IPO UNDERPRICING OVER THE VERY LONG RUN

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Abstract: A central measure of the efficiency of the Initial Public Offering (IPO) market is the extent to which issues are underpriced. Legal, regulatory, disclosure and underwriting pressures have moulded the IPO market since World War II. This paper presents new and comprehensive evidence covering British IPOs since World War I. We find that during the period from 1917 to 1945, public offers were underpriced by an average of only 3.80%, as compared to 9.15% in the period from 1946 to 1986 (when the UK stock market was deregulated). This substantial rise is robust to the inclusion of variables controlling for changes in firm risk and method of issue, and improvements in disclosure and the emergence of prestige underwriters.

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When Domino's Pizza had an initial public offering (IPO) in the United Kingdom in November 1999, its shares started trading at a 78% premium to the offer price. This large initial premium was equal to the average premium during 1999, and there is anecdotal evidence of large premia in previous hot markets, such as the Ford Motor Company's offering of its European subsidiary on the London Stock Exchange (LSE) in December 1928, which recorded an 87% first-day premium. Yet it is not known whether IPO underpricing was commonplace early in the last century.[1] As early as 1929, the large initial premia of IPOs were highlighted by *The Economist* (27 July), among others. However, the first empirical study of the pricing of IPOs on the London Stock Exchange was not published until 1967, when Merrett, Howe and Newbould (1967) revealed underpricing of 17.2% on public offers between 1959 and 1963. The earliest study of IPO pricing in the US examined a sample of Regulation A equity offerings in 1957, 1959 and 1963 (Stoll and Curley, 1970) and was followed by studies more tightly focussed on the initial returns of all IPOs (Logue, 1973; Ibbotson, 1975). Subsequent research[2] confirmed underpricing as a consistent feature of stock markets in both countries.

The contribution of this paper to the extensive literature is to assemble and analyze a new dataset of equity IPOs on the LSE from World War I (WWI) up to the present. The last century of UK IPOs can be divided into three sub-periods: 1917-45, post-WWII (1946-86) and post-Big Bang (1987-2006).[3] We find that underpricing of public offers in the period 1917–45 averaged only 3.80%, as compared to 9.15% in the period 1946–86. This substantial rise is robust to the inclusion of variables controlling for changes in firm risk and method of issue, and improvements in disclosure and the emergence of prestige underwriters. In the 21 years since Big Bang, underpricing, as represented by IPOs on the

Main market, has risen further to 13.2%.Around 1900 London was the pre-eminent international financial centre, the British stock market was larger relative to GDP than the US, and was the second largest exchange in the world (Rajan and Zingales, 2003). As well as being an important stock market in its own right, the attraction of a long-run study of British IPOs lies in the dominance of the fixed offer price regime for much of the last century. In contrast, the US market had moved to book-building IPOs much earlier.[4] In examining how underpricing changed over time, we consider whether improvements in investor protection and underwriting have resulted in lower underpricing over the course of the last century. Although this process was slow to get underway, IPO investors were considerably better protected after 1945 due to substantial reforms in company law, accounting standards and the LSE's own rules. Similarly, reputable banks committed themselves to underwriting IPOs after 1945.

Over the long haul there has thus been a narrowing of information gaps, reflecting better regulation and disclosure as well as the benefits of certification. Other things being equal, we would expect this to have moderated the level of underpricing over time. However, the rise in underpricing documented in this paper suggests that any marginal benefits from better regulation, disclosure and certification were outweighed by other developments in the IPO market. We argue that among such developments there was deterioration in the level of trust between investors, issuers and sponsors. Consistent with this erosion of trust, investment banks increased their market power, managers' incentives were realigned as investment became institutionalised, and the winner's curse was exacerbated as investors became more heterogeneous after WWII.

In the post-Big Bang period (1987-2007), headline underpricing has continued to rise to 18.5%. The introduction of book building, the relaxation of restrictions on placings, and the

frequent employment of both methods in a single IPO has undermined the usefulness of the previous traditional distinction between public offers and placings in favour of one drawn between the Main Market (Official List) and the Unlisted Securities Market (USM), succeeded by the Alternative Investment Market (AIM). Hence, this headline figure has been propelled by the substantial underpricing of the smaller IPOs, first on the USM (19.8%), and then on AIM (21.5%), whilst IPOs on the Main Market have also displayed modestly higher underpricing (13.2%).

The general rise in UK underpricing in the last two decades is similar to that of the US, which has been extensively analysed in the literature. Furthermore, the fundamental shift in issue method to book building following Big Bang makes an integrated analysis of the whole 20th century problematic. We therefore choose to concentrate our analysis on the period when the fixed price offer method was dominant from WWI up to Big Bang,

In section I, we discuss the historical improvements in investor protection and underwriting. Section II reviews the literature on underpricing and sets out a simple linear model of underpricing relevant to the period between WWI and Big Bang. In section III we describe the data. Section IV presents our main findings. Section V discusses possible explanations for the underpricing puzzle, and section VI concludes.

I. Historical background

Over the span of the last century, with the notable exception of the dominant fixed offer price method, the London IPO market experienced profound structural change via improved investor protection, the greater prominence of reputable investment banks, the decline of Provincial IPO markets, and the rise of institutional investment. In this section, we discuss these developments in turn.

A. Fixed offer price

Benveniste and Wilhelm (1990) and Loughran, Ritter, and Rydqvist (1994) show the importance of different regulatory environments for underpricing. The IPO market on the LSE operated under a fixed offer price regime from at least WWI until Big Bang in 1986. Under this regime the issuing firm and its sponsors set the offer price and made no adjustment in order to balance demand and supply once marketing began. A second important characteristic of this regime was the *pro rata* allocation of shares in the event of oversubscription of an IPO. Big Bang induced competition in the securities business generally, and in IPO underwriting specifically, by allowing any bank including US investment banks to own an LSE member firm, and thereafter, book-building became a more important IPO method in London (see Ljungqvist, 2003, pp. 24 and endnote 25).

B. Investor Protection

According to La Porta, Lopez-de-Silanes, Shleifer, and Vishny (LLSV), securities laws matter for financial development. The legal origin of a country and the degree of protection extended to minority investors against managers and dominant shareholders ("anti-director rights") explain the variation in stock market size (LLSV, 1997) and share ownership concentration (LLSV, 1998) across a sample of 49 countries at the end of the last century. In subsequent research (La Porta, Lopez-de-Silanes, and Shleifer, 2006), they argue that the presence of a public enforcement body, for example the Financial Services Authority in Britain, is only necessary as a substitute for weak laws. On a scale running from zero to one, LLSV (1998) and La Porta, Lopez-de-Silanes, and Shleifer (2006) estimate the UK scores for anti-director rights, mandatory disclosure requirements and liability standards imposed on managers, underwriters and accountants alike as 0.83, 0.83 and 0.66,

respectively. At the end of the 20th century, Britain scores relatively highly in the regulation and disclosure of its listed securities, including IPOs.

Across the period of this study, the development of regulation and disclosure in Britain is signposted by the passage of Companies Acts in 1929, 1948 and 1967, together with the Financial Services Act of 1986. The 1929 Act had less impact than did subsequent legislation. Formally, this Act required any auditor's report in a prospectus to detail the last three years' profits for an issuing firm, as well as the disclosure of use of proceeds, director compensation and inside ownership, material contracts and related party transactions. However, most crucially, it did nothing to prevent the manipulation of company accounts. It is therefore highly questionable whether this legislation would have prevented the occurrence of the high-profile Royal Mail scandal of the late 1920s, an event underlining the shocking extent to which profit figures could be manipulated (Davies and Bourn, 1972), and the Enron of its day. In fact, corporate accounting disclosure improved very little before the publication of the recommendations of the Cohen Committee on Company Law Reform in 1945 in the run-up to the passage of the 1948 Companies Act. In keeping with its evidence to this Committee, the accounting profession was urging reform on its corporate clients from at least the end of WWII (Richards, 1989). Consequently, the significant improvements delivered by the Act, namely, mandatory consolidated accounts, an end to hidden reserves, and the establishment of the "true and fair view" principle in accounting (Arnold and Matthews, 2002) were already diffusing through corporate Britain several years before 1948.

Consistent with this timeline of improved financial disclosure, Franks, Mayer, and Rossi (2005) argue that two other aspects of investor protection in Britain, namely anti-director rights and liability standards of directors and advisers, did not improve significantly until the

second half of the 20th century. A simple average of their estimated LLSV scores for anti-director rights, liability standards, and disclosure requirements summarises this time trend, and highlights the importance of the 1948 Act.[5] The latter introduced proxy voting by mail, facilitated the calling of an extraordinary shareholders' meeting with as few as 10% of votes, and relaxed the standard of proof of directors' liability for untrue statements in a prospectus.

Supplementary to company law, the LSE self-regulated the behaviour of its members and of listed companies through its *Rules and Regulations of the Stock Exchange* (LSE Rules)[6] up until the enactment of the Financial Services Act in 1986. On the eve of World War I, the LSE rules dealt only with firms seeking an Official Quotation and a high proportion of new issues occur without a prospectus (Lavington, 1921) and without publication of their share prices. In 1915, the government finally required the LSE to publish a Supplementary List of the prices of those securities without an Official Quotation (King, 1947, pp. 75-76). At the end of the war, the LSE required that all IPOs seek its permission before dealing was authorised, and that an advertised statement in lieu of a prospectus should be placed in the press before such permission was granted (Michie, 1999, pp. 265). However, no accounting disclosure was mandated for Supplementary List IPOs by the LSE Rules before 1929, nor was there any requirement, similar to that for Official Quotations, that two-thirds of an issue be placed in the hands of public investors. In brief, listing requirements were extremely lax prior to 1929. When the 1920s hot issue market peaked, investors failed to price-protect themselves against low-quality offerings, a state of affairs evidenced by the poor survival rate of the 1928 IPO cohort (Harris, 1933).

The significant tightening of LSE Rules and their enforcement did not come until after 1945 (Michie, 1999, pp. 265-266). Such minimum listing criteria as the number of years of

historic profits to be disclosed ("track record") and the minimum percentage of the firm's equity to be issued to the market were successively raised. By 1951, issuing firms were required to disclose a 10-year track record and the LSE discouraged applications from firms unable to fulfil this requirement. After 1972 issuing firms still required a 5-year track record, along with at least 25% of a firm's equity being offered to the public. As well as tightening minimum listing criteria, the LSE made greater efforts to discourage the use of private placements ("placings") after 1945, believing them to lack the transparency and fairness of public offers (Michie, 1999, pp. 414 and 476). Encouraged by the success of NASDAQ in the US, a junior market, the Unlisted Securities Market (USM), was established in 1980. Any firm seeking entry to the USM now only required a minimum offering of 10% of its equity, as against 25% on the main market. This innovation thereby helped the LSE to maintain its strict requirements for a full listing.

In summary, both investor protection and listing requirements were extremely weak before 1945. Thereafter, company law improved protection and the LSE raised disclosure standards for companies going public on the main market.

C. Investment Banks

The most important development in the underwriting market before Big Bang was the post-WWII application of reputable capital to the underwriting of IPOs. Up until 1929, 30% of IPOs were not underwritten at all, and underwriting was conducted by an assortment of company promoters, syndicates, company directors, stockbrokers and a new breed of industrial trust. There were considerable doubts about the capital backing of underwriters, especially when such information was not made public (Finnie, 1934, pp. 137-60; *The Economist*, 5 July 1924, p. 13). As the fallout from the 1928 IPO boom illustrated well

(Harris, 1933), there were too many underwriters with insufficient capital or interest in building a sound reputation. The merchant banks, the most reputable of whom sat on the *Accepting Houses Committee* (AHC), established in 1914, were slow to begin underwriting equity IPOs. Before 1914, these banks had been very active in underwriting foreign bond issues, but, despite the contraction of this business in the interwar years, they were reluctant to commit themselves to underwriting industrial IPOs (Roberts, 1992). This reluctance contrasts with the support extended by both US private banks (Ramirez, 1995) and German universal banks (Fohlin, 1998) to their respective industrial clienteles.

This situation changed in 1945 with the establishment of the *Issuing Houses Association* (IHA), intended as a body to represent the interests of new issue underwriters to the regulatory authorities. Although membership quickly rose to around fifty and stayed at that level until shortly after Big Bang, the merchant banking members of the AHC, led by Barings and Rothschilds, continued to represent the most reputable names in the City and were at the IHA's core. In the following sections, we define prestigious underwriters by membership of the AHC, and the total membership of this body at seventeen for much of the period 1945–86.

