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FINANCIAL DEPENDENCE AND FIRM SURVIVAL IN INTERWAR BRITAIN

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Financial Dependence and Firm Survival in Interwar Britain[1]

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Abstract

Was the London Stock Exchange (LSE) little more than a Dickensian den of speculation, or did it make a contribution to industrial development in interwar Britain? The interwar stock market laboured under problems of weak disclosure, inadequate investor protection and ineffective underwriting. New manufacturing industries were the most vulnerable to resulting asymmetric information problems. Drawing on a new database of IPOs on the London Stock Exchange between 1919 and 1938, I conclude that new manufacturing firms were finance-constrained. Consistent with the Rajan-Zingales financial dependence hypothesis, this result reflects the weak interwar institutional environment. The disastrous IPO survival rates of the late 1920s provide further evidence of this weak environment. Yet, when issue activity rebounded strongly in the following decade, a dramatic improvement in survival ensued, due, in part, to the efforts of the LSE. This was an early example of the "light touch" regulatory approach for which London has subsequently become renowned.

JEL classifications: G3,G24,N2,L26
Keywords: IPOs, Survival, Regulation, Investment

[1] The previous draft of this paper appeared as "New Issues, New Industries and Firm Survival in Interwar Britain". I am grateful for suggestions from Forest Capie, Nick Crafts, Mans Soderbom, and participants at the 2007 Economic History Society Annual Conference and seminars at the University of Oxford and the Bank of England.

The shares are a penny, and ever
so many are taken by
Rothschild and Baring,
And just as a few are allotted to
You, you wake with
a shudder despairing.

W.S. Gilbert, Iolanthe, 1882, II

Prior to 1914, domestic industry was typically small in scale and more than adequately financed from internal sources, family and friends. Thereafter, the substantial capital investment undertaken by the new manufacturing industries of electrical engineering, motor vehicles and aircraft, synthetic fibres and chemicals coupled with the cash flow difficulties facing more established manufacturing industries escalated the need for external finance. The interwar stock market now had a vital role to play in providing long-term risk capital because of the inability of the banks to meet these needs in full.[2] The interwar period is therefore of particular importance in the development of corporate finance in Britain.

Adverse opinions on the performance of the London Stock Exchange (LSE) in the interwar period have been heavily influenced by the antics of the likes of Clarence Hatry, the poor survival record of the 1928 new issues,[3] and the Royal Mail scandal of 1931. On the other hand, it is claimed that the LSE did a reasonable job in channelling finance into domestic industry.[4] Such firms as Boots, Morris Motors and Marks and Spencer began their lives as publicly quoted companies, and Ford Motor listed its European business in this period. So which picture is correct?

Employing a new sample of interwar IPOs, I examine both the contribution made by the IPO market to financing capital investment across different industries, and the quality of firms brought to market as measured by firm survival. IPOs financed a greater proportion of interwar capital expenditure than in the period since 1970. However, in new manufacturing industries such as chemicals, electrical engineering, and motor vehicles, equity finance did not contribute a materially greater share of investment needs than in such traditional manufacturing industries as shipbuilding, heavy engineering and textiles. This chimes with the Rajan-Zingales “financial dependence” thesis, which states that those industries dependent upon external finance should benefit disproportionately in financing their investments, the more developed is their capital market. Interwar Britain,

[2] Ross (1996).
[3] A new issue denotes either an initial public offering (IPO), or a further issue by a firm once listed, otherwise known as a seasoned equity offering (SEO).
[4] Thomas (1978), pp.34; Michie (1999), pp.285-286.

possessed a weakly regulated capital market which afforded public investors little or no protection and penalised capital-hungry firms.

Following the poor survival record of the 1928 IPOs, the quality of IPOs improved dramatically when activity recovered in the mid-1930s. This was, in part, attributable to the LSE beginning to vet applications more carefully in the regulatory vacuum created by ineffective accounting rules, inadequate investor protection and a lack of reputable underwriters. The 1930s represents an early example of the "light touch" regulatory approach for which the LSE has more recently become known and occasionally criticised [5] .Unfortunately, after WW2 LSE self-regulation lent too far in favour of protecting the public investor from the risks of investing in new firms and became too heavy-handed. This stance was only reversed with the development of the Unlisted Securities Market (USM) in the 1980s superceded by the Alternative Investment Market (AIM) in the 1990s.

