70	1.50	0.88	331	6.00	1.00	0.19	0.24	1	
Median	4.00	65.87	1.00	1.00	365	5.57	1.00	0.00	0.00	1	
AIM											
N	1410	1410	1410	1410	1410	1410	--	282	183	25	561
Mean	6.29[a]	16.50[a]	1.10[a]	0.39[a]	412[a]	20.20[a]	0.00	0.20	0.13[a]	1	1
Median	6.00[b]	4.34[b]	1.00	0.00[b]	365	9.11[b]	0.00	0.00	0.00	1	1

Note: This table reports descriptive statistics for All IPOs, MM IPOs, AIM IPOs spreads, and other IPO characteristics from the London Stock Exchange over 1995–2021. All variables are defined in Appendix A.

[a]A significant difference between AIM MM for mean difference *t*-test at 1% or 5%.

[b]A significant difference between AIM and MM for Wilcoxon/Mann–Whitney median difference test at a 1% or 5% level.

TABLE 2 Determinants of IPO spread

	OLS (1)	OLS (2)	2SLS (3)	2SLS (4)
Log of proceeds	−2.748***	−3.089***	−0.389**	−1.085***
	(−11.94)	(−8.26)	(−2.37)	(−2.88)
No. of book runners	−0.225	−0.367	3.398***	1.892
	(−0.82)	(−1.73)	(2.58)	(1.23)
Prestigious	0.07	0.681	0.929**	1.306*
	(0.23)	(1.46)	(2.08)	(1.88)
VC baking	0.211	0.215	1.401**	0.953
	(0.66)	(0.78)	(2.53)	(1.52)
AIM dummy	0.835***	0.368	1.592***	1.171**
	(2.98)	(1.29)	(2.86)	(2.13)
Underpricing	0.118**	0.094**	8.579***	5.399**
	(2.47)	(2.22)	(2.78)	(2.49)
Log of lockup length	2.53***	0.001	1.53**	0.001
	(3.33)	(1.55)	(2.16)	(1.49)
Constant	25.476***	26.685***	−1.296	10.046
	(14.73)	(10.80)	(−0.14)	(0.94)
Year FE	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
Underwriter FE	N	Y	N	Y
R^2	0.265	0.219	0.264	0.214
N	2095	2095	2095	2095

Note: This table reports regression results of the determinants (i.e., log of proceeds, number of book runners, prestigious book runners, venture capital backing, high tech dummy, AIM dummy, underpricing, and log of lockup length) of gross IPO spread (Spread) by estimating the following baseline model:

$$Spread_i = \alpha + \beta_1 Log\,Proceeds_i + \beta_2 No\,of\ book\ runners_i + \beta_3 Prestigious_i + \beta_4 VC_i + \beta_5\ tech\ dummy + \beta_6 AIM\ dummy_i$$
$$+\beta_7 \log lockup\ length_i + \beta_8 Underpricing_i + \varepsilon_i.$$

For the first stage regression for estimating Underpricing and log(lockup length) (in separate regressions) in columns 3 and 4, we use the log of proceeds, no. of book runners, prestigious, VC backing, tech dummy, and AIM dummy as explanatory variables. *T*-statistics based on cluster-adjusted (by year) standard errors (Petersen, 2009) are in parentheses. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

runners. Prestigious is defined as if the book runner is a global investment bank in Derrien and Kecskes (2007). Lockup length is the number of days insiders are not allowed to sell shares. Underpricing is calculated as the return on the offering price to the closing price at the end of the first trading day. AIM is a dummy for the Alternative Investment Market in London. VC backing is a dummy if the IPO is venture capital backed.

The results are reported in Table 2. In the first regression (column 1), we use year and industry fixed effects. The log of proceeds is negative and significant in this specification. The negative coefficient of proceeds indicates that the higher the proceeds, the lower the spread.[12] The AIM dummy is positive and significant, implying that book-runners charge IPO issuers higher fees in the AIM than in the MM, after controlling for other factors. This supports our hypothesis 1. Underpricing is significant and positive in model 1 suggesting that concerns relating to liquidity and uncertainty about the level at which the stock will trade influence the IPO spread. Lockup length is also positive and significant implying the companies that have longer lockups pay more fees. In column 2, we consider year, industry, and underwriter fixed effects. The results are broadly similar to model 1.

Because underpricing and lockup length are determined outside of the models (endogenous variables), we estimate them in separate regressions and use the estimated value for underpricing and lockup length in second-stage regression.[13] We report the results in columns 3 and 4. In column 3 we use year and industry fixed effects and in column 4, we use year, industry, and underwriter fixed effects. In both specifications, the AIM dummy is highly significant implying that AIM companies pay more fees. We also consider other variables such

as idiosyncratic risk, log age days, bid-ask spread, and inverse issue price in unreported results. The bid-ask spread and the inverse issue price have a positive and significant impact on the spread.

5 | HECKMAN TWO-STEP PROCESS FOR GROSS SPREAD

The above analysis assumes that the market choice is exogenously determined. However, the choice of the IPO market could be endogenous for AIM companies that meet the heavier regulatory environment of the MM. In fact, half of the AIM companies in our sample fulfil the listing requirements of the MM. Essentially, the decision to issue equity in the AIM or MM is a self-selection decision like other corporate finance decisions. If this is the case, our previous analysis through OLS could produce biased results, as pointed out by Heckman (1979). Heckman (1979) shows that the use of OLS in the case of self-selection choice results in specification error and proposes a two-step estimation process to control for self-selection bias (Table 3).

We apply a two-stage process, where we model the choice of AIM versus the MM in the first stage. Then, we estimate the inverse Mills ratio in the first stage, and in the second stage equations, we use the inverse Mills ratio to correct for the bias. It is recommended that at least one extra variable is present in the first stage that is not used in the second stage (Li & Prabhala, 2007). This additional variable should be exogenous and impact the choice of the market but not the gross spread. It is widely believed that the MM is a market for established, larger and mature companies, while the AIM is a market for young and small firms. In line with this view, we use three identifiable listing requirements in the MM, such as market capitalization, percent float, and age, as the additional explanatory variables in the first stage equation. The justification of these variables stems from the listing requirements of the MM. To address this issue, we use the Heckman (1979) two-step process described in Appendix B.