D. Provincial IPO markets

Notwithstanding the considerable IPO activity on the Provincial Stock Exchanges (PSEs) prior to WWII, the LSE was first choice for many firms seeking a listing by the interwar period (Thomas, 1973).[7] After 1945, provincial activity declined. Ghandi (1964) was able to trace only 379 IPOs of mainly ordinary shares (common stocks) between 1951 and 1960, compared to 693 IPOs launched on the LSE according to our own data over the same period.[8]

Offerings on the PSEs were substantially unregulated before 1914. However, towards the end of the interwar years the main PSEs, Birmingham, Liverpool and Manchester, moved rapidly towards adopting the listing requirements of the LSE (Thomas, 1973), and after WWII, all the PSEs effectively fell into line with LSE regulations regarding IPOs. Between 1964 and 1966, the 15 most important PSEs merged into three regional exchanges, Northern, Midland & Western and Scottish, before formally merging with the LSE in 1973. In brief, despite the LSE's importance, provincial firms had a degree of choice as to where to list until the mid–1960s.

E. Rise of Institutional Investment

Notwithstanding Scott's (2002) claim that institutional investment in equities had its origins in the interwar years, private investors still accounted for around 80% of LSE trading volume at the end of the interwar period (Michie, 1999, p. 178). Institutional share ownership continued its rise in the 1950s and finally surpassed the holdings of private individuals in 1975 (Central Statistical Office, 1995). Together with the improved disclosure provisions of the 1948 Companies Act (Hannah, 1983), this shift contributed to the emergence of a market for corporate control in Britain.

Summarising this section, fixed offer price methods dominated; and in the first half of the last century, investor protection and listing requirements were weak, and underwriting practices were underdeveloped. The second half of the last century witnessed advances in both the latter areas, as well as the disappearance of provincial IPO activity, and the rise to prominence of the institutional investor.

II. An empirical model of underpricing

Most models of underpricing are based on the premise that an issuing firm wishes to maximise the gross proceeds of its IPO, subject to fulfilling stock exchange requirements such as the establishment of a liquid market in the shares. We define underpricing, or the first-day return, ($RET_{i\,1}$) for firm *i* as the change in share price to the final trade recorded on the first day of trading ($P_{i\,1}$), as compared to the offer price ($P_{i\,0}$):

$$RET_{i\,1} = (P_{i\,1} / P_{i\,0}) - 1 \qquad [1]$$

The greater is underpricing, the lower are gross IPO proceeds and therefore the greater is the money that issuing firms, and selling shareholders in particular, have "left on the table". Theories and empirical tests that attempt to explain this underpricing are reviewed by Jenkinson and Ljungqvist (2001), Ritter and Welch (2002), Ljungqvist (2007), and Brau and Fawcett (2006), among others.

Many models reflect the contemporary institutional framework of the IPO market, and cannot explain the persistent underpricing revealed by our research. Benveniste and Spindt's (1989) theory of information revelation provides important insights into book-building and underpricing. While recent papers confirm the value of these contributions to the IPO literature, the Benveniste-Spindt model is not relevant to a market operating under a fixed offer price regime, as was the case for the UK over most of the last century. Similarly, Stoughton, and Zechner (1998) argue that managers will maximise the value of their stake in the company by attracting a large controlling shareholder, but this again works best under a book-building regime. Allen and Faulhaber's (1989) and Welch's (1989) signalling explanations are precluded by the adoption of pre-emptive rights by UK quoted companies in the second half of the last century, since the pricing of rights issues

is wealth-neutral (Jenkinson and Ljungqvist, 2001, pp. 79). Asquith, Jones, and Kieschnick's (1998) assertion that underpricing is in part a manifestation of price support during initial trading does not apply to a pre-Big Bang era lacking in large, integrated and capital-backed investment banks, which in turn made systematic price support improbable. Tinic's (1988) claim that underpricing alleviates the risk of litigation by disgruntled investors is not only contentious (Drake and Vetsuypens, 1993), but also ignores the fact that litigation is extremely unlikely under the British legal system (Jenkinson, 1990). Finally, behavioural explanations such as the prospect explanation of underpricing, advanced by Loughran and Ritter (2002), are better for explaining hot issue markets than structural changes in underpricing over time.

In Table I, we summarise the main underpricing hypotheses that are relevant to the fixed offer price regime on the LSE and for which a suitable variable is available. Beatty and Ritter (1986) argue that underpricing should increase in the *ex ante* uncertainty of the firm's value where investor heterogeneity exists. Ritter (1984) and Loughran and Ritter (2004) highlight changes in firm risk as one explanation for shifts in underpricing over time. We use three proxies for firm risk: the size, age, and valuation of the issuer. Size is measured as the natural logarithm of voting stock market capitalization at the offer price in end 2006 prices, LNMCAP. Firm age is calculated from the foundation of the underlying business, where disclosed, or the date of incorporation of the firm, which usually occurs later, and is expressed as a natural logarithm, LN(1+AGE). Firm valuation is measured by the natural logarithm of the ratio of book value to offer price per share, LNBVP, where book value is the proforma post-IPO net asset value per share held by voting shareholders. Additional measures of *ex ante* uncertainty include industry risk, proxied by the sector classifications from the *Stock Exchange Daily Official List* (SECTOR); and

technology risk, defined by a dummy variable indicating whether or not the prospectus refers to the company undertaking research and development (RD).[9]

Insert Table I

Certification by prestigious underwriting banks provides investors with reassurance about the IPO and might therefore reduce underpricing. However, the empirical evidence on this has been sensitive to the choice of time period. While Carter, Dark, and Manaster (1998) provided empirical support for bank reputation reducing US underpricing in the 1980s, Loughran and Ritter (2004) and others have shown that the opposite was true in the 1990s. We model the impact of certification by employing two dummy variables: the first (UW) takes the value of 1 when an IPO was underwritten by a third party, 0 otherwise; and a second (PRESTIGE) takes the value of 1 when an IPO is underwritten by a member of the AHC (see section I-C above) and 0 otherwise.

Underwriters of public offers would typically be at risk for between 10 and 14 days. Placings, where a bank (or broker) bought the shares at an agreed price ahead of sale to the final investor, are regarded as "underwritten", and accordingly a bank was at risk for a much shorter period. Better accounting disclosure is also important in minimising information gaps. The number of years of historic profits is extracted from the prospectus (TRACK),[10] whilst a dummy variable controls for whether or not the proforma net asset valuation has been subject to independent scrutiny by an auditor or professional property appraiser (AUDIT).

Underpricing can reflect the magnitude of agency problems affecting investors and issuing firms, and the extent to which incentives are aligned. Habib and Ljungqvist (2001) postulate a realignment of incentives hypothesis according to which underpricing varies

indirectly with the proportion of the offering that is represented by disposal of insider shares, the assumption being that managers are likely to care about the wealth effects of underpricing. Ljungqvist and Wilhelm (2003) refine this hypothesis by arguing for the additional importance of managers' percentage equity ownership in motivating them to act as a good agent for shareholders and minimise underpricing (though Loughran and Ritter (2004) assert the value of their equity stakes are more important than the percentage ownership). Although there may be suspicions about the motivation for going public (Leland and Pyle, 1977), the expectation is that managers will care more about underpricing, the greater the proportion of the firm being sold. Furthermore, if it is costly to generate information to underpin IPO pricing (Sherman and Titman, 2002), there should be a tradeoff between the proportion of post-issue voting equity sold in the offering (PROPSOLD) and the extent to which shares are underpriced.[11] We therefore examine how underpricing varies with PROPSOLD.

We employ the explanatory variables listed in Tables I and 2 in a linear model of first-day IPO returns, RET, as follows:

$$\begin{aligned} RET = {} & \beta_1 LNMCAP + \beta_2 LN(1+AGE) + \beta_3 LNBVP + \beta_4 TRACK + \beta_5 AUDIT + \beta_6 PROPSOLD \\ & + \beta_7 UW + \beta_8 PRESTIGE + \beta_9 RD + \beta_{10} PLACING + \beta_{11} SECTOR \\ & + \beta_{12} RESTRUCTURE + \beta_{13} MRET + \beta_{14} USM + \beta_{15} YEAR + \varepsilon \end{aligned} \quad \textbf{[2]}$$

The error term, ε, is assumed to be i.i.d. normal. We use a dummy variable for the issue method (PLACING), which takes the value 1 if the IPO is a placing and 0 otherwise. A vector dummy (SECTOR) covers each industry sector, with sector membership being denoted by a value of 1. A second dummy (RESTRUCTURE) takes the value 1 when, as in the case of interwar prospectuses, restructuring obscures the proportion of the post-issue

voting equity being sold at IPO (PROPSOLD).[12] Ritter and Welch (2002) and others note the influence of equity market conditions on underpricing, which is proxied by lagged market returns over one or three months prior to the first day of trading (MRET). A dummy variable, taking the value 1 if the offering occurred on the USM (see section I-B) and 0 otherwise, controls for the weaker listing requirements required by this junior market after 1980. Finally, we include a vector of dummy variables indicating the calendar year in which the issue first traded (YEAR). Unless otherwise stated, all regressions reported below include a full set of YEAR dummies, and SECTOR dummies for all industries represented in the IPO sample other than "Commercial, Industrial, etc". All regressions are conducted with a suppressed constant.

What impact would we expect the structural changes discussed in section I to have upon underpricing? A contemporary view, informed by recent research, is that better disclosure rules should have enabled outside investors to place greater faith in the information disclosed in the prospectus, and to feel less inclined to demand a substantial discount to the IPO's perceived value in return for taking up shares. Analogously, stronger anti-director rights should have better equipped shareholders to resist "bad" managements, minimising the need for compensation by way of underpricing when a firm first comes to market. Finally, in accordance with the certification hypothesis, the introduction of reputable capital into IPO underwriting should have helped to reduce underpricing. In sum, all three structural changes should have resulted in less underpricing after 1945 than before. With the model described by equation [2], we control for changes in the risk composition of the IPO sample and in issue method, and test the marginal effects of better disclosure (TRACK) and reputable underwriting (PRESTIGE). We also test whether

underwriters of repute, together with better investor protection, reduced observed underpricing after 1945 compared to the interwar years.

III. **Data**

The primary sources for prospectus data covering IPOs on the LSE in the period 1917-86 are the *Times Book of Prospectuses* (1917–69), the Singer and Friedlander *New Equity Issue Statistics* (1970–79), and the *Extel Book of New Issues* (1980–86). Offer price and the number of shares offered are checked against the *Stock Exchange Year Books*, the *Issuing House Year Books*, and press reports in *The Times Digital Archive 1785–1985*. Stock prices used to calculate returns are taken from the *Stock Exchange Daily Official List* (SEDOL) and the *Financial Times*. We have been unable to find stock prices on IPOs before the publication of the Supplementary List in 1915. The LSE recorded "marks" indicating prices, but not trading volumes at each price. Since SEDOL marks are not time-ordered, we use the simple average of these marks to estimate the first-day price until the publication of closing bid-ask prices became commonplace after 1945, when we switch to the closing mid-price.

For comparison with recent IPOs, the 1917–1986 dataset is extended with statistics for 1995–2007 sourced from Paleari, Piazzalunga, Redondi, Trabucchi, and Vismara (2007). The 1987–1994 IPOs were filled using hand-collected data (1987–1990) and data extracted from the quarterly *KPMG New Issue Statistics* database (1991–1994). Whilst we have underpricing data for the whole period through to 2007, we choose not to undertake cross-sectional analysis of the 1987-2007 period, given the fundamental change in issue method to book building, and the fact that this later period has been discussed elsewhere.

Instead, we focus on the period up to the Big Bang watershed, which marked the beginning of the end of the fixed offer price method, as discussed in section I.