This IPO sample permits a unique and detailed look at the sort of firms across a range of different industries being financed during the whole of the interwar period, including the 1930s. The strong recovery in new issue activity in London in the mid-1930s did not occur in the US, France or Germany, understandably so, given the macro-economic turmoil into which these economies were thrown.

This sample also includes the very type of risky industrial and commercial firm absent from the classic Edelstein (1982) study of the late Victorian stock market.[6] It incorporates preference share issues alongside ordinary share issues. The former were excluded from a recent study of the British equity market between 1870 and 1913 in this journal[7] which concentrated exclusively on ordinary shares listed on the Official List. Whilst ordinary share investing was certainly on the rise in the interwar years,[8] it was far from being the security of choice that it became in the latter half of the twentieth century.

In the next two sections, I discuss the background to the interwar stock market, and then describe the data sources. The following three sections examine the types of firm that went public and their reasons for so doing, provide estimates of the amount of new money raised, and employ survival analysis in gauging the quality of these newly-listed firms.

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[5] The Chairman of the NYSE stated at this year's Word Economic Forum in Davos that the LSE, and AIM in particular, "had to be careful not to damage its reputation by allowing in companies that are not well run". *Financial Times,* "NYSE chief says AIM must raise standards" Jan.27-28, 2007.

[6] Before the introduction of a Supplementary List of share prices in 1915, newly listed firms traded on the LSE would only have appeared in Edelstein's data set if subsequently given an Official Quotation. Yet, most were not due to the lack of liquidity in the shares.[6] Goetzmann and Ukhov (2006) use the same data set.

[7] Grossman (2002).

[8] Scott (2002)

BACKGROUND TO THE STOCK MARKET IN INTERWAR BRITAIN

The interwar stock market faced two very different challenges. The first involved the need to balance the competing objectives of expanding its business by attracting new listings and of protecting its own reputation and the public investor from unscrupulous promoters and from fraudulent investment schemes.[9] The second arose from the growing appetite of British industry, in general, and new manufacturing industries, in particular, for external finance.

The institutional environment surrounding the interwar stock market, as described by the quality of company disclosure, the strength of minority investor protection, and the extent of reputable bank involvement in underwriting, was weak.[10] The 1929 Companies Act did relatively little to remedy this position. Despite requiring the prospectus to detail the last three years' audited profits and the issue proceeds to be raised by the company and their uses, the Act did not to prevent the continued manipulation of company accounts. Had this legislation been introduced earlier, it is unlikely that the much publicised Royal Mail scandal would have been prevented.[11] Substantial improvement in company accounts had to await the passage of the 1948 Companies Act,[12] as did any strengthening of the rights of minority investors.[13] Unfortunately, the public investor was no better served by the banks, brokers and finance houses sponsoring new issues. [14] As the Macmillan Committee put it, "the public is usually not guided by any institution whose name and reputation it knows".[15] The most reputable banks, as defined by membership of the prestigious Accepting Houses Committee, did not begin to commit to equity underwriting until 1945 and only underwrote a handful of IPOs prior to that date.[16]

The LSE self-regulated the behaviour both of its members and of listed companies through the *Rules and Regulations of the Stock Exchange* (LSE Rules).[17] Prior to WWI, the LSE Rules dealt only with firms seeking an Official Quotation. A

[9] This is a theme which runs through Michie (1999), see for example, pp.96-97.
[10] See Chambers and Dimson (2006) for a discussion of this institutional environment in the long-run context of the 20th century.
[11] A 1931 government investigation into the Royal Mail Steam Packet Company revealed falsification of financial statements disclosed in its prospectuses published in the late 1920s, which lead to the imprisonment of the Chairman, Lord Kylsant. See Davies and Bourn (1972).
[12] Arnold and Matthews (2002).
[13] Franks, Mayer and Rossi (2006).
[14] Thomas (1978), pp.47-50; Finnie (1934).
[15] Macmillan Committee, *Minutes of Evidence, Q.1308*.
[16] Chambers (2006). The merchant banks did use affiliate companies to begin underwriting industrial firms in the thirties, but, tellingly, they did not carry the parent company's name and as such could not have fully reassured the public investor.
[17] The first fully printed rule book dates from 1812. Subsequent editions were not numbered. Covering the period of this study, I located editions for 1918, 1922, 1926, 1927, 1928, 1929, and 1934.