TABLE 3 Heckman two-step selection bias test-AIM firms that meet MM listing requirements and MM IPOs

Panel A: 1st stage regression (selection equation)		
	Coef.	***Z***
Log (mkt cap mil)	−3.620***	−9.07
Percent float	0.008	1.49
Log (age days)	−0.614***	−3.37
Cons	26.70***	9.00
Year FE	Y	
Industry FE	Y	
Underwriter FE	Y	
Pseudo R^2	0.717	
N	1372	
Panel B: 2nd stage regression (outcome equation)	**Coef.**	***t***
Log of proceeds	−1.727***	−7.02
No. of book runners	−0.265	−1.13
Prestigious	0.041	0.25
VC backing	0.013	0.45
Inverse mills ratio	0.312***	2.89
Cons	25.321***	11.21
Year FE	Y	
Industry FE	Y	
Underwriter FE	Y	
Adj R^2	0.1785	
N	1372	

Note: This table reports the results of the Heckman two-stage process for gross IPO spread analysis for the AIM and MM in the London Stock exchange from 1995 to 2021. Panel A represents the first-stage selection equation estimated by Probit regression. The dependent variable is one if a firm meets the MM listing requirements but issues equity on the AIM (687 IPOs) and zero if it issues equity on the MM (685 IPOs). Panel B represents the outcome (second-stage equation), where the dependent variable is IPO gross spread. The Inverse Mills ratio adjusts for the selection bias. All variables are defined in Appendix A. Standard errors are cluster-adjusted by year (Petersen, 2009). ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

5.1 | Heckman two-step process for AIM firms that meet MM listing requirements and MM IPOs

The results of the Heckman two-step estimation process, reported in Panel A of Table 4, show that the coefficients of the log of market capitalization (−3.620) and log of age (−0.614) are negative and significant in the first step Probit regression. This suggests that smaller and younger companies choose to raise capital in the AIM. Next, we estimate the inverse Mills ratio from the Probit regression in the first stage and add it in the second stage regression as an additional explanatory variable and report them in Panel B. As can be seen, the coefficient of the inverse Mills ratio is 0.312 and significant at a 1% level. This result reveals self-selection and implies that the AIM companies' specific prominent and unobservable characteristics that satisfy MM listing requirements increase the likelihood of choosing AIM as the platform of equity issuance, raising the IPO gross spread. Since the inverse Mills

ratio is significant at a 1% level, it seems that the unobservable characteristics increase the gross IPO spreads.

5.2 | Endogenous switching regression-AIM firms that meet MM listing requirements and MM IPOs

Panel B of Table 4 reports the second-stage switching regression results for the AIM IPOs. These second-stage results indicate that only the log of proceeds is negative (−1.823) and significant at 1%.[14] The Inverse Mills ratio (0.742) is significant at 5%, suggesting that the discernable (e.g., IPO characteristics such as size, and age) and undiscernible (e.g., unmeasurable risk) characteristics of the AIM IPOs that meet MM listing requirements are associated with the higher level of gross spread. The MM regression shows that the log of proceeds (−0.712) and the number of book runners (−0.525) are negative and significant, while VC backing is positive and significant (0.541). In this setting, the MM results in Panel B show that the inverse Mills ratio (0.158) is not significant. The insignificant inverse Mills ratio for MM implies that the market choice does not impact the level of gross IPO spread firms pay to issue equity in the market of their choice – AIM or MM; however, since there is an endogenous choice for the AIM firms which meet the MM listing requirements to issue equity in AIM or MM, as before we perform a "what if" analysis next to determine what would be the spread if this group of AIM firms had chosen to issue equity in the MM.

As shown in Panel C of Table 5, AIM firms would have paid a significantly lower spread if they issue equity in the MM. Specifically, AIM firms that meet MM would pay 4.51%, which is 1.33% lower than what they paid (5.84%) by selecting to raise capital in the AIM. This result suggests that AIM firms that meet the MM listing requirement could have experienced significant cost savings by listing on MM.

While so far, we have examined the impact of the IPO market choice on the spread of IPO issuers, and firm unobservable characteristics in the AIM are related to higher gross spread. In the next section, we conduct further analysis to understand the spread charged after neutralizing the difference between book runners and IPO size.

TABLE 4 Endogenous switching regression-AIM firms that meet MM listing requirements and MM IPOs

Panel A: 1st stage regression (selection equation)		
	Coef.	***Z***
Log (mkt cap mil)	−3.620***	−9.07
Percent float	0.008	1.49
Log (age days)	−0.614***	−3.37
Cons	26.70***	9.00
Year FE	Y	
Industry FE	Y	
Underwriter FE	Y	
Pseudo R^2	0.717	
N	1280	

Panel B: 2nd stage regression (outcome equation)	**AIM**		**Main**	
	Coef.	***T***	**Coef.**	***T***
Log of proceeds	−1.823***	−5.27	−0.712**	−2.12
No. of book runners	0.421	0.51	−0.525***	−2.95
Prestigious	0.112	0.32	0.254	0.94
VC backing	−0.071	−0.12	0.541*	1.96
Inverse mills ratio	0.742**	2.16	0.158	0.912
Year FE	Y			
Industry FE	Y			
Underwriter FE	Y			
cons	19.854***	8.91	12.653***	4.05
Adj R^2	0.1024		0.0985	
N	687		685	

Panel C: What if analysis	**AIM**		**Main**	
	Spread	***t***	**Spread**	***t***
Actual	5.84%***	40.21	4.12%***	33.25
Hypothetical	4.51%***	201.25	5.65%***	70.21
Difference	1.33%***	−8.33	−1.53%***	7.86

Note: This table reports the results of the switching regression model analysis for gross IPO spread for the AIM and MM in the London Stock exchange from 1995 to 2016. Panel A represents the first-stage selection equation estimated by a Probit regression, where the dependent variable is set equal to one if a firm meets the MM listing requirement but issues equity on the AIM (687 IPOs) and zero if it issues equity in the MM (685 IPOs). Panel B represents the outcome (second-stage equation) for the AIM and MM separately, where the dependent variable is IPO gross spread. The Inverse Mills ratio adjusts for the selection bias. All variables are defined in Appendix A. Standard errors are cluster-adjusted by year (Petersen, 2009) ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

6 | FURTHER ANALYSIS

6.1 | Spread after neutralizing the difference between book runners

One important issue is that global investment banks do not underwrite many IPOs in the AIM. We also notice that several book runners manage IPOs only in the AIM. To understand why fees are higher in the AIM, we first examine the underwriters' involvement in the MM and

TABLE 5 Descriptive statistics of book-runners who underwrite in the MM and AIM

Variable	Mean	SD	Median
Panel A: MM IPOs by book-runners who manage issues in the MM and AIM, $N = 302$			
MM			
Spread	4.01	1.31	4.00
Log of proceeds	8.52	0.81	7.32
No. of book runners	1.74	1.04	1.00
Prestigious	0.97	0.28	1.00
Underpricing	3.57	31.25	9.87
VC backing	0.23	0.52	0.00
Panel B: AIM IPOs by book-runners who manage issues in the MM and AIM, $N = 95$			
Spread	5.11	1.26	4.21
Log of proceeds	7.76[a]	0.62	5.31[c]
No. of book runners	1.25	0.56	1.00
Prestigious	0.87	0.26	0.00 [c]
Underpricing	11.25 [a]	36.02	13.78 [c]
VC backing	0.11	0.31	0.00
Panel C: IPOs= > £15 million in the AIM, $N = 286$			
Spread	5.32[b]	1.65	4.61[d]
Log of proceeds	7.52[b]	0.30	7.21
No. of book runners	1.11[b]	0.36	1.00
Prestigious	0.54[b]	0.50	0.00
Underpricing	4.87	27.07	6.82[d]
VC backing	0.25	0.43	0.00

Note: This table reports descriptive statistics for IPOs in (a) MM IPOs by book-runners who manage issues in the MM and AIM, (b) AIM IPOs by the book-runners who manage issues in the MM and AIM, and (c) IPOs= > £15 in the AIM. Variable definitions are in Appendix A.