Accordingly, the annual time series of mean first-day returns ending in 2007 relates to 4547 IPOs, both public offers and placings, in Table 3; the multiple regression analysis is based on 2553 IPOs between 1917 and 1986.[13] Whilst recognising that this does not fully reflect provincial IPO activity (section I-D), we include 250 IPOs jointly listing on at least one Provincial Stock Exchange as well as London, and 62 IPOs jointly listing on one of the 3 regional stock exchanges and the LSE.[14] There were 321 part-paid IPOs in the interwar years; thereafter there were none. These IPO returns are calculated on a fully paid basis, reflecting the fact that shareholders were obligated to pay the balance of the offer price (the "call") when due.[15]

In conformity with previous underpricing studies, there are a number of data exclusions. Firstly, we excluded 119 offers for sale by the tender method, given their intrinsically different procedure for price determination as compared to fixed price offers; see Derrien and Womack (2003) and Jagannathan and Sherman (2006). We exclude "penny" stock IPOs, defined as those with an offer price of 10 pence or less (after decimalization in 1972), or the equivalent pre-decimalization price of 2 shillings or less. Also excluded are IPOs of closed-end funds (known in the UK as investment trusts), transfers from a junior market, new lists by firms already quoted on another exchange, new lists by firms with a dispersed and broad prior stockholder base (known in the UK as "introductions"), IPOs which bundled a preference share and an ordinary share, and privatizations.[16]

The changes in average IPO characteristics across the whole period 1917–86 are presented graphically in Figure 1.[17] In panel A, we see that firms going public became

larger in terms of real market capitalization (MCAP), only experiencing a decline in the early 1980s with the start of the USM. They also became more highly valued, as indicated by the ratio of their book value per share to their offer price (BVP). In panel B we show that, up to 1979, companies that had an IPO became older (AGE). The length of the audited profit record (TRACK) was longer post-WWII than in the interwar years, and then settled at five years from the early 1970s onwards. Panel C reveals that the proportion of the firm that was sold (PROPSOLD) declined steadily over time. On the other hand, there was a marked move towards underwriters with a strong reputation (PRESTIGE) after 1945. Finally, panel D shows that offerings of companies in the natural-resource sectors of mining, oil, and plantations were important in the mid–1920s and mid–1930s, but not thereafter. The proportion of R&D-intensive IPOs was generally less than 10% of the sample, but became more important towards the end of the period. Other things equal, the trends in mean firm size, age, and underwriter reputation may be expected to have narrowed underpricing over time. In contrast, the trends in the mean proportion sold and in the mean firm valuation (lower BVP) may be expected to have widened underpricing over time.

Insert Figure 1

The descriptive statistics and correlation matrix of first-day returns and the explanatory variables are included in Table II. In addition, we make use of the sector classification for each IPO (see section II) and pre-IPO stock market returns.[18]

Insert Table II

IV. Results

A. Annual time series of first-day returns

The annual time series of IPO volume and first-day returns are summarised in panels A-C of Table III.[19] There were no IPOs in 1915 and 1916 and only four during 1917 and 1918, reflecting wartime capital market restrictions. Similarly, there were only 14 observations in our dataset during the war years 1940–45. IPO activity in the interwar years was not insubstantial, despite being understated due to the greater use of preference shares as well as the poor disclosure of placings.[20] Excluding the depression years 1930–33, an average of 32 IPOs took place each year between 1919 and 1939. This figure compares favourably with the annual rate of activity up to 1979, other than in the 1960s. By peacetime standards, the seven years immediately following the 1973–74 oil-shock had a particularly low number of offerings (see Table III). The Dimson, Marsh and Staunton (2002, 2007) dataset shows that the London equity market's 1973-74 collapse, and its 1975 recovery, constituted a quite exceptional period. The inflation-adjusted UK equity index (at mid-year) was lower in 1974-1976 than in any other year since 1959. Throughout 1974-1982, the inflation-adjusted index (at mid-year) remained lower than in any other year during 1959-1973 or 1983-2006.

Insert Table III

In panel D of the table, it can be seen that, from 8.96% (1917–1929) and 5.43% (1930–39) in the interwar decades, the equally-weighted mean level of underpricing subsequently rose to 11.86% (1950–59) and then 14.01% (1960–69). After a narrowing to 8.65% in the

1970s, the equally-weighted mean level of underpricing averaged 15.80% in the 1980s. Reflecting the growth of London's Alternative Investment Market (AIM), which facilitated numerous IPOs by very small companies, there were even higher average levels of underpricing in the 1990s (18.08%) and 2000s (19.03%). The median underpricing reveals the same contrast between the lower level of underpricing in the interwar decades, and a higher level after WWII.

Panel E of Table III summarises, for the 2553 IPOs between 1917 and 1986, the mean and median first-day returns, and gross IPO proceeds and money left on the table in end of 2007 purchasing power. In total, some £2.1 billion was left on the table for this IPO sample. Equally weighted mean underpricing was 11.12% over the entire period. The lower row of Panel E shows that the underpricing story is essentially the same over the entire 90 years from 1917 to 2007. Over this longer interval, equally-weighted mean underpricing, capitalization-weighted mean underpricing and the median level of underpricing are all larger than the 1917-86 estimates (reflecting the higher initial premia on AIM issues). Making no distinction between public offers and placings, Panel F shows that the 610 IPOs over the period to 1945 were underpriced by an average of 8.04%, whereas after 1945, the pre-Big Bang 1943 offerings were underpriced by an average of 12.09%, and the 1996 IPOs post-Big Bang by 18.54%.

Figure 2 graphs the annual time series of mean first-day returns and the number of IPOs in each year. There are two striking features to this chart: the cycle of "hot" and "cold" markets in underpricing, and the rise in the average level of underpricing since the mid-fifties. The latter is the primary focus of this paper. The recent story of IPO underpricing from the 1980s onward has been told by Loughran and Ritter (2004) and others, who have investigated the changing incentives for issuers, investors and intermediaries (see section

II). Our emphasis is on the interval from WWII to the Big Bang deregulation in 1986, and on the contrast with the interwar period.

Insert Figure 2

Given their lack of transparency and their susceptibility to manipulation, there was a marked tendency for placings to be more underpriced than public offers, as can be seen in Table IV. After 1945, reflecting the LSE's attempts to regulate the placing method more strictly, the underpricing of placings narrowed. This pattern was not, however, replicated among public offers, the underpricing of which widened after 1945. As can be seen in Panel C of the table, up to 1945 public offers were underpriced by an average of 3.80%, whereas after WWII they were underpriced by an average of 9.15%.

Insert Table IV

B. Univariate partitioning

Both this and the next section review the ability of the changing risk composition of IPOs to explain observed shifts in underpricing. The breakpoint of 1945 used in this section and the next is determined exogenously by the discussion of developments in investor protection (section I-B) and underwriting (section I-C).[21] In this section we examine the univariate relationships between underpricing and the continuous variables, firm size (MCAP), firm age (AGE), book value to offer price (BVP), length of profits record (TRACK), and the proportion of a firm's voting equity sold at the IPO (PROPSOLD). As noted in section II, there is a general presumption that more mature and more stable firms should experience less underpricing, which is typically explained in the literature by the rationale

that they are easier to value, and hence investors do not demand price-protection against valuation errors.

In Table V, IPOs are sorted for each period into quartiles, and we estimate the equally weighted mean first-day return for each quartile. If, for example, underpricing varies negatively with market capitalization, as hypothesised, there should be a monotonic decrease in underpricing as capitalization increases through the quartiles, other things being equal. For an integer variable like AGE, quartiles can have differing numbers of constituents. In the case of PROPSOLD, the breaks are struck after excluding those firms that, as a consequence of restructuring, had poor disclosure regarding the proportion of their equity sold at IPO (see footnote 12).

Insert Table V

Table V provides evidence in favour of the hypothesized univariate relationships. Looking across time, the clearest support for the hypothesized relationships is found in the 1946–86 period. Underpricing decreases systematically, as firm size (MCAP), AGE, book value to offer price (BVP), and PROPSOLD increase. This pattern is less reliable during the 1917–45 period, when only AGE and PROPSOLD display similar relationships, MCAP displays a weaker (and non-monotonic) relationship and BVP and TRACK show no relationship with underpricing.[22] Nevertheless, as the IPO boom of the late 1990s highlighted, underpricing is not determined exclusively by the need to entice investors to subscribe to IPOs, since hot IPO markets can be accompanied by severe queuing and harsh rationing of IPO allocations. In addition to market pressures, managerial motivations are also likely to be relevant as determinants of IPO prices, an observation that is further

supported by the large regression coefficients on PROPSOLD that we report in the following section.

C. Regression results

The results from running OLS regressions of the underpricing model [2] are summarised in Table VI. As described in section II, all regressions use a set of dummy variables for issue year (YEAR) and industry sector (SECTOR), and a lagged market return variable (MRET) measured over one month prior to the first day of trading.[23] Panel A reports regressions with one control variable included at a time, with highly significant coefficients being obtained for LNMCAP, LN(1+AGE), TRACK, UW, PRESTIGE, and PROPSOLD, whilst LNBVP and RD are significant at the 5% level. AUDIT has no statistical significance either univariately or multivariately in the regressions which follow, and we do not report it in Table VI.

Insert Table VI

Panel B reports the results from estimating a multiple regression using all variables across the entire 1917-86 sample period. All variables are of the expected sign. The proportion of voting equity sold in the offering (PROPSOLD) is statistically significant at the 1% level and five other issue attributes, LNMCAP, LNBVP, TRACK, UW and RD, are significant at the 5% level; LN(1+AGE) is significant at the 10% level. The PROPSOLD coefficient is substantial, as may be illustrated by a comparison of an IPO in which nearly all the outstanding shares are sold, with an IPO that has a negligible proportion sold. The coefficient on PROPSOLD indicates that, other things equal, underpricing for the former would be reduced by 24.5%, yielding substantially higher gross proceeds, as predicted by the realignment of incentives hypothesis. Over the entire sample period, firm age

(LN(1+AGE)), firm valuation (LNBVP) and R&D-intensity (RD) and TRACK are of limited economic significance. In the latter case, an IPO disclosing an additional decade of profits would reduce underpricing by a modest 4%.

Panel B also reports the results from estimating the model over the sub-periods 1917–45 and 1946–86. The most powerful results are obtained post–1945 (regression 11), when the coefficients are of the predicted sign and, except for UW and PRESTIGE, are statistically significant. These results suggest that the improved prospectus disclosure may have had a beneficial impact insofar as underpricing was now varying, as expected, with levels of disclosure, as proxied by the length of the profits record. To a lesser extent, underpricing was varying also with the reliability of net asset values disclosed, as well as firm risk measures, age, and size. In addition, we tested for the marginal effect of prospectus disclosure on underpricing by including alternative explanatory variables, namely the dummy variable indicating whether or not the prospectus disclosed an independently verified asset valuation (AUDIT), mentioned above, and a simple count of the number of balance sheet items, However, these results were, disappointingly, not significant.

As regards the impact of underwriting, in the 1917–45 period the coefficient on UW (regression 10) indicates that the benefit of simply having an IPO underwritten was a considerable 7.4%; however, this benefit disappeared after 1945 (regression 11), as virtually all IPOs were underwritten. The coefficient on PRESTIGE, although not statistically significant at all, indicates that the hiring of a reputable bank as underwriter was of modest economic benefit in the earlier period (regression 10) but had no discernible economic impact on underpricing in this later period (regression 11). Hence,

whilst certification in the form of simply having an IPO underwritten ameliorated underpricing, the added benefit from hiring a prestigious bank apparently did not.

We re-estimated the regressions in Panel B and C including terms interacting the placing dummy with the explanatory variables. The results suggest that firm size, age, length of track record, and underwriter reputation have different marginal effects on public offers and placings in the interwar period.[24] Consequently, Panels D and E in Table VI report the regressions for the whole period and the two sub-periods for public offers and placings respectively. In the rest of this paper, we focus the discussion upon public offers.[25]

D. Comparison of pre- and post–1945 periods

We can now return to the main question of the behaviour of IPO underpricing over time. Controlling for changing risk composition, sector risk, and equity market conditions as well as the influence of underwriter reputation and investor protection, we estimate the coefficients of the YEAR dummy variables from a regression similar to model [2] for the 1457 public offers. The only difference is that, with the exception of YEAR, which is defined as before, all other explanatory variables are demeaned in order to assist the economic interpretation of the YEAR coefficients. In model [2], each YEAR coefficient represents the level of underpricing experienced in a given year by an IPO with characteristics in line with average values for the sample. From a simple regression of these YEAR coefficients on a constant plus a dummy variable for each post-1945 year, the difference (+9.17%) between the mean value for the 1917–45 period (+0.22%) and that for 1946–86 period (+9.40%) is highly statistically significant with a *p*-value of 0.0000.[26] In Figure 3 we graph the YEAR dummy coefficients for public offers, accompanied by the means of these coefficients in the 1917–45 and 1946–86 intervals.