substantial number of new issues occurred without a prospectus,[18] and brokers made a market in the shares without the recording and publication of any prices. The latter position was remedied in 1915, when the LSE began publication of a *Supplementary List* of the prices of those securities without an Official Quotation.[19] At the end of the war, all IPOs were required to seek the LSE's "permission to deal" before share trading was authorised. In addition, an advertised statement in lieu of a prospectus had to be placed in the press before permission was granted.[20] However, this was the full extent of listing requirements laid down by the LSE in the case of admissions to the *Supplementary List* before 1929. Given the vast majority of firms first went onto the *Supplementary List*, it should perhaps have been no surprise that the 1928 crop of new issues subsequently performed so poorly.[21]

The second major challenge confronting the LSE in the interwar years, and a decisive change from the pre-1914 era, was a growing demand by industry for external finance. Declining company profitability, higher company taxation, and the rising capital investment needs driven by the opportunity to commercialize the scientific advances of the Second Industrial Revolution, all contributed to this demand shift. The internal combustion engine, electricity and chemicals were the most important technologies of the early twentieth century[22] and spawned further developments in such products as rubber tyres as well as synthetic fibres. Radio was perhaps the most tangible embodiment of this new industrial world, and rapidly developed as a mass consumer product.[23]

US firms with newly-established research laboratories were the driving force behind the commercialization of these new technologies and pulled British industry along in their wake.[24] Although the direct contribution of the new manufacturing industries to overall growth in British manufacturing output was almost 30% between 1924 and 1937 and over 40% in the immediate post-war period,[25] they did not appear to grow any faster. Indeed, the Aldcroft and Richardson thesis[26] that these industries exhibited higher productivity growth and were decisively important in the strong economic performance of

[18] Lavington (1921).
[19] King, 1947, pp. 75-76
[20] Michie (1999), pp. 265.
[21] *Economic Journal* December ,1931; Harris (1933).
[22] Mowery and Rosenberg (2000), p.8.
[23] Stromberg (2004).
[24] Mowery and Rosenberg (1989); Edgerton and Horrocks (1994).
[25] Matthews, Feinstein and Odling-Smee (1982), p.257, Table 9.2. This estimate ignores any spillover effects on the growth in output of other parts of the economy.
[26] Aldcroft (1970); Richardson (1967).

the 1930s has been successfully challenged.[27] Nonetheless, the capital investment undertaken in motor vehicles, synthetic fibres, rubber (tyres) and electrical engineering was substantial and doubled the fixed asset base between 1920 and 1938. In contrast, that in mature industries such as shipbuilding and engineering, and textiles was extremely modest.[28] Radio and gramophone, rayon, and motor vehicle and aircraft IPOs featured prominently in the list of LSE IPOs of the interwar years. Bell-weather technology stocks such as Decca Gramophone and Ford Motor listed on the LSE in the last quarter of 1928, their share prices surging by 43% and 86% respectively on the first day of trading.

Technology firms typically possess abundant investment opportunities which payoff in the distant future and as such they are prone to asymmetric information problems with outside investors. An absence of cash flows today relative to their investment needs makes these firms more dependent on external finance and particularly equity finance early in their lives as public companies. Rajan and Zingales (1998) claimed that those industries dependent on external finance found it easier to access financial markets, the more financially developed was the country in which they operated. Furthermore, the easier it was to raise external finance, the faster these industries grew relative to the rest of industry. Financial development, proxied by the quality of accounting standards, particularly opens up access to the stock market for exactly those firms facing potentially severe asymmetric information problems. The new manufacturing industries of the interwar years had the most ambitious capital expenditure plans, and were the most in need of external equity finance, but were most susceptible to information gaps between firms and investors.

In this paper, I evaluate the performance of the interwar LSE in two ways. Firstly, I assess from firm-level data the importance of IPOs in financing capital investment by new manufacturing industries relative to the rest of British industry and to traditional manufacturing industries in particular. In accordance with the Rajan-Zingales financial dependence thesis, the ability of the new manufacturing industries to finance their investment projects through external equity issues relative to the rest of manufacturing should vary directly with the quality of disclosure to as well as the protection afforded public investors by the interwar institutional environment. Of course, investors could be suckered into investing their savings at the IPO only to find that they had been duped by

[27] Dowie (1968). Broadberry (1986) showed there was little evidence of dispersion in output growth across industries in the period 1924-37, pp.10, Table 1.4. Broadberry and Crafts (1992) examined the failure of British manufacturing productivity levels to match those of the United States.
[28] Feinstein (1965), Ch.3, pp. 45, Table 3.33.

unscrupulous managers, brokers and bankers. Therefore, I go on to examine the quality of the firms going public in terms of firm survival rates throughout the interwar period.