[a]The means are different between MM IPOs by the book-runners who manage issues in the MM and AIM and AIM IPOs by the book-runners who manage issues in the MM and AIM.

[b]The means are different between All Main and AIM IPO greater or equal to £15 million.

[c]The medians are different between MM IPOs by the book-runners who manage issues in the MM and AIM and AIM IPOs by the book-runners who manage issues in the MM and AIM.

[d]The medians are different between All Main and AIM IPO greater or equal to £15 million.

AIM market. Table 5 describes the underwriter characteristics in both markets. Panel A describes the MM IPOs by book-runners who manage issues in the MM and AIM. There are 302 such IPOs. The gross spread for this group is 4.01%. The average log of proceeds and number of book-runners are 8.52 and 1.74, respectively. Underpricing is 3.57%. Prestigious underwriters underwrite 97% of IPOs, and 23% have a VC presence. Panel B describes the AIM IPOs by book-runners who manage issues in the MM and AIM. There are only 95 IPOs. The spread is 5.11%, which is slightly higher than the spread in Panel A. The underpricing is very high in Panel B (11.25%), compared to Panel A (3.57%). In terms of mean differences, the log of proceeds and underpricing is different. The median difference is significant for the log of proceeds, prestigious, and underpricing.

Table 5, Panel C illustrates IPO gross proceeds higher than 15 million or more. The average spread is 5.32% for such IPOs. The average log of proceeds and number of book-runners are 7.52 and 1.11, respectively. Prestigious underwriters underwrite 54% of these IPOs, and 25% are VC-backed. The mean difference between AIM IPOs by the book-runners who manage issues in the MM and AIM and IPOs of 15 million or more shows that spread, log of proceeds, number of book-runners, and prestigious underwriters are significantly different. The median difference is significant for spread and underpricing.

Then, we run separate multivariate regressions for the underwriters who manage issues in the AIM and MM and AIM only underwriters, respectively, and report the results in Table 6. The log of proceeds has a negative and significant effect on the spread for the underwriters who

TABLE 6 Regressions for book-runners who underwrite in the MM and AIM (2SLS)

	Underwrites in the main market and AIM (1)	AIM only underwriters (2)	All MM IPOs and IPOs of £15 M and above in the AIM (3)
Log of proceeds	−0.694**	−3.365***	−0.562**
	(−2.69)	(−12.79)	(−2.33)
No. of book runners	−0.19	1.657*	−0.171
	(−1.45)	(1.92)	(−1.10)
Prestigious	0.832**	0.936**	0.014
	(2.00)	(2.51)	(0.06)
AIM dummy	0.101		0.136
	(0.34)		(0.62)
Log of lockup length	0.001	0.002*	−0.01
	(0.94)	(1.78)	(0.51)
Underpricing	0.011	−0.107*	−0.041
	(0.08)	(−1.86)	(−0.36)
VC baking	−0.069	0.198	−0.383
	(−0.24)	(0.51)	(−1.59)
Constant	8.839***	25.911***	8.681***
	(4.21)	(14.04)	(4.56)
Year FE	Y	Y	Y
Industry FE	Y	Y	Y
Underwriter FE	Y	Y	Y
R^2	0.15	0.236	0.056
N	331	853	881

Note: This table reports regression results for IPO spread after neutralizing the effects of book-runners and size. In the first stage, we estimate underpricing and log of lockup length (in separate regressions) using a log of proceeds, no book runners, prestigious, VC backing, tech dummy, and AIM dummy. The dependent variable is gross spread. All variables are defined in Appendix A. *T*-statistics based on cluster-adjusted (by year) standard errors (Petersen, 2009) are in the parenthesis. ***, ** and * represents significant at 1%, 5% and 10%, respectively.

manage equity issues in the AIM and MM (column 1). The prestigious underwriter is positive and significant in this specification. However, for underwriters who exclusively concentrate on AIM IPOs (Column 2), the log of proceeds is negative and significant, and prestigious underwriters are positive and significant. Because firms listing on the AIM tend to perform poorly (Doukas & Hoque, 2016) once they list on the AIM (Gerakos et al., 2013), underwriters are exposed to significant reputation risk. This reduces the number of underwriters willing to underwrite AIM companies, leading to higher spreads. On the other hand, the number of book-runners and the log of lockup length are positive and significant. Surprisingly, the positive sign of these two variables reveals that as the number of book runners in the AIM increases, they charge higher spreads and impose longer lockups. These results indicate the unique nature of NOMADs and highlight the ability of book runners to charge higher spreads in the AIM.

6.2 | Spread after neutralizing the size of IPOs

Since the size of the IPOs is smaller in the AIM than in the MM, one might argue that we are comparing apples with oranges. To construct a more comparable sample to the MM, we examine the larger IPOs in the AIM. Specifically, we look at IPOs with proceeds of £15 million or greater. By looking at large IPOs, we neutralize the size difference between the two markets. This allows us to understand better the gross spread charged for the larger IPOs in MM and AIM. The results in column 3 of Table 6 show that the log of gross proceeds is significant for

TABLE 7 Analysis of firms that fulfil MM listing requirements but list in the AIM

Variable	Mean	Std.	Median
Panel A: AIM firms that do not fulfil MM listing requirement, $N = 718$			
Spread	8.02[a]	4.35	5.29
Proceeds mil	14.32[a]	41.20	8.41[b]
No. of book runners	1.05[a]	0.23	1.00
Prestigious	0.34[a]	0.47	0.00
Underpricing	21.55	71.02	16.58[b]
VC backing	0.22	0.41	0.00
Lockup length	415.00[a]	133.02	365
Panel B: AIM firms that fulfil MM listing requirements, $N = 691$			
Spread	5.84	1.84	5.0
Proceeds mil	11.11	15.52	6.8
No. of book runners	1.03	0.17	0.0
Prestigious	0.43	0.50	0.0
Underpricing	17.32	39.82	14.14
VC backing	0.18	0.37	0.00
Lockup length	390.00	120.25	365
Panel C: Regression results for firms who fulfil MM listing requirement but list in the AIM (2SLS)			
Log of proceeds	−2.903***		
	(−13.98)		
No. of book runners	0.375		
	(1.42)		
Prestigious	0.938		
	(0.45)		
Log of lockup length	0.001*		
	(1.90)		
Underpricing	−0.084*		
	(−1.83)		
VC backing	0.209		
	(0.86)		
AIM firms do not fulfil MM listing requirements	0.893***		
	(4.11)		
Constant	24.085***		
	(14.08)		
Year FE	Y		
Industry FE	Y		
Underwriter FE	Y		
R^2	0.234		
N	2081		