Insert Figure 3

If the coefficients are weighted by the number of public offers in each year, the weighted means of the YEAR dummy coefficients in the same two intervals are +2.88% and +9.63%, respectively: a rise of 6.75%.[27] In a further test of this upward shift in underpricing of public offers, we replace the individual year dummies with two dummy variables for IPOs occurring during 1917–45 (UPTO1945) and 1946–86 (AFTER1945). The regression model is as follows:

$$\begin{aligned} RET = {} & \beta_1 LNMCAP + \beta_2 LN(1+AGE) + \beta_3 LNBVP + \beta_4 TRACK + \beta_5 AUDIT + \beta_6 PROPSOLD \\ & + \beta_7 UW + \beta_8 PRESTIGE + \beta_9 RD + \beta_{10} SECTOR + \beta_{11} RESTRUCTURE \\ & + \beta_{12} MRET + \beta_{13} USM + \beta_{14} UPTO1945 + \beta_{15} AFTER1945 + \varepsilon \end{aligned} \quad \textbf{[3]}$$

Once again, all explanatory variables other than the two dummy variables of interest, UPTO1945 and AFTER1945, are demeaned. The 7.93% difference in the coefficient of UPTO1945 (+2.10%) and that of AFTER1945 (+10.03%) represents the estimated rise in underpricing of public offers. We carry out a standard Wald test of the null hypothesis that restricting these two coefficients to equality, $\beta_{14} = \beta_{15}$, is valid, and the null is rejected with a *p*-value of 0.0001. [28]

Lastly, the rise in underpricing of public offers was confirmed by comparing the median of the YEAR coefficients in the 1917–45 (+0.42%) and post-1945 periods (8.79%). Median yearly underpricing rose by 8.37%, which is significant at the *p*=.0000 level using a standard Wilcoxon signed ranks test.[29]

To summarise, the increased underpricing of LSE offers is confirmed by analysis of individual year dummies, of the 1917–45 and post-1945 period dummies, and of medians

of the annual coefficients. The post-WWII rise in underpricing of public offers is in all tests statistically highly significant.

E. Robustness

We conclude this section by examining the robustness of our findings which are summarised in Table VII. Our base case discussed above is restated in row 1. The rise in underpricing is measured in three ways. Two of these are the difference in equally weighted means of the YEAR dummy variable coefficients from model [2] over the 1917-45 and 1946-86 periods, and the difference in the two period dummy coefficients in model [3]. The third is the difference in the median YEAR coefficient for each period.

Insert Table VII

We start with our definition of underpricing, which was measured by first-day percentage returns. If, instead, we specify the dependent variable in natural logarithmic form, LN(1+RET), the magnitudes of underpricing are smaller, since the log of a positive number has a lower value than the unlogged number. Consequently, underpricing rises a smaller amount, on average by 7.65% using logarithmic returns, rather than by the 9.17% base case. However, the increase in underpricing from 1917-45 to the post-1945 period, measured using logarithmic returns, is undiminished in its level of statistical significance (row 2).

We also examined the interval over which we measure underpricing in equation [1]. As an alternative to the first day of trading, we re-estimated underpricing in terms of partial first-month premia, defined as the return to the end of the first trading month, measured relative to the offer price. Given the lack of a daily market index prior to January 1930, we were

only able to adjust returns for IPOs after this date. The partial first-month premia of public offers averaged 2.87% and 10.52% over the 1917-45 and 1946-86 periods respectively and were not statistically significantly different from those estimated using prices on the first day of trading. Both the inability to adjust pre-1930 premia for daily market movements and the increased variance of these estimates reduced the economic and statistical significance of the rise in underpricing (row 3). Controlling for the Ford Motor IPO, which rose a massive 383% in the 11 days from the end of the first trading day to month end,[30] by the inclusion of a dummy variable, shifted the estimated underpricing rise in the case of the period dummies, for example, from 7.32% (row 3, *p*-value=0.0115) to 8.57% (row 4, *p*-value=0.0011).

We scrutinized the impact of sample eligibility (row 5). Our regressions exclude 148 IPOs of ordinary shares packaged with voting preference shares, all of which occurred in the interwar years. The ordinary share components of these offers were heavily underpriced but the preference share component was, on average, overpriced. The initial return of the package is defined as the return of each component on a fully-paid basis, weighted by the fixed ratio indicated in the prospectus for which shares must be applied. These IPOs displayed equally weighted average underpricing of 5.75%. Including them would have not change our finding that IPO underpricing was higher in the post-WWII era than in the period up to 1945.

Our sample also omits introductions and transfers of listing, since these new lists are unaccompanied by a sale of new or existing shares. Derrien and Kecskés (2007) note that underpricing is lower for new issues that already had a prior trading history. Introductions and transfers from a provincial exchange to the London market were commonplace during the interwar period, and if they were included in our sample, measured underpricing would

have been even smaller in the 1917–45 period. If our sample were extended to include introductions and transfers, it follows that the jump in underpricing after 1945 would be even more pronounced.

Since they were important to interwar IPOs, we estimated the impact of call features by including a dummy variable for each of the 275 part-paid IPOs with dated call features and the 44 IPOs with undated call features (see footnote 15). Compared to our base case (row 1), the rise in underpricing was smaller but still ranged between 5.21% and 6.54% (row 6).

We additionally undertook sensitivity analysis of the 1945 breakpoint and the impact of wartime capital market controls. We have argued that 1945 represented the most important breakpoint over the period from WWI to Big Bang in 1986. Reflecting the element of uncertainty regarding the precise timing of regulatory changes leading up to the 1948 Companies Act, we experimented with 1948 as an alternative breakpoint.[31] Compared to the base case, this shift of breakpoint lowers the economic significance, particularly in the case of the period dummies (+4.36%, *p*-value=0.0024) but not the statistical significance of our results (row 7). However, not only do we believe 1945 to be the more justifiable breakpoint (see footnote 21), the choice of 1948 pushes the first year after the end of war into the earlier period. Note that the immediate post-war years, 1919 and 1946, exhibited strong underpricing following the removal of wartime controls on IPOs. Excluding IPOs in these two years, as well as during wartime (row 8), reveals an increase in underpricing, as indicated by the period dummies, of 5.70% (*p*-value=0.0034).

We also present sensitivity analysis in relation to missing and extreme observations. For book-value-to-price (BVP), underwriter reputation and R&D activity, 0.68 percent of observations were missing and infilled with each variable's mean, while 0.20 percent of

BVP observations were winsorized (see footnote 17). If the missing observations are excluded, the rise in underpricing (row 9) is very similar to the base case. To quantify the impact of outliers, we winsorized both the dependent and the continuous independent variables by trimming outlying observations to no more than 2.5 standard deviations from their respective mean values (row 10). The rise in equally-weighted means across the two periods is still a highly statistically significant +7.61%.[32]

Our principal finding is that underpricing of public offers was lower before than after 1945. Robustness checks show that this result is not attributable to our specification of the measure of underpricing, choice of control variables, sample definition, methods of weighting each observation, or the impact of outliers.

V. Discussion

As the rise in the annual underpricing dummies indicates, any benefit from improved post-WWII regulation and disclosure appears to have been overwhelmed by other influences. What might they have been? We argue in this section that, after the war, market developments eroded the trust between investors, issuers and sponsors that had been prevalent when markets were more local. Consistent with this trend, London based investment banks became more powerful, managers faced new incentives as markets became institutionalised, and the winner's curse became more prevalent in the IPO market.

Building on the analysis in section I-D, our first hypothesis is that IPO underpricing is mitigated by trust. Hong, Kubik, and Stein (2004) and others emphasize the linkage between social interaction and stock market participation, and contribute towards explaining the preference of investors to invest locally. It follows that trust between issuers, intermediaries, and investors should be important when floating an IPO. Lavington (1921)

was the first to advance the trust hypothesis that, early in the twentieth century, there were greater levels of trust between local issuing firms, local issuing houses, and local investors in the vicinity of the Provincial Stock Exchanges (PSEs). Thereafter, these local exchanges, led by the largest PSEs, increasingly fell into line with LSE regulatory practice, and lost business to London.

Five PSEs were located in major cities in England (Birmingham, Liverpool, and Manchester) or Scotland (Edinburgh and Glasgow). However, there were small exchanges in Bradford, Bristol, Cardiff, Dundee, Huddersfield, Leeds, Newcastle, Nottingham, and Sheffield, all of which hosted at least one IPO that was offered simultaneously on the LSE. These offerings were by local issuers whose local sponsors offered shares to local investors. There were 29 of these IPOs, and they were 4.5% less underpriced than those listed on the five major provincial exchanges and London (p=0.0147). Consistent with a story based on trust, the provincial firms listing on the smallest PSEs benefited from the close ties within a community. Further examination of the impact of trust on IPO pricing must await a larger sample of Provincial offerings. However, the importance of trust in stock market transactions is emphasised by a wide range of writers subsequent to Lavington (1921), including Michie (1999), La Porta et al (1997, 1998), and Hong, Kubik, and Stein (2004). The post-WWII increase in underpricing is consistent with reduced levels of trust between participants in the IPO market. While some of the decline in trust may explicitly be linked to the larger and more centralised market that evolved in London, this pattern is intertwined with the growing power of London-based banks, the emerging importance of institutional investors, and an exacerbated winners curse.

The failure of prestigious banks to moderate post-WWII underpricing suggests a second hypothesis, that investment banks exerted market power in IPOs after 1945. In at least two

episodes, issue methods emerged that mitigated underpricing. In the interwar period, around 50% of IPOs were issued on a part-paid basis, which appeared to reduce money left on the table, as compared to fully-paid issues (see section IV-E above); and in the 1960s offers for sale by tender also reduced money left on the table, as compared to fixed-price offers (Merrett, Howe and Newbould, 1967; Dimson, 1979). In pre-Big Bang Britain, banks, together with institutional investors, stuck with the traditional fixed-price method, and consequently were able to benefit by underpricing IPOs more (Chambers, 2007). The demise of issue methods that alleviated underpricing is consistent with market power being greater for banks than for issuing firms and their selling shareholders. This is similar to Chen and Ritter's (2000) claim that, in the 1990s, US banks were able to set direct IPO costs above the competitive level.

Finally, the post-WWII growth of institutional equity investment might give credence to Brennan and Franks' (1997) view that non-selling managers of issuing firms used underpricing to spread ownership widely, thereby retaining control of the firm whilst obtaining the benefits of a listing. In the interwar years this strategy was unnecessary because, as discussed in section I-E, there was no market for corporate control in the UK. However, with the passage of the 1948 Companies Act, company accounts became more reliable and transparent, and in the following decade the threat of hostile takeovers materialised, and underpricing may have become more severe in response. Testing their hypothesis on a small sample of 43 UK IPOs between 1986 and 1989, Brennan and Franks concluded that the propensity to be acquired was lower than for seasoned firms, and that 10% additional underpricing reduced the size of block shareholdings by 7.7%. The former result was not subject to any statistical tests, could be overturned in post-IPO trading, and its economic significance is open to dispute. Based on 2622 US IPOs

between 1990 and 1998, Smart and Zutter (2003) uncover a relationship only one-tenth of the economic significance of the UK case.

The same phenomenon of rising institutional equity ownership post-WWII also led to greater investor heterogeneity, compared to the interwar period, and thereby worsened the winner's curse. While Rock's (1986) model of the winner's curse is supported by 1980s UK evidence (Levis, 1990), tests require information on the level of IPO subscriptions and the subsequent share allocations by size of investor, which are typically available only for the modern period. One crude proxy for the extent of the rise of the winner's curse over time is the percentage of equities owned by informed investors, deemed to be insurance companies and pension funds. We estimate their combined share rose from 1.8% in 1919 to 8% in 1945, and then to almost 50% by the time of Big Bang.[33] Using public offers, we regress the YEAR dummy variable coefficients from our base case in model [2] on this institutional ownership variable**.** The coefficient on the latter is statistically significant (p=0.0047) and implies that every 10% increase in institutional ownership post–1945 increased underpricing of offers by 2%.[34] Repeating the exercise using annual median first-day returns regressed on the same institutional ownership variable and the annual time-series of median values of MCAP, AGE, BVP, TRACK and PROPSOLD suggests a more modest 1.2% increase in underpricing for every 10% rise in institutional equity holdings (p=0.0741). Although this measure could be capturing the influence of some omitted variable, it is at least consistent with an exacerbated winner's curse in the market for post-WWII IPOs.

VI. Conclusion

In summary, the interwar IPO market operated under the principle of caveat emptor.

Improvements in investor protection were crowded into the period after 1945, as was the entry of underwriters of high reputation. Despite this progress, this study of UK IPOs shows that underpricing of public offers rose markedly from 3.80% in the pre-WWII period to 9.15% in the post-WWII period ending in 1986. The increase in underpricing is not explained by the composition of firms that undertake an IPO. We suggest several intertwined explanations for this puzzle, led by the reduced level of trust between investors, issuers and sponsors after the Second World War. Consistent with this interpretation, we observe investment banks' reluctance to retain issue methods that mitigate underpricing, the impact of institutionalisation of the equity market, and a winner's curse problem that intensified after WWII. These themes offer an avenue for further research.