DATA SOURCES

I have compiled a data set consisting of 1406 firms going public on the LSE where an issue of shares or debentures was accompanied by the publication of a prospectus, or advertisement, in *The Times Book of Prospectuses*.[29] The details of each issue were cross-checked against the *Stock Exchange Official Intelligence* and *the Stock Exchange Year Books* (Year Books)[30]. New issues comprise both IPOs and further issues, or seasoned equity offerings (SEOs). *The Times Book of Prospectuses* appears to exclude a large number of SEOs because these issues were frequently made directly to shareholders without publishing a prospectus in a national newspaper. For example, Ford Motor, having gone public in December 1928, successfully completed a further issue of £4.5million ordinary shares made to its existing shareholders in 1931 without publishing a prospectus.[31] I concentrate the discussion on IPOs in this paper.

The Times Book of Prospectuses yielded information on the type and number of shares outstanding as well as the shares being offered to investors, their voting rights (VOTING RIGHTS), the age of the firm (AGE), the nature of its business, the number of years of past profits (PROFITS RECORD), whether the accounts were audited or valued by a third party (AUDIT), whether or not the issue was underwritten by a third party (UNDERWRITTEN), the purposes of going public, and the cash raised by the company itself (NEWMONEY) as opposed to selling shareholders. Firm size (MKTCAP) is estimated as the total number of shares outstanding post-IPO evaluated at the offer price.[32] Firm age was estimated from the date of establishment of the business. **Appendix 1** lists all variables and their definitions.

Turning to data on firm survival, I define an IPO failure as any firm subsequently delisted from the LSE by the tenth anniversary of its going public due to being wound up, placed in receivership, or struck off the register and where shareholders received nothing. In the vast majority of cases, the Year Books revealed whether the firm had

[29] In line with previous studies, issues by firms already listed on another stock exchange, investment trusts, introductions, and penny shares are excluded. Penny shares are those shares with an offer price of 2 shillings or less. Such issues were characteristic of speculative mining and rubber share counters. *The Economist*, 25 January 1930, p.180: "…the amazing appetite for gambling which sprung up in shilling, florin and other shares of small nominal value." See also Thomas (1978), p.37.

[30] After their merger in 1932 they became the *Stock Exchange Official Year Book.*

[31] Michie (1999), pp.284; and *The Times*, 19 March, 1931, pp.21: "Company Meetings: Ford Motor Company."

[32] Any securities issued but not quoted are valued at par.

failed, been acquired or was still trading as a going concern after ten years. The *Stock Exchange Daily Official List* (SEDOL) and *The Times* were consulted to confirm whether the shares were still quoted after ten years in the relatively few cases where the Year Books were silent.[33] I also estimated a firm's survival time (in months), the period from the date of going public up to its failure, with right-censoring at ten years. This survival time variable is employed in the analysis below. The Year Books distinguish between a voluntary and a compulsory winding-up. In the former case, a firm may be wound up even though it is a going concern, because the owners wish to retire or because of acquisition by another firm.[34] These instances are not treated as failures since cash or other securities are returned to shareholders.

INTERWAR IPO CHARACTERISTICS

The annual time series of the number of firms going public and the gross proceeds raised in the interwar period is summarized in **Table 1**.[35] Although ordinary shares had been widely used by firms raising external finance in the 1860s[36], debenture shares and preference shares became more popular up to 1914[37]. In the interwar years, there were more than four times as many equity issues (1140) as debenture issues (266), although firms raised almost equal amounts of money through equity issues as through debenture issues, reflecting the much larger issue size of debentures (£1,334,000) compared to shares (£324,000). By this period, debentures were issued by large, well capitalised firms rich in pledgable assets, and virtually all firms going public by issuing debentures survived. Hence, I focus on firms going public by issuing either ordinary or preference shares hereafter.

The equity IPO volume and the IPO proceeds series display pronounced cyclicality. Gross proceeds are decidedly more volatile than both stock market prices[38]

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[33] The 1939 *Year Book* contained entries on 9,400 companies issuing 19,000 securities, of which slightly more than half were traded on the LSE, the rest mainly being traded overseas, on the Provincial Stock Exchanges, or having no quote at all, Michie (1999), pp.283. There also existed a *Register of Defunct and Other Companies*, but these companies disappeared for reasons other than bankruptcy and the reason is not made clear other than in the case of a name change.