Note: This table reports (Panel A and Panel B) various IPO characteristics for IPOs for (a) AIM firms that do not fulfil MM listing requirements and (b) AIM firms that fulfil MM listing requirements. All Variables are defined in Appendix A. The table also reports (Panel C) Regression results on the impact of regulations on the gross spread (2SLS). AIM firms that do not fulfil the MM listing criteria are a dummy if they join AIM because they do not fulfil the MM listing requirements. There are three listing requirements to join the MM: A minimum of 25% shares need to be floated, normally 3 years of published account required, and a minimum market capitalisation of £750,000. AIM firms that fulfil MM listing requirements mean that the firms who fulfil MM listing requirements but list on the AIM. Superscript letters (a) and (b) represent significant mean and median differences between AIM firms that do not fulfil MM listing requirements and AIM firms that fulfil MM listing requirements, respectively. In panel C, the dependent variable is gross spread. In the first stage, we estimate underpricing and log of lockup length (in separate regressions) using a log of proceeds, no book runners, prestigious, VC backing, tech dummy, and AIM dummy. *T*-statistics based on cluster-adjusted (by year) standard errors (Petersen, 2009) are in the parenthesis. ***, ** and * represents significant at 1%, 5% and 10%, respectively.

larger IPOs. The number of book runners is negative but not significant. This result is in sharp contrast with the regression results for the AIM-only underwriters, where the number of book-runners is positively related to the gross spread. The log of lockup length is positive but not significant. The results in this section show that the AIM dummy is not significant when we construct comparable samples with the Main market. However, we have not yet addressed the question of whether book-runners charge higher spreads when AIM IPO issuers meet the MM listing requirements. We address this question in the next section.

7 | DO THE AIM IPOS THAT DO NOT MEET MM LISTING REQUIREMENTS PAY MORE?

To address this question, we split the sample of AIP IPOs into firms that do not meet the MM listing requirements and thus list on the AIM and firms that had the choice to join the MM by meeting its regulatory listing requirements or AIM, but they elected to go public through the AIM. The London MM has three identifiable listing requirements, size, age, and free float. We conjecture that the spread charged by the book-runners will be different for these two sets of AIM firms.

The sample characteristics of these two types of AIM IPOs are reported in Table 7. As can be seen about 50% of the AIM firms that could list on the MM by meeting its listing requirements elected not to do so. Specifically, the number of firms that do not fulfil MM listing requirements is 718, and the number of firms that fulfil MM listing requirements is 691. As anticipated, book runners charge higher fees for IPOs that do not fulfil the MM listing requirements (8.02%) relative to the IPOs that fulfil MM listing requirements (5.84%). The mean difference is 2.18% and statistically significant at the 1% level. Surprisingly the proceeds and number of book-runners are higher for the AIM firms that do not meet MM listing requirements. They are also associated with significantly higher lockups than their counterparts that meet the MM listing requirements designed to attenuate the market's lack of faith in the firm's prospects by restricting insiders to cash in long-anticipated profits. AIM firms that fulfil MM listing requirements go public with prestigious underwriters more than their counterpart firms that do not fulfil MM listing requirements.

Then we re-estimate our baseline regressions (Table 7, Panel C) to examine whether listing regulations play any role in determining the gross spread for all AIM IPOs, AIM firms that meet the MM listing requirements, and AIM firms that do not meet the MM listing requirements. In addition, we introduce a dummy variable that takes the value of one if an AIM firm does not fulfil MM listing requirements and zero otherwise. These results are in line with our conjecture. Specifically, the results show that the log of proceeds is negatively related to gross spread. The dummy for AIM firms that do not fulfil MM listing requirements is positive and statistically significant at a 1% level. This supports our hypothesis 2. It is economically significant as well. This implies that the firms that do not fulfil MM listing requirements need to pay higher fees to the underwriters. That is, meeting the MM listing requirements by AIM IPO issuers works as a cost-saving mechanism resulting in lower underwriting fees than the fees charged to their counterparts that do not meet the MM listing requirements. Thus, the listing regulations have an impact on the gross spread (Table 8).

TABLE 8 Propensity score matching (PSM) results between AIM IPOs that meet MM listing requirements and MM IPOs

	Spread
ATE	0.921***
	(0.06)
Matching variables	
Log of proceeds	Yes
Number of book runners	Yes
Prestigious	Yes
Log age days	Yes
Log of lockup length	Yes
Percent sold	Yes
VC backing	Yes
Matching quality (average reduction in standardized bias)	0.658
Matching method	Bias adjusted
Number of matches	4
Observations	685

Note: This table reports results for propensity score matching difference in difference (DiD) estimation that combines the Abadie and Imbens (2011) bias-adjusted propensity score matching with the standard DiD approach. The matching between the AIM firms that meet MM market listing requirements (treatment group) and the Main Market IPOs (control group) employs the matching variables at the time of the IPO. We run a probit model to calculate the propensity score where the dependent variable is set equal to 1 when AIM firms meet MM listing requirements and 0 for MM IPOs, and dependent variables are the log of proceeds, the number of book runners, prestigious, log age days, log (lockup length), Percent sold and VC backing. For each AIM IPO that meets MM market listing requirements, we use the four best matches out of the control group according to the bias-adjusted propensity score. The average treatment effect (ATE) shows the extra spread that AIM IPOs that meet MM market listing requirements paid compared to the control group. The standard error of ATE is provided in parentheses. The matching quality is provided by the average reduction of the standardized bias. ***, ** and * represents significant at 1%, 5% and 10%, respectively.

7.1 | Do the observable firm and IPO characteristics such as gross proceeds, and age explain the higher spread paid by AIM IPOs that meet MM listing requirements?