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Table I: Testable Hypotheses to Explain Underpricing

	Hypothesis	Explanatory variable	Variable name	Impact on underpricing
1.	*Ex ante* uncertainty			
	(a) Firm risk	Firm age	AGE	–
		Market capitalization	MCAP	–
		Ratio of book value to offer price	BVP	–
	(b) Technology risk	R&D (dummy variable)	RD	+
	(c) Industry risk	12 Industry sectors	SECTOR	±
2.	Certification	Underwritten by third party (dummy variable)	UW	–
		Reputable underwriting (dummy variable)	PRESTIGE	–
3.	Disclosure	Length of profits record	TRACK	–
4.	Realigned incentives	Proportion of post-issue voting equity sold at IPO	PROPSOLD	–

Table II: Descriptive Statistics and Correlation Matrix, 1917–86

RET is the first-day IPO return and LN(1+RET) is its natural logarithm. AGE is firm age in years. MCAP is the market capitalization of voting shares at the offer price in £millions at end 2006 prices. BVP is the net asset value attributable to voting shares divided by their post-IPO market capitalization at the offer price. All three variables are transformed into their natural logarithms. TRACK is the length of historic profits record disclosed in the prospectus. PROPSOLD is the proportion of the post-issue voting equity sold in the IPO. UW is a dummy variable taking the value 1 if underwritten by a third party. PRESTIGE is a dummy variable taking the value 1 if underwritten by a reputable investment bank. RD is a dummy variable indicating whether the firm engages in R&D activity.

Statistic	RET	LN(1+RET)	MCAP	LNMCAP	AGE	LN(1+AGE)	BVP	LNBVP	TRACK	PROPSOLD	UW	PRESTIGE	RD
Mean	0.111	0.089	27.48	16.42	36.02	3.09	.71	–.56	6.74	.40	.89	.16	.09
Median	0.060	0.058	12.20	16.32	27.00	3.30	.61	–.49	7.00	.33	1.00	.00	.00
Maximum	2.221	1.170	2050	21.44	256.00	5.50	5.24	1.66	30.00	1.00	1.00	1.00	1.00
Minimum	–0.450	–0.598	.62	13.33	.00	.00	–.62	–4.57	.00	.02	.00	.00	.00
Std. Dev.	0.230	0.174	77.28	1.02	34.66	1.18	.51	.70	3.94	.22	.31	.37	.28
Skewness	3.247	1.472	13.69	.73	1.77	–.89	2.62	–.62	–.06	1.22	–2.48	1.83	2.91
Kurtosis	21.349	8.792	267.81	4.19	7.39	3.60	15.90	4.47	2.99	3.85	7.15	4.33	9.44
No. Obs.	2553	2553	2553	2553	2553	2553	2553	2553	2553	2553	2553	2553	2553
Correlation matrix													
RET	1.000												
LN(1+RET)	.976	1.000											
MCAP	–.013	–.007	1.000										
LNMCAP	–.060	–.045	.585	1.000									
AGE	–.071	–.049	.098	.114	1.000								
LN(1+AGE)	–.065	–.028	.075	.123	.810	1.000							
BVP	–.055	–.060	–.050	–.262	.165	.080	1.000						
LNBVP	–.061	–.070	–.096	–.315	.151	.052	.862	1.000					
TRACK	–.034	.008	–.009	.068	.392	.590	–.044	–.078	1.000				
PROPSOLD	–.180	–.227	–.102	–.257	–.127	–.242	.159	.223	–.334	1.000			
UW	–.084	–.077	.059	.162	.093	.156	–.106	–.111	.236	–.019	1.000		
PRESTIGE	–.027	–.012	.286	.430	.116	.132	–.111	–.138	.082	–.152	.156	1.000	
RD	.067	.069	.071	.100	–.041	–.012	–.115	–.118	–.043	–.071	–.022	.072	1.000

Table III: Annual Volume, First-day Returns, Proceeds, and Money on the Table, 1917–2007

First-day returns are the change over the offer price in the average or closing price, when available, on the first day of trading, and are equally-weighted (EW) and capitalization-weighted (CW). Capitalization is defined as the post-IPO market capitalization of voting shares at the offer price, in £ millions at end 2006 prices. The sample includes both public offers and placings.

Panel	Period	Number of IPOs	EW mean returns %	CW mean returns %	Median returns %	Real gross proceeds £m	Money on the table £m
Panel A	1917–18	4	5.85	7.20	2.52	11.8	0.9
	1919	42	19.35	10.43	3.49	268.0	30.8
	1920	63	-0.60	1.02	1.25	413.0	-4.0
	1921	3	0.08	0.07	2.09	12.1	0.2
	1922	5	1.03	-0.43	-0.76	72.1	-0.8
	1923	13	-0.14	5.13	-1.36	140.0	-0.5
	1924	8	0.08	-4.72	-1.91	44.1	-3.8
	1925	40	6.45	6.22	2.18	420.0	21.0
	1926	20	7.75	4.16	3.43	197.0	3.1
	1927	38	8.30	-1.57	3.98	455.0	-10.0
	1928	74	12.84	20.12	1.43	884.0	126.0
	1929	47	15.26	20.41	-1.67	460.0	29.5
	1930	6	-0.97	-0.21	-0.05	79.8	0.2
	1931	3	2.41	0.10	2.66	38.3	0.9
	1932	4	4.15	5.80	5.44	26.6	0.1
	1933	12	7.95	7.34	4.58	65.2	3.7
	1934	39	13.53	14.46	2.78	546.0	50.3
	1935	44	0.66	7.53	0.91	321.0	3.9
	1936	73	8.86	8.48	0.62	438.0	24.2
	1937	47	-0.27	4.65	-0.14	288.0	14.2
	1938	8	1.38	-9.27	1.88	54.5	-5.4
	1939	3	-5.90	-4.59	-3.57	5.9	-0.3
	1940–45	14	29.43	27.41	27.01	63.5	17.1
Panel B	1946	59	14.79	9.02	10.71	517.0	47.6
	1947	96	5.04	3.44	2.30	760.0	26.4
	1948	64	0.64	-0.18	1.77	453.0	-2.9
	1949	36	2.07	2.56	1.01	251.0	8.7
	1950	28	3.54	4.58	3.70	91.5	3.7
	1951	38	4.98	3.64	4.78	143.0	3.1
	1952	19	7.74	9.26	7.41	64.9	4.1

…/…

Table III (continued)

Panel	Period	Number of IPOs	EW mean returns %	CW mean returns %	Median returns %	Real gross proceeds £m	Money on the table £m
Panel B (continued)	1953	31	6.87	4.97	8.00	143.0	5.7
	1954	40	9.52	2.64	7.92	885.0	10.4
	1955	39	13.17	9.73	10.00	846.0	55.3
	1956	15	15.53	3.81	1.67	253.0	4.8
	1957	23	14.14	11.89	11.54	82.9	7.9
	1958	35	14.04	13.12	9.85	134.0	16.0
	1959	80	19.20	16.36	13.19	488.0	74.5
	1960	93	12.21	10.13	9.38	552.0	51.4
	1961	58	17.08	16.02	12.35	272.0	45.0
	1962	68	17.31	13.88	8.62	555.0	71.4
	1963	49	26.02	14.58	18.06	358.0	54.9
	1964	65	10.03	6.33	6.00	378.0	22.8
	1965	57	7.50	5.43	5.00	260.0	14.1
	1966	30	12.31	13.45	8.71	247.0	35.5
	1967	26	23.10	23.31	15.28	142.0	32.0
	1968	50	13.66	13.48	7.07	379.0	51.4
	1969	52	7.02	11.90	1.52	574.0	56.1
	1970	52	2.40	3.79	1.30	550.0	21.4
	1971	58	13.10	16.31	9.81	749.0	99.2
	1972	85	9.78	8.82	5.83	1370.0	130.0
	1973	40	4.81	7.50	4.06	575.0	32.2
	1974	1	-24.00	-23.99	-24.00	2.1	-0.5
	1975	2	5.21	9.59	5.21	31.6	3.0
	1976	5	-9.85	-9.70	-11.67	179.0	-18.5
	1977	6	18.01	11.94	15.96	104.0	13.4
	1978	10	17.55	17.95	12.63	97.8	16.7
	1979	8	22.71	15.53	18.89	154.0	24.5
	1980	12	21.40	14.95	19.86	45.7	6.8
	1981	44	11.33	-3.01	6.37	361.0	22.2
	1982	50	22.55	16.19	10.71	346.0	59.6
	1983	69	28.84	23.75	14.29	395.0	78.0
	1984	98	16.51	14.62	13.12	830.0	96.1
	1985	119	9.06	13.96	5.81	1860.0	274.0
	1986	133	10.00	10.90	7.88	2750.0	285.0

…/…

Table III (continued)

Panel	Period	Number of IPOs	EW mean returns %	CW mean returns %	Median returns %	Real gross proceeds £m	Money on the table £m
Panel C	1987	108	27.90	27.62	24.25	1490.0	402.0
	1988	107	9.00	5.94	7.37	2120.0	110.0
	1989	22	7.54	14.17	8.32	1670.0	260.0
	1990	9	4.37	2.18	3.33	284.0	3.4
	1991	11	7.13	3.20	3.45	1100.0	31.3
	1992	26	7.61	2.92	7.42	2650.0	80.6
	1993	68	12.84	9.28	8.83	3150.0	283.0
	1994	111	7.01	4.18	4.31	7860.0	353.0
	1995	54	14.08	12.43	8.78	3930.0	484.0
	1996	129	15.01	18.04	10.00	5270.0	896.0
	1997	107	10.66	11.82	7.14	5000.0	737.0
	1998	63	13.74	7.97	7.14	8430.0	1040.0
	1999	63	78.04	20.50	16.54	7380.0	1930.0
	2000	183	57.93	30.28	10.65	11600.0	4050.0
	2001	67	13.74	3.05	9.00	6070.0	306.0
	2002	48	7.30	3.16	6.29	2520.0	39.2
	2003	50	15.72	3.74	8.18	3070.0	86.2
	2004	173	14.12	7.86	8.64	5370.0	416.0
	2005	225	12.74	9.47	8.93	7380.0	636.0
	2006	212	12.11	8.46	7.95	11600.0	910.0
	2007	158	4.47	5.87	7.21	9220.0	19.7
Panel D	1917–29	357	8.96	9.68	1.89	3377.1	192.4
	1930–39	239	5.43	7.07	0.63	1863.3	91.8
	1940–49	269	7.00	4.64	2.94	2044.5	96.8
	1950–59	348	11.86	9.23	8.70	3131.3	185.5
	1960–69	548	14.01	12.23	8.82	3717.0	434.6
	1970–79	267	8.65	8.87	5.33	3812.5	321.4
	1980–89	762	15.80	13.34	9.61	11867.7	1593.7
	1990–99	641	18.08	11.32	7.76	45054.0	5838.3
	2000–07	1116	19.03	12.44	8.47	56830.0	6463.1
Panel E	1917–86	2553	11.12	10.29	6.00	24533.4	2144.3
	1917–2007	4389	14.37	11.78	7.41	131697.4	15217.7
Panel F	1917–45	610	8.04	8.97	1.26	5303.9	301.3
	1946–86	1943	12.09	10.50	7.69	19229.5	1843.0
	1987–2007	1996	18.54	12.16	8.66	107164.0	13073.4

Table IV: Mean First-day Returns and IPO Volume by Issue Method, 1917–86

Mean returns are equally weighted.

Panel	Period	Public Offers		Placings	
		Mean return	Number	Mean return	Number
Panel A	1917–29	5.66%	315 (88%)	33.80%	42 (12%)
	1930–39	0.87%	200 (84%)	28.82%	39 (16%)
	1940–49	4.73%	137 (51%)	9.36%	132 (49%)
	1950–59	10.32%	91 (26%)	12.41%	257 (74%)
	1960–69	11.57%	336 (61%)	17.88%	212 (39%)
	1970–79	7.87%	219 (82%)	12.25%	48 (18%)
	1980–86	8.95%	159 (30%)	17.69%	366 (70%)
Panel B	1917–86	7.26%	1457 (57%)	16.26%	1096 (43%)
Panel C	1917–45	3.80%	515 (84%)	31.11%	95 (16%)
	1946–86	9.15%	942 (48%)	14.85%	1001 (52%)

Table V: Univariate Analysis of First-day Returns by IPO Characteristics

First-day returns are equally weighted mean percentage returns. MCAP is the market capitalization of voting shares at the offer price in constant 2006 prices. AGE is firm age. BVP is the post-IPO proforma net asset value attributable to voting shares divided by their market capitalization at the offer price. TRACK is the number of years of historic profits included in the prospectus. PROPSOLD is the proportion of post-issue voting equity sold at IPO. Quartiles are ranked from low to high. In the case of PROPSOLD, the panel omits 85 interwar IPOs that sold all their voting equity but where insiders probably subscribed to the IPO (see footnote 12). These omitted IPOs were underpriced on average 7.29%. The 54 missing AGE and 22 missing BVP observations are in-filled with their equally weighted means.