[34] Hudson (1989), p.111

[35] The difference between the aggregate proceeds of this sample (£724 million) and the *Midland Bank Series* (£2,560 million) reflects the exclusion of SEOs mentioned earlier. See **Appendix 2**.

[36] Cottrell (1980), pp.86.

[37] Watson (1996).

[38] The equity price index is constructed 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.

and the economic cycle, described by *The Economist* index of business activity[39] (**Figure 1)**. The period is defined by intense bursts of IPO activity (1919-20, 1927-29 and 1934-38), interspersed with lulls (1921-26 and 1930-33), a pattern which is consistent with the narrative of Thomas (1978). I adopt this periodisation in the rest of the paper.

The surge of issues in 1919 and 1920, which greeted the ending of the new issue moratorium during WW1, was followed by a collapse in activity in 1921 and 1922, reflecting the depth of the economic recession.[40] Firms again rushed to go public in 1927, 1928 and the first half of 1929 at a rate of almost one company per working day. The early years of the next decade were marked by a second collapse in activity in the wake of a 40% fall in London share prices and the widespread turmoil enveloping international capital and foreign exchange markets. The mid-1930s then witnessed a marked IPO recovery in sharp contrast to Wall Street,[41] where the delay in the US dollar coming off the Gold Standard and the devastating effects of systemic financial distress took a heavy toll on the US economy and on US industry.

Why did firms go public? In most cases, it was possible to elicit the main reason from the prospectus. Approximately half the time firms wanted to raise new money for capital expenditure, debt repayment, or working capital and "general purposes" (**Table 2**). In contrast to the post-1945 period, fewer than one in ten firms went public to merge with another firm. Of the remainder, the sole reason given for going public was the desire of insiders to sell down their stake either by directly disposing of shares (11%), or by "converting" an old-established firm into a newly listed firm of virtually the same name (18%). In the latter case, a newly listed firm would both issue shares directly to the pre-IPO shareholders of the established firm as consideration for the existing business, so-called "vendor shares", and shares to outside investors for cash to meet its capital investment and working capital needs. Alternatively, the new firm issued shares for cash which was then used to acquire the established firm. In this case, although superficially the IPO appeared to raise cash for the company, the cash ended up in the pockets of the insiders. As Henderson (1951) pointed out in his study of the interwar new issue market, the Midland Bank statistics, whilst more informative than either the *Bank of England* or *The Economist* series, did not make the latter crucial adjustment and therefore overestimated new money raised. Although Henderson constructed his own estimates, he did so for just two years, 1927 and 1936. In this paper, I estimate new

[39] Capie and Collins (1983).
[40] *The Economist* index of business activity fell by 35% between July 1920 and June 1921The fact that the share price index did not show a similar sharp fall at this time reflects the lack of a pure ordinary share index series prior to the establishment of the *Financial News 30* index in January 1930.
[41] There were only 38 common stock IPOs between 1934 and 1938, Gompers and Lerner (2003), pp.1360, Table 1.

money from IPOs for all the interwar years where new money is defined as proceeds raised for capital investment, general purposes and working capital needs, and for repayment of debt.[42]

IPO characteristics such as firm risk, the level of prospectus disclosure, and ownership and control measures are summarised for the 1,140 equity IPOs in **Table 3**. Ignoring the small number of IPOs in 1930-33, there are several noticeable trends. Firms going public became marginally riskier over the period; average firm size, defined by market capitalisation, actually declined over time, whilst firm age followed more of a u-shaped pattern only dipping noticeably in the late 1920s. Prospectus disclosure generally improved. On average, more years of past profits were disclosed, an audited asset valuation statement was more likely to be included, and the voting rights attaching to the securities in issue and the underwriting arrangements were more likely to be adequately detailed. The only exceptions to this trend once again occurred in the late 1920s.

In the case of ownership and control, firms typically sold more than 50% of their total market value to outside investors (PROPSOLD), substantially more than in the modern period.[43] There is no tendency of firms to issue more ordinary shares as a proportion of their total market capitalisation. This proportion started above 50% (1919-20) and ended the period at 35% (1934-38), querying the claim that the cult of the equity first emerged among British investors during the interwar years.[44] Whilst ordinary shares typically carried one vote per share, preference shares could vary their voting rights. Although Berle and Means first observed that the modern corporation in pursuit of scale and professional management increasingly divorced ownership from control, the variety of securities available to firms meant that interwar owners had some ability to resist this trend. A typical structure minimising the degree of control relinquished by insiders on going public was a dual capitalisation issue.[45] Insiders were able to retain majority control of a firm whilst selling a greater share of cash flow rights. The impact of the adoption of this technique became increasingly apparent through the interwar period. On average, whilst 1919-20 firms sold an almost equal share of their cash flow and voting