Previous results show that AIM IPOs that meet MM listing requirements compared to the MM IPOs charged higher spreads by the underwriters. One might argue that the reason AIM IPO issuers that meet MM listing requirements charged a higher level of spread than their MM counterparts might be driven by the firm and IPO characteristics (such as gross proceeds, and age) at the time of IPO. To address this potential endogeneity issue, we use propensity score matching (PSM) to neutralize the firm-level differences and estimate the spread difference between AIM firms that meet MM listing requirements and Main Market IPOs. Specifically, we use propensity score matching difference in difference (DD) estimation that combines the Abadie and Imbens (2011) bias-adjusted propensity score matching with the standard DD approach. The matching between the AIM firms that meet MM market listing requirements (treatment group) and the MM market IPOs (control group) employs the matching variables at the time of the IPO. Specifically, we run a probit model to calculate the propensity score where the dependent variable is 1 when AIM firms meet MM listing requirements and 0 for MM IPOs, and dependent variables are the log of proceeds, the number of book runners, prestigious, log age days, log (lockup length), Percent sold and VC backing. We use the four best matches out of the control group for each AIM IPO issuer that meets the MM listing requirements according to the bias-adjusted propensity score.[15] The average treatment effect (ATE), the primary variable of interest, controlling for firm and IPO characteristics, shows the extra spread that AIM IPOs that meet MM listing requirements paid compared to the control group (MM market IPOs).

As reported in Table 10, the PSM results show that AIM firms that meet the MM market listing requirements pay a 0.921% higher spread (significant at 1% level) compared to the MM market IPOs. This result indicates that the firm-level characteristics of IPO firms do not drive the higher level of spread for AIM firms that meet MM market listing requirements. We rule out the possibility that the higher level of spread charged to the AIM firms that meet MM listing requirements is driven by their characteristics (such as smaller size and young age).

8 | INTERTEMPORAL VARIATION IN AIM REGULATIONS AND GROSS SPREAD

In this section, we briefly describe several AIM regulatory changes and their impact on gross spread. AIM tightened regulations regarding the IPOs and NOMADs in 2005, 2006, 2007, and 2008. In 2005, London Stock Exchange announced some rules regarding the company, disposals relating to the company, NOMAD independence, rights to delay or refuse admissions, and sanctions concerning the NOMADs. The regulations first introduced a £25,000 fine for the NOMADs if they violate any rules regarding the IPO.[16] The Exchange announced that the existing 'rule 8' would be amended, giving the right to refuse admission of an applicant to AIM where it considers that admission may be detrimental to the orderly operation of the Exchange's markets or where the applicant does not comply with a special condition imposed by the stock exchange. In 2006, the London stock exchange increased the mandatory requirements for all listed firms. One such change was to maintain a well working webpage where they release all investor-related announcements. In 2007, AIM published new rules for nominated advisors.[17] The regulations discuss the nominated advisors' eligibility criteria and approval process. They also mention the continuing obligations of a nominated advisor. In 2008, the London Stock Exchange fined a NOMAD for the first time. 'Nabarro Wells & Co Ltd, an AIM nominated adviser ('Nomad'), has today been fined £250,000 and publicly censured in respect of its conduct. Nabarro Wells has been found to have breached AIM Rule 39 and Part 2 of the Eligibility Criteria for Nomads which were in force at the relevant time'.[18] In sum, a few regulatory changes might have an impact on IPO gross spreads.

More rigorous due diligence might increase the cost of raising funds through IPOs. NOMADs, for example, will be more careful after one of them gets fined and censored. To examine whether regulatory changes positively impact gross spreads, dummies are used to capture the effect of regulatory changes. Therefore, we create post-2005, post-2006, post-2007, and post-2008 dummies to examine which of these regulations (if any) impacted the gross spread. Since the regulation affects AIM, in the first model, we analyse all AIM companies and, as reported in Table 9, we find that post-2005, post-2006, and post-2008 regulation dummies are positive and significant. This result implies that tightening the regulations had a positive impact on IPO gross spreads. The 2007 dummy, however, suggests that AIM published new rules for nominated advisors that had no significant effect on spreads. This result remains unchanged in all regressions. We then partition the sample according to our previous tests, AIM firms that do not meet MM listing requirements and AIM firms that meet MM listing requirements. Our objective here is to examine whether the strict regulations impact the gross spread through the AIM firms that do not fulfil MM listing requirements. In column 2 (Table 9), the regression results show that the post-2006

TABLE 9 The effect of AIM regulation changes on the gross IPO spread (spread)

	All AIM (1)	AIM firms that do not meet MM listing requirements (2)	AIM firms that meet MM listing requirements (3)	All AIM (4)	All AIM (5)
Log of proceeds	−3.512***	−4.242***	−1.712***	−3.451***	−3.541***
	(−15.75)	(−14.12)	(−9.89)	(−18.12)	(−17.93)
No. of book runners	−0.854*	−1.51*	−0.074	−0.921*	−0.752
	(−1.87)	(−1.87)	(−0.52)	(1.84)	(1.54)
Prestigious	−0.875***	−1.528***	−0.079	−0.963***	−0.992***
	(−3.68)	(−7.42)	(−0.62)	(−5.62)	(−4.62)
VC backing	0.021	0.725	−0.091	0.055	0.069
	(0.17)	(1.02)	(−0.25)	(0.25)	(0.17)
Post-2005 dummy	0.825***	0.474	0.523**	0.925**	1.232***
	(3.22)	(0.81)	(2.12)	(2.23)	(2.75)
Post-2006 dummy	0.985**	1.715**	0.521	0.532	0.618
	(2.56)	(2.56)	(1.11)	(0.90)	(1.32)
Post-2007 dummy	−0.278	−0.626	−0.115	−0.221	−0.871
	(−0.32)	(−0.83)	(−0.42)	(−0.42)	(−0.33)
Post-2008 dummy	0.925**	0.321	1.021***	1.821***	2.126***
	(2.30)	(0.57)	(3.33)	(3.21)	(2.87)
AIM firms do not meet MM LR				0.325	−0.841
*post2005				(0.62)	(−1.11)
AIM firms do not meet MM LR				0.921	0.623
*post2006				(1.11)	(0.99)
AIM firms do not meet MM LR				−0.392	−0.423
*post2007				(−0.41)	(−0.51)
AIM firms Do not meet MM LR				−1.151	−1.235
*post2008				(−1.12)	(−1.15)
AIM firms do not meet MM LR					2.038**
					(4.01)
Constant	39.021***	51.023***	17.253***	45.369***	69.231***
	(12.32)	(14.32)	(14.93)	(37.93)	(23.56)
Industry FE	Y	Y	Y	Y	Y
Underwriter FE	Y	Y	Y	Y	Y
R^2	0.321	0.351	0.258	0.352	0.327
N	1410	718	691	1410	1410

Note: This table reports regression results for the impact of AIM regulation changes on IPO spread. The dependent variable is IPO spread. The post-2005 dummy is equal to 1 if the IPO issuers raised money in 2005 and onwards and 0 otherwise. The post-2006 dummy is equal to 1 if the IPO issuer raised money in 2006 and onwards and 0 otherwise. The post-2007 dummy is equal to 1 if the IPO issuer raised money in 2007 and onwards and 0 otherwise. Post-2008 dummy is equal to 1 if the IPO issuer raised money in 2008 and onwards and 0 otherwise. All variables are defined in Appendix A. *T*-statistics based on cluster-adjusted (by year) standard errors (Petersen, 2009) are in the parenthesis. ***, **, and * represents significant at 1%, 5% and 10%, respectively.

dummy is positive and significant. In 2006, London Stock Exchange increased the mandatory requirements for all listed firms, such as maintaining a functional website to disclose investor-related data. This regulation was likely more relevant to the firms that do not meet MM listing requirements, and hence we observe that it had a greater impact on the AIM firms that do not meet MM listing requirements. In column 3, we run the regressions for the firms that meet MM listing requirements and find the post-2005 and post-2008 dummies positive and significant.