Attribute	Quartile	Quartile means 1917–45			Quartile means 1946–86		
		Attribute	Return	No of Obs	Attribute	Return	No of Obs
MCAP (£m 2006)	1	3.3	13.39%	153	5.2	15.17%	486
	2	6.4	4.68%	152	10.6	12.44%	486
	3	11.0	5.44%	152	19.8	10.67%	486
	4	44.7	8.74%	153	89.3	10.06%	485
	All	16.3	8.03%	610	31.2	12.09%	1943
AGE (years)	1	0.2	10.39%	133	8.2	16.84%	472
	2	6.3	8.53%	173	21.2	12.40%	506
	3	24.4	7.21%	184	41.2	10.44%	485
	4	60.6	5.95%	120	90.6	8.74%	480
	All	22.8	8.03%	610	40.2	12.09%	1943
BVP (multiple)	1	0.44	7.43%	153	0.22	14.26%	486
	2	0.78	8.24%	152	0.43	13.16%	486
	3	0.94	12.30%	152	0.66	10.64%	486
	4	1.51	4.19%	153	1.27	10.28%	485
	All	0.92	8.03%	610	0.65	12.09%	1943
TRACK (years)	1	0.0	8.72%	158	4.3	16.44%	488
	2	0.0	8.81%	153	7.2	13.09%	486
	3	2.8	7.06%	149	10.0	11.13%	488
	4	6.8	7.48%	150	10.9	7.64%	481
	All	2.4	8.03%	610	8.1	12.09%	1943
PROPSOLD (proportion)	1	0.26	17.85%	132	0.18	16.08%	471
	2	0.48	11.31%	131	0.26	13.51%	485
	3	0.66	1.91%	131	0.34	11.33%	486
	4	0.82	1.45%	131	0.52	7.69%	501
	All	0.55	8.15%	525	0.33	12.09%	1943

Table VI: OLS Regressions of First-day Returns, 1917–86

The dependent variable is RET, the first-day IPO return, measured as a decimal. Firm size is proxied by the natural logarithm of market capitalization at the offer price in 2006 prices, LNMCAP. Age is expressed as the natural logarithm of one plus the number of years difference between the founding year of the business and the year of offering, LN(1+AGE). Book Value to Price (BVP) is the post-IPO proforma net asset value attributable to voting shares divided by their market capitalization at the offer price, and is also expressed as a natural logarithm. TRACK is the number of years of historic profits in the prospectus. PROPSOLD is the proportion of post-issue voting equity sold at the IPO, measured as a decimal. UW is a dummy variable taking the value of 1 if underwritten by a third party, and 0 otherwise. PRESTIGE is a dummy variable taking the value 1 if underwritten by a reputable investment bank, and 0 otherwise. RD is a dummy variable indicating where a firm is engaged in research and development activity. All regressions are described in the text as model [2] and include a full set of YEAR dummies, industry SECTOR dummies, a RESTRUCTURE dummy for pre-IPO reorganisations that obscure prospectus data, an AUDIT dummy as to whether or not the asset valuation had been subject to an independent audit, a placing method dummy variable, and a lagged market return. Estimation method is OLS and standard errors are calculated using White's (1980) heteroskedasticity-consistent method. *P*-values are in parentheses. Statistical significance of coefficients at the 10%, 5% and 1% level is indicated by *, ** and *** respectively.

Panel	Reg	Period	LNMCAP	LN(1+AGE)	LNBVP	TRACK	PROPSOLD	UW	PRESTIGE	RD	N	AdjR^2
A: All IPOs	(1)	All	–.017***								2553	0.106
			(.003)									
	(2)	All		–.0151***							2553	0.106
				(.006)								
	(3)	All			–.016**						2553	0.104
					(.027)							
	(4)	All				–.005***					2553	0.106
						(.004)						
	(5)	All					–.216***				2553	0.106
							(.000)					
	(6)	All						–.074***			2553	0.106
								(.000)				
	(7)	All							–.032***		2553	0.106
									(.001)			
	(8)	All								.038**	2553	0.104
										(.038)		
B: All IPOs	(9)	All	–.014**	–.010*	–.015**	–.004**	–.245***	–.041**	–.009	.041**	2553	.149
			(.034)	(.098)	(.047)	(.036)	(.000)	(.045)	(.355)	(.024)		
	(10)	1917–45	–.021	–.001	–.007	.005	–.280***	–.074*	–.045	.115*	610	.157
			(.148)	(.916)	(.734)	(.180)	(.000)	(.052)	(.451)	(.073)		
	(11)	1946–86	–.018**	–.016**	–.014*	–.007***	–.173***	0.001	–.007	.035**	1943	.173
			(.017)	(.022)	(.080)	(.001)	(.000)	(.956)	(.443)	(.044)		
C: Offers	(12)	All	–.010	–.005	–.007	–.005**	–.223***	–.072*	–.002	0.068**	1457	.101
			(.188)	(.546)	(.404)	(.019)	(.000)	(.056)	(.869)	(.027)		
	(13)	1917–45	–.003	.005	.015	.002	–.240***	–.078*	–.049	.124*	515	.043
			(.824)	(.636)	(.356)	(.486)	(.002)	(.053)	(.521)	(.075)		
	(14)	1946–86	–.011	–.012	–.011	–.011***	–.187***	–.056	.009	.039	942	.156
			(.224)	(.169)	(.299)	(.001)	(.000)	(.601)	(.483)	(.193)		
D: Placings	(15)	All	–.050***	–.025**	–.026**	–.002	–.252***	.025	–.036**	.035	1096	.217
			(.000)	(.021)	(.021)	(.514)	(.001)	(.269)	(.022)	(.102)		
	(16)	1917–45	–.145***	–.057	–.058	.024	–.359**	.123	.167	–.104	95	.202
			(.007)	(.278)	(.469)	(.321)	(.048)	(.303)	(.539)	(.603)		
	(17)	1946–86	–.035**	–.018*	–.021**	–.005	–.213***	.016	–.042***	.033	1001	.154
			(.014)	(.084)	(.050)	(.144)	(.000)	(.463)	(.007)	(.112)		

Table VII: Robustness Tests of Changes in Underpricing of Public Offers After 1945

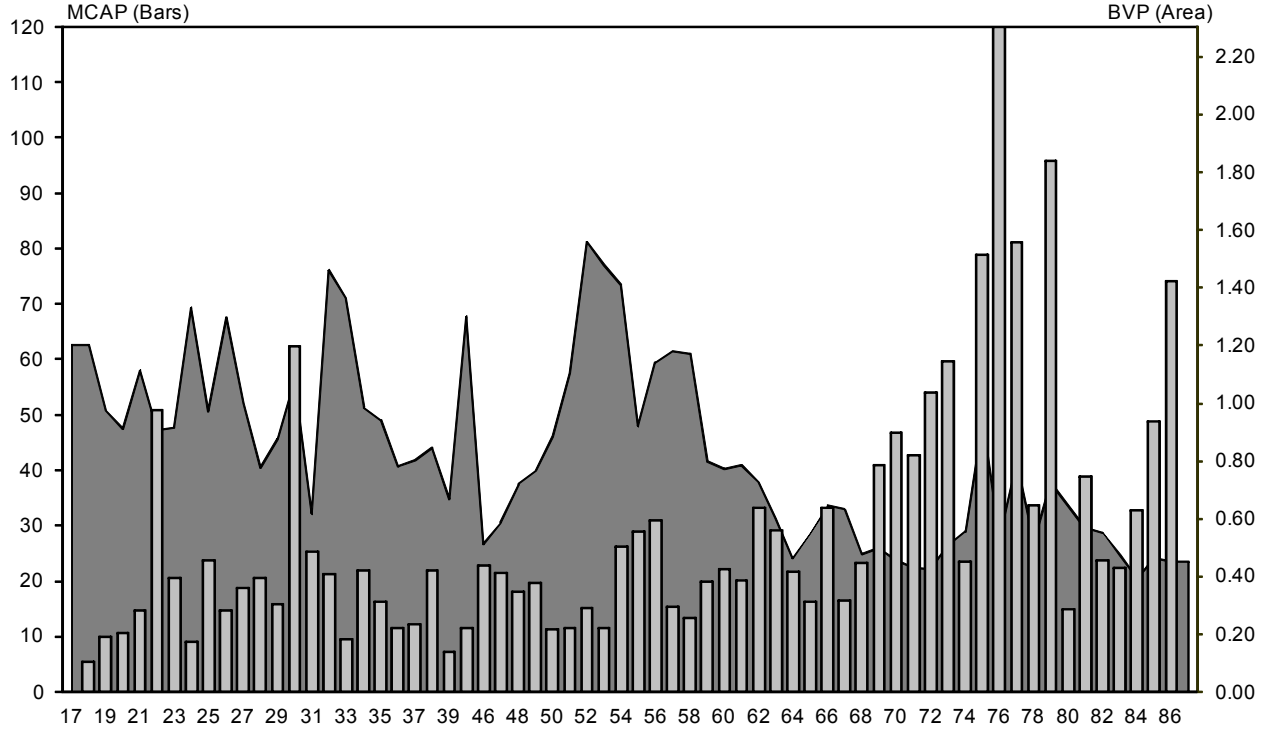
The change in underpricing from 1917–45 to 1946–86 is measured by the difference in the average level of the underpricing year dummy coefficients between these two intervals. The averages are the equally-weighted (EW) mean of annual underpricing dummy coefficients, and the median of annual underpricing dummy coefficients in model [2]; and the difference between the coefficients of the UPTO1945 and AFTER1945 dummy variables in model [3]. In row 8, as well as the war years, we exclude 1919 and 1946 because both the volume and pricing of IPOs was affected by the ending of wartime controls on IPO activity. In row 9, there were 67 IPOs with missing data (see footnote 16). All differences are measured in percentages. Statistical significance at the 10%, 5%, 1% and 0.1% level is indicated by *, **, ***, and **** respectively.

Method for measuring YEAR or period dummies in regressions [2] and [3]	Difference between 1917–45 and 1946–86 year dummies		
	EW mean	Median	Period dummies
1. Base case, using non-logarithmic underpricing	9.17 ****	8.37 ****	7.93 ****
2. Use logarithmic measure of underpricing	7.65 ****	6.37 ****	6.72 ****
3. Measure underpricing to end of 1st trading month	7.27 ***	8.05 ****	7.32 **
4. As row 3, but incorporating a dummy for Ford	8.75 ****	8.12 ****	8.57 ***
5. Extending sample to include “package” IPOs	8.36 ****	7.60 ****	7.05 ****
6. Include dummy variable for call feature	6.54 ****	5.21 ****	6.38 ***
7. Switch breakpoint from 1945 to 1948	8.05 ****	8.21 ****	4.36 ***
8. As row 7, omitting war periods 1917-19 & 1939-46	7.71 ****	6.24 ****	5.70 ***
9. Omit IPOs with missing data that were infilled	8.91 ****	8.77 ****	7.89 ****
10. Winsorize dependent and independent variables	7.61 ****	6.55 ****	6.48 ****

Figure 1: Characteristics of Initial Public Offerings on the LSE, 1917–86

Observations are equally weighted intra-year means except WWI (1917–18) and WWII (1940–45). There were no observations in 1915–16. Both public offers and placings are included.