[42] Raising equity to meet "general purposes" and "working capital" needs appeared to be used as a catch-all explanation where the company either had no specific investment projects in mind, or was unwilling to disclose more detailed investment plans to competitors. In choosing to repay debt, I take the view that either this debt had previously financed investment , or that a firm's debt capacity is restored enabling long-term funds for investment to be raised at some future date.
[43] Chambers and Dimson (2006).
[44] Scott (2002).
[45] This was the combination of a preference share carrying no voting rights offered at £1 per share primarily to public investors plus an ordinary or deferred share offered at 2 shillings per share a large proportion of which would be issued to the managers and other insiders.

rights, by 1934-38 firms sold a similar share of cash flow rights (62%) but a substantially smaller share of votes (48%). There was, of course, considerable cross-sectional variability in these figures. In general, weaker firms were forced to sell more voting than cash flow rights in their attempts to attract outside investors.[46]

Prospectuses disclosed a firm's geographic locus and the nature of its business activities, enabling domestic firms to be distinguished from foreign firms. Two out of every three foreign IPOs were natural resource enterprises engaged in either non-ferrous metal mining, tea, coffee or rubber plantations, or oil exploration and development. Based on the 1948 UK Standard Industrial Classification, I allocate each domestic firm into one of the following sectors: new manufacturing, traditional manufacturing, other manufacturing, finance and property, retail and distribution, (non-financial) services and other.[47]

I define the new manufacturing industries primarily by research-intensity. In the absence of any data on the distribution of research activity across industries, I assume that Britain mimicked the US. Mowery and Rosenberg report US industrial research-intensities which clearly point to chemicals, electrical engineering and equipment, and rubber tyres as by far the most research-intensive during the interwar years; automobiles and aircraft close the gap on this group at the end of the interwar period.[48] Whilst scientific instruments, photographic equipment, and synthetic fibres are not separately identified in the industry classification employed, I include these latter three industries given the technologies they embraced. As a further check on the definition of the new manufacturing firms, I made use of prospectus disclosure regarding whether a firm engaged in some sort of research and development activity. There were only 49 such firms in all, but these firms were highly correlated with the new manufacturing industrial classification. Traditional manufacturing industries are defined as coal mining, shipbuilding and heavy engineering, and textiles (excluding synthetic fibres); and other manufacturing covers mining other than coal or metals, metal manufacturing, food drink and tobacco, clothing, paper and printing, and leather products.

Breaking down equity IPO volume by domestic industry (**Table 4**), other manufacturing firms were the most numerous (370) followed by new manufacturing firms (185), and traditional manufacturing IPOs (106). IPOs have a tendency to occur in waves, as investors become more familiar with a particular industry, or group of related

[46] Thomas (1978), pp.30.
[47] SEDOL classifications are too crude and dominated by the "Commercial, Industrial, etc" sector in the interwar years.
[48] Mowery and Rosenberg (1998), ch.4 and Tables 4.2 to 4.5. Research intensity is defined as number of scientific personnel per 1000 wage earners.

industries, and firms, in turn, exploit such windows of opportunity. In the 1880s breweries dominated IPO activity; in the 1890s, it was the turn of bicycle firms. The interwar period exhibited the same pattern. The majority of new manufacturing IPOs were clustered into the late 1920s (69) and the mid-1930s (67), whilst foreign, mainly resource ventures, were concentrated in the years up to 1926. Traditional manufacturing IPOs, on the other hand, occurred evenly through the period, ignoring the early 1930s.

Summarising the main features of interwar IPOs, activity tended to cluster both across time and industry; firms became slightly riskier, as proxied by their size; the quantity of disclosure improved but the content did not; and management sold a substantial 60% of cash flow rights but fewer voting rights in an effort to retain control. The most common reason for going public was to raise new money for capital investment and working capital needs. Arms length acquisitions were relatively rare in contrast to the post-WW2 era.

THE INTERWAR IPO MARKET AND DOMESTIC MANUFACTURING INDUSTRY

As outlined in the previous section, prospectuses often required very careful scrutiny in order to ascertain what proportion of issue proceeds went to finance the company's operations rather than into the pockets of insiders and other selling shareholders. This was particularly true of those firms floated prior to the 1929 Companies Act which subsequently required disclosure of the amount and uses of proceeds.