To reconfirm that the regulations do not exert greater influence towards the AIM firms that do not meet MM listing requirements, we interact the post-2005, post-2006, post-2007, and post-2008 firms with the AIM firms that do not meet MM listing requirements dummy in columns 4 and 5. The interaction terms are not significant. The post-2008 dummy and post-2005 dummy variables are significant in columns 4 and 5, respectively. In column 5, we introduce the dummy of AIM firms that do not meet MM listing requirements, and after controlling for the regulatory changes, it is still positive and significant. In sum, with increases in due diligence procedures after the regulatory changes, AIM firms that do not meet the MM listing requirements are associated with higher spreads.

While the direct cost of IPOs has been examined thus far, the level and nature of indirect cost of IPOs (i.e., IPO underpricing) in the AIM and MM are the focus of our investigation in the next section.

9 | INDIRECT COST OF RAISING MONEY AND LOCKUP LENGTH

IPO underpricing is an indirect cost of raising capital. To understand the fee differences in the AIM and the MM, we examine the underpricing in both markets. Our objective here is to determine whether the higher gross spreads we have observed in the AIM are offset by, the lower underpricing in the AIM. To address this issue, we estimate the following OLS regression specification:

$$\begin{aligned} Underpricing_i = {} & \alpha + \beta_1 Log\,Proceeds_i + \beta_2 MultiBookrunner_i \\ & + \beta_3 Prestigious_i + \beta_4 VC\,Backing + \beta_5 Tech \\ & + \beta_6 AIM_i + \beta_7 AIM\,firms\,DON^{'}T\,fulfil\,MM \\ & + + \beta_8 AIM\,only\,underwriters \left(\sum_{j=1995}^{2020} \beta_j Year_j \right) + \varepsilon_i \end{aligned} \quad (2)$$

where the underpricing is the first trading day return in comparison to the issue price. The variables of interest are the AIM dummy and AIM firms that do not fulfil MM listing requirements. The results are reported in Table 10. Column 1, shows that the coefficients of the log of proceeds are negative and significant. The AIM dummy is significant, suggesting that book-runners underprice more the AIM IPOs than the MM IPOs. This implies that the indirect cost of raising funds in the AIM is significantly higher than what it would cost in the MM. The AIM-only underwriters dummy is significantly positively related to underpricing. This implies that AIM only underwriters underprice more. The AIM firms that do not fulfil the MM listing requirements significant, suggesting that firms that do not meet MM listing requirements are subject to great underpricing. Hence, the results suggest that AIM is associated with higher underpricing. The significance of the AIM firms that do not fulfil MM listing requirements suggests that the firms that do not fulfil pay higher indirect cost of IPOs which is underpricing. This result corroborates our earlier finding that AIM firms that do not fulfil MM listing requirements pay a higher gross spread. Thus listing regulations have an impact on the direct and indirect costs of IPO.

Next, we focus on the length of lockups where the book-runners have more direct control. Our objective here is to examine the lockup length that is at the discretion of the book runners. If underwriters have more power in the AIM are expected to charge higher fees and impose longer lockups on insider selling. This is quite

TABLE 10 Determinants of underpricing and lockup length in IPOs

	(1) Underpricing	(2) Lockup length
Log of proceeds	−0.279***	−0.019***
	(−2.88)	(−2.68)
No. of book runners	−0.066	−0.058**
	(−0.95)	(−2.06)
Prestigious	0.064	−0.009
	(0.34)	(−0.76)
VC backing	−0.132	−0.002
	(−1.18)	(−0.22)
AIM dummy	0.329**	0.081***
	(2.53)	(4.07)
AIM firms do not meet MM listing requirements	0.073**	0.022*
	(2.41)	(1.99)
AIM only underwriters	0.291***	0.018***
	(2.79)	(3.48)
Constant	2.391***	2.717***
	(3.14)	(43.49)
Year FE	Y	Y
Industry FE	Y	Y
Underwriter FE	N	N
R^2	0.055	0.099
N	1959	1958

Note: This table reports regression results for IPO underpricing and lockup length. Dependent variables in underpricing in column 1 and log of lockup length in column 2. Variable definitions are in Appendix A. *T*-statistics based on cluster adjusted (by year) standard errors (Petersen, 2009) are in parentheses. ***, ** and * represents significant at 1%, 5% and 10%, respectively.

important because we reported earlier that the gross spread and lockup length are positively related to AIM-only underwriters. To examine it formally, we use the following regression equation:

$$\begin{aligned}\log(\textit{lockup length})_i = {} & \alpha + \beta_1 \textit{Log Proceeds}_i \\ & + \beta_2 \textit{No of Bookrunner}_i \\ & + \beta_3 \textit{Prestigious}_i + \beta_4 \textit{VC Backing} \\ & + \beta_5 \textit{Tech} + \beta_6 \textit{AIM}_i \\ & + \beta_7 \textit{AIM firms DON}^{'}\textit{T fulfil MM} \\ & + \beta_8 \textit{AIM only underwriters} \\ & + \left(\sum_{j=1995}^{2020} \beta_j \textit{Year}_j\right) + \varepsilon_i \end{aligned} \tag{3}$$

The lockup length is the number of days after IPO, allowing insiders to sell their shares, typically 180 to 365 days after the first day of trading. The variables of interest are the AIM dummy, the AIM firms that do not fulfil MM listing requirements dummy, and the AIM only underwriters dummy. These regression results, listed on Panel B of Table 10, show that the AIM dummy is positive and significant, implying that the AIM companies are associated with higher lockup periods. The same pattern is observed for AIM firms that do not fulfil MM listing requirements. This pattern suggests that book-runners have a higher power in imposing longer lockups and charging higher fees for the AIM IPOs. The AIM-only underwriters are positive and significant, implying that AIM-only underwriters impose longer lockups. Secondly, the AIM firms that do not fulfil MM listing requirements dummy are also positive and significant. This indicates that firms that do not fulfil MM listing requirements pay higher underwriter fees and they are subject to longer lockup periods on insider selling. This reveals that AIM-only underwriters have more power in charging higher fees and imposing longer lockups for companies that do not meet the MM listing requirements.