A: Real market capitalization (LHS bars) and ratio of book value to price (RHS area)



B: Company age at IPO (LHS bars) and length of track record in years (RHS area)

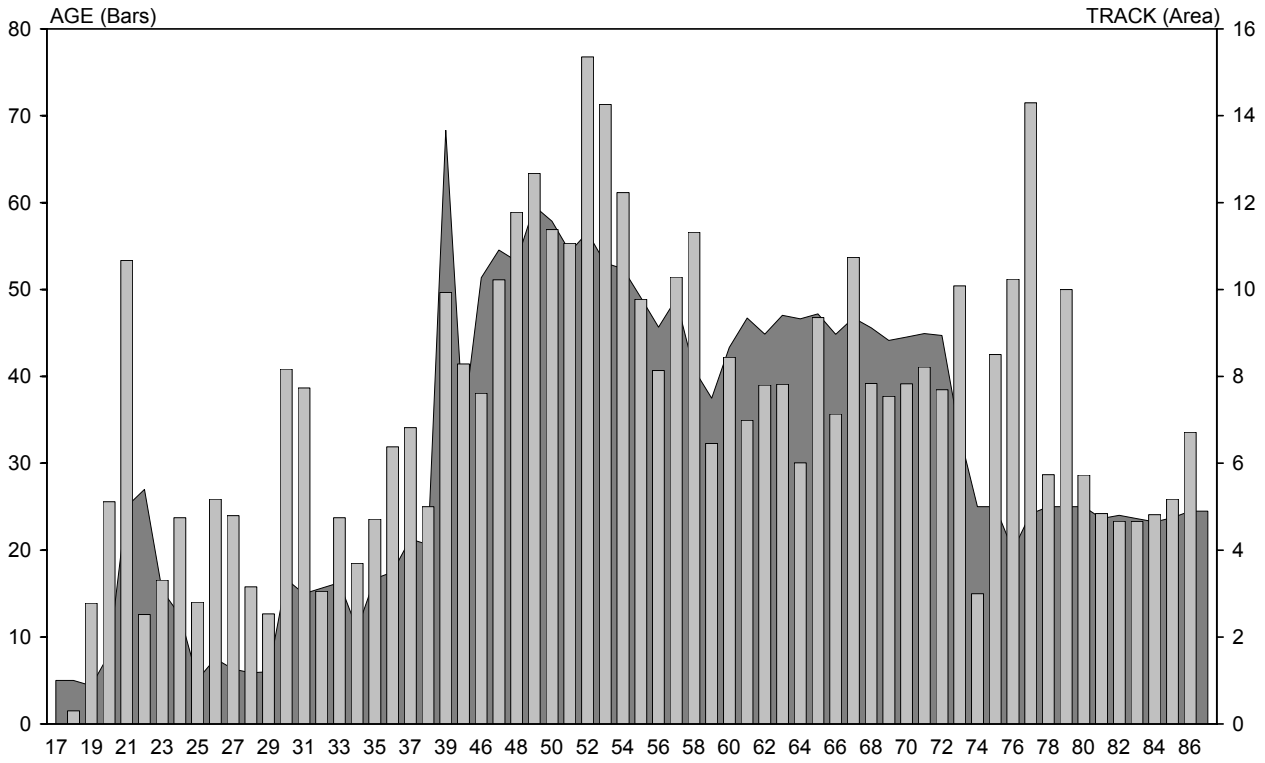
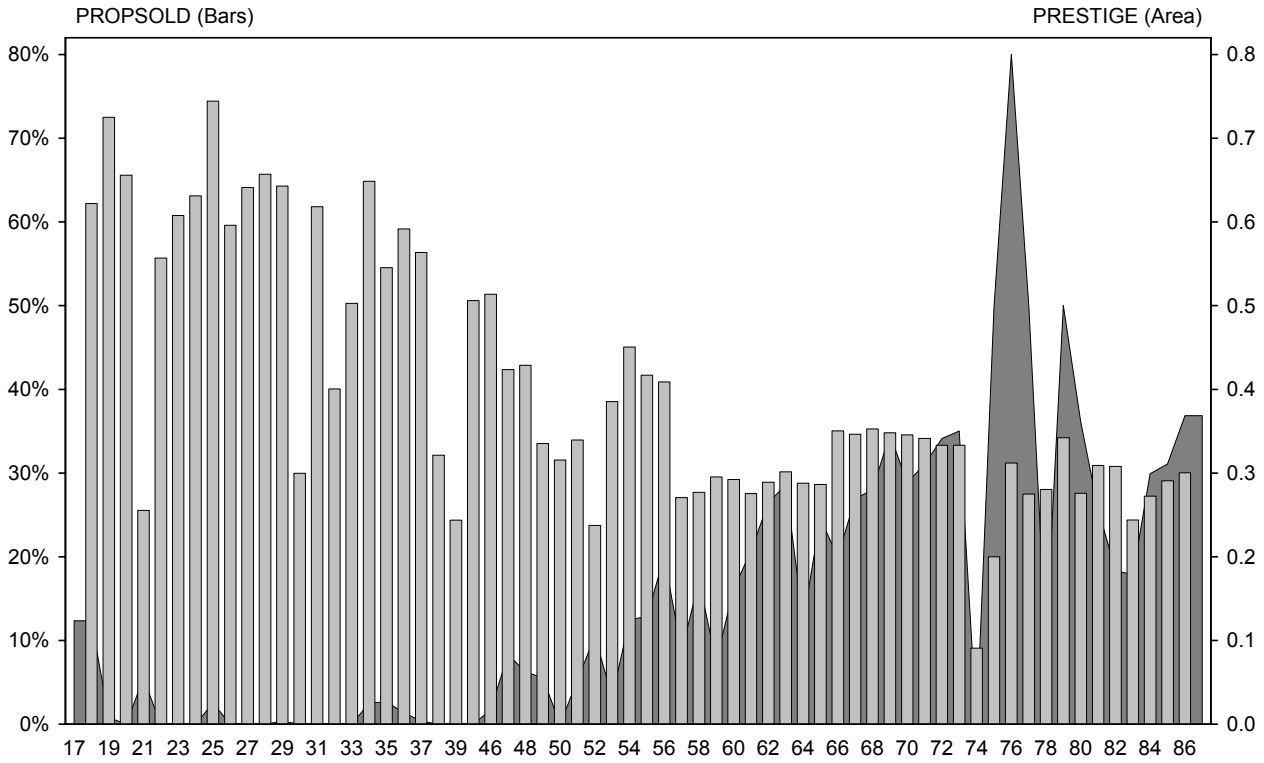


Figure 1 (continued)

C: Proportion sold at IPO (LHS bars) and underwriter reputation (RHS area)



D: Proportion of natural resource issues (LHS bars) and R&D intensity (RHS area)

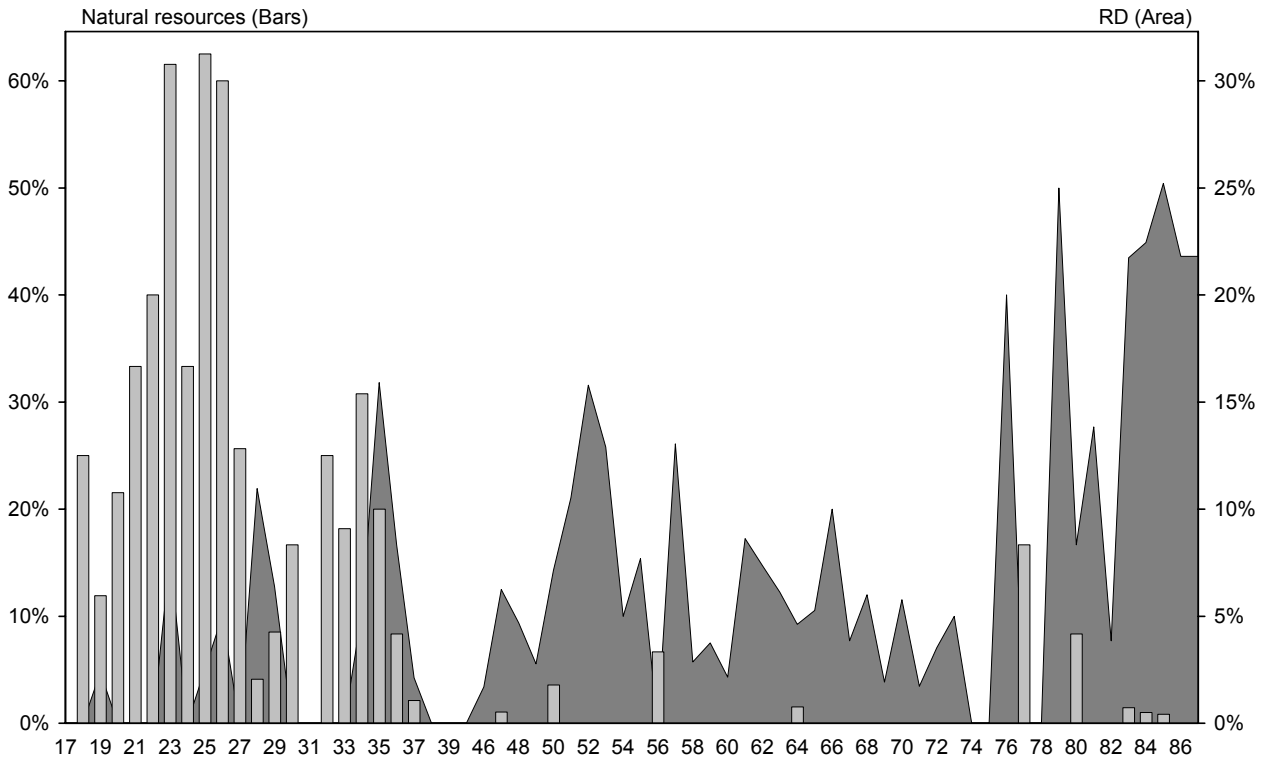


Figure 2: Time-Series of Underpricing (LHS bars) and Volume (RHS area) 1917–2007

Underpricing is defined as first-day percentage returns, relative to the issue price; and volume is defined as the number of IPOs in a given year. The annual underpricing averages are equally weighted intra-year means except WWI (1917–18) and WWII (1940–45). There were no observations in 1915–16. Both public offers and placings are included. The estimates of underpricing and volume are based on the dataset for 1917-1986 compiled for this study, and on secondary sources for 1987-2007 (see text). The underpricing bars are truncated for 1974 (–24%, based on one IPO), 1999 (+78%), and 2000 (+58%).

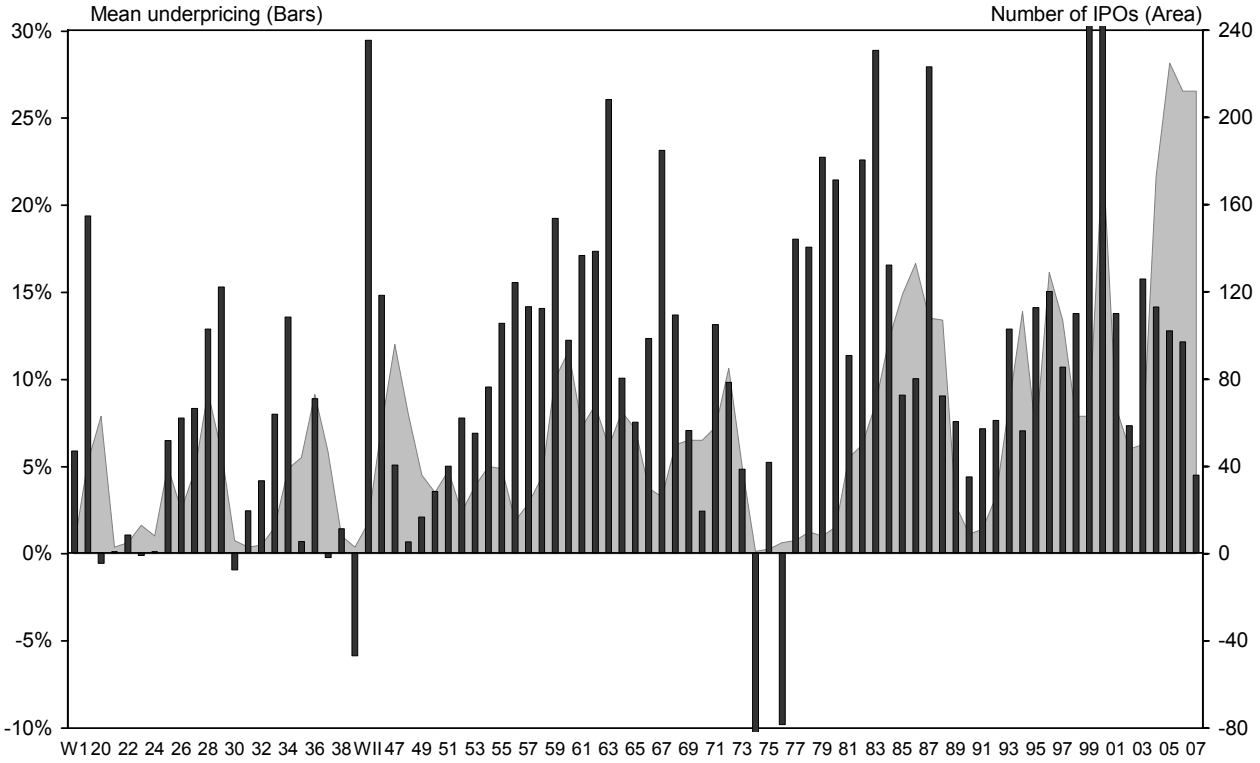
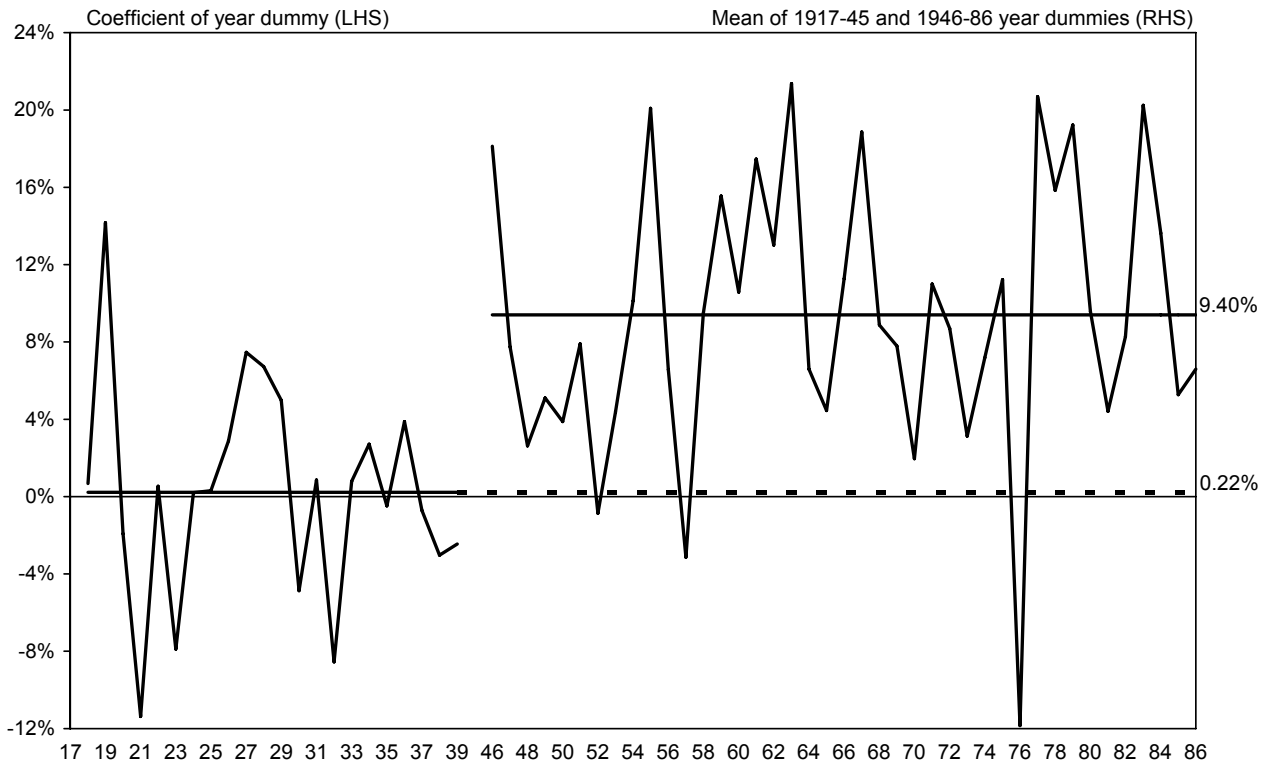