I estimate that 42% of the approximately £370 million in total IPO proceeds raised from investors went to the companies themselves to finance their investment plans (**Table 5**), with foreign firms raising more new money than domestic firms. Among domestic firms, gross proceeds of new and traditional manufacturing IPOs were virtually the same at £55 million, despite the former being more numerous. This reflects the larger issue size of traditional manufacturing firms. For example, when Platt Brothers, the textile machinery manufacturer, went public in July 1922, its owners sold shares valued at close to £4 million, a figure ten times the average interwar IPO. Almost three-quarters of the proceeds raised by traditional manufacturing firms occurred in the first half of the 1920s, predominantly by two shipbuilding firms, Harland and Wolff (July 1924) and Tankers (March 1920), and two textile firms, No 2 DR Cotton Mills (Sept-1926), a subsidiary of Dunlop Rubber, and Rylands and Sons (July 1920). More significantly, new manufacturing firms raised only slightly more new money (£22.8 million) than did traditional manufacturing IPOs (£21.4 million), with one-half of the new manufacturing

total raised in the late 1920s. This figure does not include the 1928 Ford Motor IPO since the US parent company elected to sell its various European businesses to the new company in return for the cash raised at IPO.

What contribution did the IPO market make to financing capital investment in domestic manufacturing? Overall, IPOs raised £83 million of new money equivalent to 6.1% of gross domestic fixed capital formation (GDFCF) (**Table 6**). Whilst this contribution may appear modest relative to that from internal funds and other sources, it is substantial in comparison with recent experience in Britain. Between 1970 and 1994, non-financial firms financed none at all of their capital investment through equity issues (both IPOs and SEOs), attributable to the large number of new issues undertaken to fund acquisitions and the increased use of financial leverage through the 1980s.[49] Tew and Henderson (1959) estimated that a quarter of capital expenditure by manufacturing, building and distribution firms was raised from new issues between 1949 and 1953.[50] As previously stated, I cannot ascertain the scale of new money raised from SEO's in the interwar period. Assuming that Tew and Henderson's results are equally applicable to the interwar years, firms were probably raising about a quarter of new money through IPOs alone.

It is obviously not possible to observe the demand schedule for external equity finance and therefore estimate the level of unsatisfied demand directly. Rather than attempting to justify whether or not an overall figure of 6% was a meaningful contribution to interwar domestic industry, it is more informative to compare how financing varied across industry. Whilst new manufacturing firms financed 6.9% of their GDFCF from IPOs, this figure only modestly exceeded the 5.2% share of GDFCF financed by other manufacturing industries as a whole, and was not much different from the 6.8% figure for traditional manufacturing industries.

Why were new manufacturing firms which were investing substantial sums in expanding their businesses not able to raise more equity finance? The Rajan and Zingales thesis offers the most likely explanation for this result. The weak institutional environment of the interwar stock market penalized those firms most dependent upon external equity finance, namely, those belonging to the new manufacturing industries. This is the same type of firm that Kennedy argued were victims of the inability of late Victorian capital markets to cope adequately with information gap problems, with one important difference. By the interwar period, the scale of the investment opportunities

[49] Corbett and Jenkinson (1997), pp.82-83.
[50] Tew and Henderson (1959), pp.64-76. My estimate of IPO proceeds represented 28% of the Midland Bank estimate of total new issue proceeds (IPOs plus SEOs), as stated in the previous section and in Appendix 2.

they faced had increased considerably and they were now faced with a greater need for external equity finance. Hence, any failure of capital markets through weak disclosure and poor investor protection now had more serious consequences for new manufacturing industries.

FIRM SURVIVAL IN THE INTERWAR PERIOD

The weak interwar institutional environment not only penalised the fund raising prospects of new manufacturing firms, it also increased the chances of weak firms to go public undetected by investors, bankers and stock exchanges alike. The degree to which weak firms gained access to the interwar stock market can be gauged by long-run share price performance, or, alternatively, firm survival after the IPO. The only study of long-run IPO performance in interwar Britain examined the 1928 new issue cohort.[51] The anonymous author concluded that the value of this portfolio of 283 new issues of ordinary shares, preference shares and debentures floated in 1928 had depreciated by 41% up to May 1931. Harris (1933) then updated the performance of the same portfolio over the period to April 1933 and estimated its depreciation at 47%, approximately 10% worse than the overall market ignoring dividends. Whilst issues by established firms and firms disclosing a profits record performed better than the overall market, new ventures along with "new" firms acquiring existing businesses with no past profits disclosed were disastrous, their share prices declining over 90% on average! It was this that caused such outrage among contemporary investors and commentators.