10 | CONCLUSION

Despite the enormous growth of the AIM IPOs in the UK since its initiation in 1995, no study has examined the fees charged by book runners in the AIM relative to the MM for firms that meet the listing requirements of MM. In this study, we address this issue by investigating the IPO gross spread differences between the AIM and the MM of the London Stock Exchange during the 1995–2021 period and find that the IPO spread is 2.06% higher in the AIM than in the MM. Our multivariate regression results confirm that after controlling for other factors AIM firms pay more fees compared to MM firms.

As the market choice is an endogenous decision, we model it as Heckman's (1979) procedure. Some firms meet the MM listing requirements but still join AIM. Hence, for firms meeting MM listing requirements, joining AIM is a self-selection decision. We find that the self-selection parameter, inverse mills ratio, reveals that observable and unobservable characteristics (risks) of IPOs lead them to choose the AIM where AIM companies pay higher gross spread compared to the Main Market. Then we employ endogenous switching regressions to determine the spread if AIM firms that meet MM listing requirements joined MM and vice versa, our findings show that AIM IPO issuers could save more than £100 million by raising equity capital in the MM. Our evidence reveals that this spread differential is attributed to the issuing firms' market self-selection.

We examine the impact of listing regulations on the spread charged in AIM. The London MM has three identifiable listing requirements, size, age, and free float. Some firms that do not meet the MM listing requirements and thus list on the AIM and firms that had the choice to join the MM by meeting its regulatory listing requirements or AIM, but they elected to go public through the AIM. We conjecture that the spread charged by the book-runners will be different for these two sets of AIM firms. Interestingly, the spread for AIM IPOs that meet the MM listing requirements is 2.18% lower (5.84%) than the spread (8.02%) of their AIM IPO counterparts that do not fulfil the MM listing requirements controlling for other factors. This finding suggests that meeting MM listing requirements by AIM IPO firms that choose not to list on the MM act as a cost-savings issuance attribute, although they could have saved even more by going public through the MM. When we control for all the issue characteristics and use the propensity score matching, the results show that even after neutralizing the issue characteristics, AIM firms that meet MM market listing requirements pay a 0.921% higher spread than MM IPO firms. Our results suggest that listing regulations play a significant role in the fees paid by IPO firms.

While AIM provides a less regulated venue to be listed, the cost of IPO admissions is slightly higher compared to the MM. However, the gross spread in MM and AIM is significantly lower compared to the US exchanges (Abrahamson et al., 2011). This has increased the popularity of AIM and many countries follow MM/AIM setting like Japan, Canada, Hong Kong, Malaysia, and India. Our research findings suggest that those countries need to make the regulations/listing requirement not too onerous and keep the admissions cost to a minimum.

AUTHOR CONTRIBUTIONS

Hafiz Hoque: Conceptualisation, data collection, analysis and writing up. **John Doukas**: Polishing the paper, writing the contribution, linking sections.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Research data are not shared.

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ENDNOTES

[1] PwC and Economist Intelligence Unit (2019), 'Capital markets in 2030: the future of capital markets, https://www.pwc.com/gx/en/audit-services/capital-market/publications/capital-markets-2030.pdf.

[2] AIM has been criticized for its lack of regulation and lax corporate governance standards by John Thain, chief executive of the New York Stock Exchange (NYSE). While speaking at the World Economic Forum in Davos, Switzerland, Mr Thain stated that AIM 'did not have any standards at all and anyone could list'. James Quinn, NYSE Chief attacks AIM, The Telegraph, 27 January 2007.

[3] Similar analysis was performed by Fang (2005) in a study of investment bank reputation, the price and quality of bond underwriting services, and by Golubov et al. (2012) in a study of advisor reputation and bidder returns in M&A transactions.

[4] Over the whole study period the total cost savings is estimated as: 691 AIM Firms Meeting MM listing requirements x £11.14 million average proceeds x1.33% (5.84–4.51%) = £102.37 million.

[5] AIM has tightened regulations in respect to the IPOs and NOMADs in 2005, 2006, 2007 and 2008.

[6] Nominated Advisors (NOMADs) are vital in the AIM IPO process as IPO firms are required to have a NOMAD to join the market and continued listing.

[7] This includes IPOs and Non-IPOs. Non-IPOs include introduction, reverse takeover, transfer across markets, re-admission, and merger issue. In this paper we analyse IPOs only.

[8] http://www.lseg.com/resources/media-centre/press-releases/london-stock-exchange%E2%80%99 s-aim-celebrates-20th-anniversary.

[9] For brevity these results are not reported here, but they are available upon request.

[10] For a detailed discussion on continuing obligations, please see Doukas and Hoque (2016).

[11] We also checked for the non-linearity with regards to log of proceeds, but the data shows it is linear.

[12] We also ran regressions entering one variable (e.g., log of proceeds, no of book runners, and prestigious underwriter) at a time. In this setting, we find that log of proceeds, no of book runners, and prestigious underwriter are negative and significantly related to the spread. The R^2 from different models shows that log of proceeds explains the highest variation in spread, which is 24.9%. For brevity, these results are not reported but are available upon request.

[13] For the first stage regression for estimating Underpricing and log(lockup length) (in separate regressions), we use log of proceeds, no of bookrunners, prestigious, vc backing, tech dummy and AIM dummy as explanatory variables.

[14] The first stage regression in Table 8 is the same as first stage regression in Table 7. Hence, it is not discussed here.

[15] We choose the number of matches according to the simulation results in Abadie and Imbens (2011) who find the best matching quality is obtained for the number of four matches.

[16] It should be noted the maximum fine internal AIM executive panel can impose is £25,000. The external AIM Disciplinary Committee has no such limit on the level of fine that can be imposed. For detail, please see AIM release 13, www.londonstocexhange.com, 18 March 2005.

[17] Effective from February 2007, an entity seeking approval as a nominated adviser must:

- be a firm or company (individuals are not eligible);
- have practised corporate finance for at least the last 2 years;
- have acted on at least three Relevant Transactions during that 2-year period; and
- employ at least four Qualified Executives.

[18] http://www.lseg.com/media-centre/news/corporate-press-releases/nabarro-wells-co-ltd-fined-%C2%A3250000.