Figure 3: Year Coefficients in Regression of Underpricing on Control Variables 1917–86

We show the coefficients on the YEAR dummies relating to public offers in a regression similar to model [2] except that the explanatory variables are demeaned (see text). The horizontal lines show the means of the YEAR dummies over the 1917–45 and 1946–86 intervals, namely 0.22% and 9.40% respectively. There were no public offers in 1940–45 and in 1974.



FOOTNOTES

[1] The only evidence on IPO pricing during the early twentieth century relates to pre-World War I Germany, namely the studies by Schlag and Wodrich (2000), Fohlin (2000), and Burhop (2006)..

[2] For example, Ibbotson, Ritter and Sindelar (1994) and Loughran and Ritter (2004) in the US; and Davis and Yeomans (1974), Dimson (1979), Buckland and Davis (1989), Jenkinson and Trundle (1990), Levis (1993) and Ljungqvist (2003) in the UK.

[3] Big Bang referred to the deregulation of fixed brokerage commissions and the ending of restrictions on membership on the LSE (Thomas, 1986). It was at least as important for Britain as the liberalisation of fixed commissions in 1975 was to the US markets.

[4] Ritter (1987). On a proceeds weighted basis 88% of IPOs between 1977 and 1982 were already book built.

[5] This mean score was 0.06 (pre–1929), 0.28 (1929), 0.61 (1948), 0.67 (1967) and 0.78 (1986). The scores for public enforcement are excluded since, as La Porta, Lopez-de-Silanes and Shleifer (2006) argue, this measure is a substitute for the other three. The 1929 score incorporates a disclosure score of 0.33 representing our belief that the improvement in disclosure in that year, was more modest than that claimed by Franks, Mayer and Rossi (2005).

[6] The first fully printed rule book dates from 1812. Subsequent editions were not numbered. Covering the period of this study, we located editions for 1915, 1918, 1922, 1926, 1927, 1928, 1929, 1934, 1946, 1951, 1968 and 1969; after 1973, it became the Admission of Securities to Listing (the “Yellow Book”).

[7] The quantitative evidence in Thomas (1973, pp.249) regarding "provincial" new issues in the interwar years relates predominantly to issues on the LSE in the distribution of which a provincial broker participated.

[8] These figures include introductions, where a firm with a sufficiently widely dispersed share register may apply for a listing without an accompanying share issue.

[9] Disclosure of R&D expenditure in company accounts did not become customary until 1977 under the UK accounting standard, SSAP 13. In the interwar years, prospectuses rarely made explicit reference to research and development, terminology which had not yet been widely adopted in Britain, but did refer to patent ownership and activity which is taken as indicative of R&D activity.

[10] To be precise, we define TRACK as the number of years of historic profits *plus* 0.0001*AGE where the latter is the issuer's age in years, as defined above. This tiny adjustment facilitates ordinal ranking of the TRACK variable.

[11] For offerings with varying proportions sold, but with other characteristics held constant, we implicitly assume that the cost of inducing investors to participate in the IPO—namely, money left on the table—is a constant proportion of gross proceeds.

[12] Prior to the end of 1945, there were 85 IPOs apparently selling all their voting equity (PROPSOLD=1.00). In at least some of these instances, the prospectus failed to make clear that insiders most likely participated in the offering.

[13] We included data on IPOs from Buckland and Davis (1989), Levis (1993), and proprietary sources. The former source included dividend yield data on 523 USM offerings, but not proforma net asset values. Following Dimson, Nagel, and Quigley (2003), we therefore inferred book-value-to-price ratios from the dividend yields.

[14] The 250 IPOs took place on a total of 18 PSE's up to July 1966 when the last regional exchange was formed, and of these, 189 IPOs listed on one or more of Birmingham, Edinburgh, Glasgow, Liverpool, or Manchester. There were, in addition, almost 350 IPOs listing solely on a PSE and publishing a prospectus in *The Times* prior to regionalisation for which either share prices could not be found, or disclosure regarding the placing price was inadequate.

[15] Hence, for a partly paid share the value of the remaining call(s) discounted at the treasury bill rate over the time to call is added to the amount paid prior to initial trading; in addition, where a share is not quoted fully paid the discounted value of outstanding calls are added to the partly paid share price. The returns on 44 part-paid IPOs with undated calls were estimated assuming these calls would not be made.

[16] We included 30 IPOs consisting of an ordinary share plus a deferred share in some combination. In the absence of unseasoned IPOs, in 1930 we included five seasoned equity offerings that were of comparable size to interwar IPOs.

[17] In this and the subsequent analysis, 54 missing observations for firm age, 23 book-value-to-price, 24 for underwriter reputation and 1 for research and development activity were infilled with the mean value for each variable. In the case of book-value-to price observations that were non-positive, we replaced the 4 undefined values for LNBVP by winsorized estimates. In section IV-E, we show that our results are robust to these procedures.

[18] One and three month UK equity market returns are calculated from the London and Cambridge Economic Service index (monthly data to August 1921), the Scholles 20 ordinary share index (weekly from August 1921 to December 1926), the Bankers Magazine index (monthly during 1927 and 1928), the Annalist London 20 share index (weekly from January 1929 to December 1929), and daily from 1930 from the Financial News 30 share, the Financial Times 30 and the Financial Times All Share indexes. The intention is to capture unanticipated stock market fluctuations, so it

is appropriate that these one- and three- month returns measure capital appreciation only, excluding dividends.

[19] For comparison with recent IPOs, the 1917–1986 dataset is extended with statistics for 1995–2006 kindly supplied by Paleari, Piazzalunga, Redondi, Trabucchi, and Vismara (2007), to whom we are grateful. The 1987–1994 gap was filled using hand-collected data (1987–1990) and data extracted from the quarterly *KPMG New Issue Statistics* database (1991–1994). The post-1986 data were compared with statistics (for differing samples) from Jenkinson and Trundle (1990), Levis (1993, 2007), Ljungqvist (2003), and Unlu, Ferris and Noronha (2004). Errors and omissions that were identified in the Paleari et al (2007) dataset were notified to the compilers and, where possible, were corrected.

[20] We estimate that during the interwar years ordinary share IPOs accounted for close to half of all offerings, preference share IPOs around a third and the rest were combined ordinary and preference IPOs. As for placings, we excluded 308 interwar IPOs because the placing price was not disclosed in the prospectus.

[21] The choice of 1945 rather than 1948 reflects the timing of the Cohen Committee Report making recommendations leading to the 1948 Act, the anticipation of the Act's financial disclosure provisions by the accounting profession and the establishment of the IHA at the end of 1945. The use of 1948 does not affect the main findings reported below.

[22] See footnote 12. In the period 1917–45, the 85 IPOs with PROPSOLD=100% displayed equally weighted mean underpricing of 7.29%.

[23] Estimated over 1917-86, the coefficient on the one-month prior return was 0.816 (p=0.000). This is marginally statistically different from one (p=0.0927), which we attribute to the lack of a daily index before January 1930, as explained in footnote 18. The coefficient over the period 1930-86 was 0.882 (p=0.0000), which is not statistically different from one (p=0.2758). For the 1917-29

period, when daily data were unavailable, the coefficient was -0.006 (p=0.9916). We also measured MRET over three months, with a coefficient of 0.669 (p=0.000). In addition, we experimented with stock market volatility estimated over the 21 business days prior to the first day of trading. Based on data commencing in January 1930, volatility did not enter significantly into regressions [2] and [3], indicating that underpricing did not fluctuate systematically with overall equity market uncertainty.

[24] In an F-test, we could not accept the null hypothesis that the coefficients of the interactions between the placing dummy and LNMCAP, LN(1+AGE), LNBVP, TRACK, PROPSOLD, UW, PRESTIGE, and RD in [2] were all equal to zero for both the whole period (p-value=0.0000) We thank Mahendrarajah Nimalendran for this suggestion.

[25] An F-test suggests that when applying model [2] to public offers only, we can accept the null that the slopes of the explanatory variables did not differ across the two periods, 1917-45 and 1946-86 (p-value=0.2738).

[26] The residuals from this simple regression exhibited no serial correlation under standard tests.

[27] In contrast to public offers, the evidence from model [2] when estimated using only placings points to a substantial fall in underpricing across the two periods. The fall in equally-weighted mean underpricing is 11.61% (p=0.0526), confirming the sharp fall exhibited by equally-weighted first-day returns (Table IV, panel C). Assuming the interwar sample of only 95 placings is representative of the underpricing experience of the larger population of IPOs using this method, and given the relative lack of transparency and fairness they exhibited pre–1945 (section I-B), this result is not surprising.

[28] The fall in the period dummies is 16.82% (p=0.0000) from estimating model [3] on placings alone.

[29] For completeness, we also report the median and market capitalization-weighted mean of the individual first-day returns. Median first-day returns rose from 0.00% (1917–45) to +5.16% (post-1945); a Wilcoxon signed ranks test rejects the null hypothesis of the equality of these medians with a *p*-value of 0.0000. Capitalization-weighted mean first-day returns, where capitalization is defined as the post-IPO market capitalization of all voting shares at the offer price, rose from +5.88% (1917–45) to +9.62% (post-1945).

[30] In contrast, the largest partial first month rise among post-WWII IPOs was the 158% recorded by Amalgamated Securities in October 1959.

[31] Since there were no public offers between 1940 and 1945, this prevented experimenting with 1939 as a breakpoint.

[32] A final opportunity for robustness checking is the impact of underwriter PRESTIGE on underpricing. After WWII, this is potentially endogenous since, as Habib and Ljungqvist (2001) note, there is an incentive for a firm susceptible to underpricing to hire a prestigious underwriter. Instrumenting for PRESTIGE in 2SLS estimation is infeasible because of a lack of instruments uncorrelated with underpricing.

[33] These figures are estimated from a quinquennial time-series of the allocation made to ordinary shares by UK insurance companies out of total assets between 1913 and 1962 (Sheppard, 1967) spliced with 6-yearly observations of share ownership by insurance companies and pension funds between 1963 and 1991 (Central Statistical Office, 1995). We assume that pension funds had very little invested in ordinary shares prior to 1945.

[34] Standard tests fail to uncover the presence of serial correlation in the residuals.