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APPENDIX A

TABLE A1 Variable definitions

Variable	Definitions
Spread	Spread is the total issuer's fees divided by the gross proceeds
No. of book runners	The number of book-runners is the number of investment banks acting as book-runners.
Log of proceeds	Log of proceeds are in £ million in 2007 inflation-adjusted figures
Prestigious	Prestigious is defined as one if the book runner is a global investment bank by following Derrien and Kecskes (2007) and zero otherwise.
Log of lockup length	Log of lockup length is the log number of days insiders are not allowed to sell shares
Underpricing	Underpricing is calculated as the return on the offering price to the closing price at the end of the first trading day
MM	MM is the London Main Market.
VC backing	VC backing is a dummy if the IPO is venture capital-backed.
Book runners who are active in the main and AIM	Book runners who are active in the Main and AIM mean the book runner has issued IPOs in both markets
AIM only underwriters	AIM only underwriters are the ones who only issued shares in AIM but not on the MM
Log (Mkt cap mil)	The log of the market capitalisation of an IPO at the admission date
Percent float	Percentage of shares issued in the market.
Log (age days)	Log of the time from when the company started to the IPO date.
AIM dummy	AIM dummy equals 1 for AIM companies and zero otherwise.
AIM firms do not fulfil MM listing requirements	AIM firms that do not fulfil Main Market IPO listing requirements that are age (minimum 3 years), float (minimum 25% shares in public hands), and size (minimum size of £750,000).

APPENDIX B

B.1 | Heckman two-step selection bias test

To address this issue, we use an OLS regression model of the following form:

$$Spread_i = X_i'\beta + \theta Market_i + \mu_i \tag{A1}$$

where X_i' is a vector of firm-specific characteristics, $Market_i$ is a dummy for the market (AIM = 1 and MM = 0), and μ_i is the error term. For the OLS estimates to be reliable, this setup implicitly requires that $Market_i$ be exogenous in Equation (A1). If $Market_i$ is endogenous, then Equation (A1) cannot be consistently estimated by OLS. Heckman (1979) proposes a simple two-stage estimator to correct this bias. First, the following equation is estimated by probit:

$$Market_i = Z_i'\delta + \varepsilon_i \tag{A2}$$

where Z_i' is a vector of characteristics that affect the choice between the AIM and MM in the London Stock exchange, and ε_i, is the error term of the selection equation. Given the binary nature of our listing choice measure,

$$Market_i = 1 \; if \; Z_i'\delta + \varepsilon_i > 0 \; and \; Market_{i=}1 \; if \; Z_i'\delta + \varepsilon_i \le 0 \tag{A3}$$

When μ_i and ε_i are correlated, OLS estimates in Equation (1) are biased.

However, it has been shown that, if Equation (1) is replaced by

$$Spread_i = X_i'\beta + \omega\frac{\varphi(Z_i'\delta)}{\phi(Z_i'\delta)}Market_i + \frac{-\varphi(Z_i'\delta)}{1-\phi(Z_i'\delta)}(1-Market_i) + \upsilon_i \tag{A4}$$

where φ (.) and ϕ (.) are the density function and the cumulative distribution function of a standard normal, respectively, then Equation (A4) can be consistently estimated by OLS. Moreover, the coefficient ω will determine the effect of the market of the issue on $Spread_i$.

The above setup can be further generalized to allow for any differences in the effect of firm-specific characteristics on the outcome variables between the two markets, that is, the AIM and MM. The resulting model is known

as a switching regression model with endogenous switching, whereby Equation (A3) is replaced by two equations:

$$Spread_{AIM} = X_i'\beta_{AIM} + \mu_{AIMi} \tag{A5}$$

$$Spread_{Main} = X_i'\beta_{Main} + \mu_{Maini} \tag{A6}$$

Equation (A5) is the outcome equation for the AIM, and (A6) is the outcome equation for the MM but for the same deal. Of course, we only observe $Spread_{AIM}$ or $Spread_{Main}$, depending on the market choice. Thus,

$$\begin{aligned} Spread_i &= Spread_{AIM\,i} if\ Market_i = AIM\ and\ Spread_i \\ &= Spread_{main\,i} if\ Market_i = Main \end{aligned} \tag{A7}$$

Endogeneity is modelled by allowing for the correlation between the residuals of the selection and outcome equations (ε_i and μ_{AIMi} (μ_{Maini})). This implies that the unobserved determinants of the market choice can now affect the outcome variable of interest. The following covariance matrix is thus non-diagonal:

$$Cov(\mu_{AIMi}\,\mu_{Maini}, \varepsilon_i) = \begin{pmatrix} \sigma_{AIM,AIM} & \sigma_{AIM,Main} & \sigma_{AIM,\varepsilon} \\ \sigma_{Main,AIM} & \sigma_{Main,Main} & \sigma_{Main,\varepsilon} \\ \sigma_{AIM,\varepsilon} & \sigma_{Main,\varepsilon} & 1 \end{pmatrix} \tag{A8}$$

Since we only observe (A5) or (A6) depending on the outcome of (A1), and never both, the observed $Spread_i$ becomes a conditional variable, and the error terms in Equations (A5) and (A6) do not have zero mean. However, it turns out that if Equation (A5) is augmented with an additional regressor $\frac{\varphi(Z_i'\delta)}{\phi(Z_i'\delta)}$, then the nonzero mean of μ_{AIMi} is adjusted for and the equation can be consistently estimated by OLS. Accordingly, for Equation (A6) this is $\frac{-\varphi(Z_i'\delta)}{1-\phi(Z_i'\delta)}$. These additional regressors are known as inverse Mills ratios. This setup is a generalization of the classical Heckman (1979) two-stage process. A similar methodology is applied in a study on the use of warrants for underwriter compensation, in Fang (2005) in a study of investment bank reputation and the price and quality of bond underwriting services, and in Golubov et al. (2012) in a study of advisor reputation and bidder returns in M&A transactions.

Because we only observe an IPO in the AIM and MM, we need to address the question "what would have been the spread for the same deal, had it been issued in a different market" to infer the effect of market issuance choice on the $Spread_i$. This question can be answered by comparing the spread charged for an IPO issue in the AIM and the spread that the same issuer would be charged in the Main Market. Econometrically, the potential outcome (market choice of IPO issuance) can be estimated by evaluating X_i' in the alternate market equation.

$$\begin{aligned} &E[Spread_{Main\,i}|AIM_{i=}1] \\ &= E\left[X_i'\beta_2 + u_{Main\,i}|Z_i'\delta + \varepsilon_i > 0\right] \\ &= E\left[X_i'\beta_2 + u_{Main\,i} + Cov(u_{Main\,i}, \varepsilon_i)\frac{\varphi(Z_i'\delta)}{\phi(Z_i'\delta)}\right] \end{aligned} \tag{A9}$$

The difference between the actual and hypothetical outcome is then computed and forms the basis of inference

$$E[Spread_{Main\,i}|AIM_{i=}1] - Spread_{AIM\,i} \tag{A10}$$

The hypothetical value $E[Spread_{AIM\,i}|Main_{i=}1]$ and the associated improvement are computed similarly. In the next section, we conduct detailed analysis on what would have been the IPO spread if AIM IPO firms are issued in the MM and vice versa.