Unfortunately, such studies need to compare IPO performance to a sample of seasoned firms matched with similar characteristics. Such benchmark data do not currently exist for the UK equity market.[52] Even were such data to exist, the estimation of long-run performance is beset with measurement problems.[53] Hence, in the rest of this paper I adopt the firm survival measure.

Once it is listed on the market a firm has three possible fates over the following five or ten years. It can survive as a viable public company maintaining its listing on the stock market, fail if delisted due to bankruptcy or winding-up without shareholders receiving any return on their investment, or be acquired. The latter case includes firms being taken

[51] *Economic Journal*, December 1931. The sample included SEOs as well as IPOs, investment trust issues and "penny" share issues.
[52] A daily market index was only published in 1930 by the *Financial News*; similarly, the firm size and book value to price factors required to sort firms by their dominant risk characteristics have not yet been estimated. In the US where such benchmark data are readily available, long-run performance has been estimated for interwar IPOs. See Simon (1987) and Gompers and Lerner (2003).
[53] See Gompers and Lerner (2003) for a discussion.

private where shareholders receive some return of their initial investment. The survival rate is then defined as the proportion of all IPOs which survive over the subsequent five or ten years, where those firms being acquired or taken private are excluded from both the denominator and the numerator. Although this measure ignores the upside of any successful IPO, it does capture the downside risk. Investors in IPOs may be prepared to accept share price declines in after-market trading, but not a substantial portion of their IPO portfolio expiring valueless. Such a level of downside risk is characteristic of unquoted, early stage venture capital investment, not quoted securities investment.[54]

Andrews (1937) analysed the survival of newly-registered companies between 1919 and 1932 in Britain, where failure was defined as a firm being wound up, or being struck off the Companies Register, rather than being delisted from the stock exchange. In both cases, barely three out of five firms registering in 1928 and 1929 survived over the following five years. Furthermore, the five-year survival rates in the case of two of the leading technology industries, "electrical, including wireless" and "motors", were only 40% and 53%, respectively.[55] Using five year survival rates his sample effectively ends in 1932.

In contrast to Andrews, this study covers the 1930s, concentrates specifically upon the survival of all those firms attaining a stock market listing rather than all newly-registered companies, and does so without resorting to stratified sampling. Compared to the Harris study, it covers all interwar years, not only 1928. Out of the entire sample of 1140 firms, 73 firms were acquired and 12 were taken private.[56] The survival rates over both five and ten year periods of the remaining firms are grouped by annual cohort according to the year in which they went public between 1919 and 1938. The results are graphed in **Figure 2**. IPOs launched in 1919-20 and 1927-29 were particularly prone to failure. Ten-year survival rates were only a little above 60% in 1919-20 and fell to 50% in 1928. However, performance was much improved in the 1930s when virtually all firms survived.

What explains these poor survival episodes of the early and late 1920s? Here, I make use of survival time, rather than a simple binary dummy variable. I define the survival time for each IPO as the time to exit, equivalent to the number of months between the first month of trading and the month of failure, censored at 120 months in

[54] Gompers and Lerner (1999), p.6. Only 25-30% of venture capital portfolios typically prosper to become quoted firms; the rest either fail, are acquired or become the "living dead".
[55] Andrews (1937), Table VII, p.508. The sample sizes are very small, only 10 and 15 firms respectively.
[56] I excluded 56 "penny" shares from the sample (see footnote 29), since they were known to be highly speculative investments and most were floated in the exuberant active market of 1928 and early 1929. I estimate that only one in ten of the penny ordinary share IPOs were still trading on the market by the end of 1934.

the case of those surviving IPOs. This approach has the advantage of introducing a time dimension to the analysis of IPO survival. Survival time or duration analysis has been widely employed in epidemiology and engineering, and has more recently found applications in industrial economics. [57]

The IPO survival times generate estimates of hazard rates when using the Cox (1972) proportional hazards model (see **Appendix 3**). Conceptually, a hazard rate is equivalent to an instantaneous IPO failure rate at time *t* conditional upon the firm surviving up to time *t*. Hazard rates should be greater, the riskier is any IPO. Therefore, I would expect hazard rates to vary inversely with firm size, firm age, the level of disclosure and whether or not the issue was underwritten, or certified by a third party. In addition, outside investors are likely to become more wary, the greater the share of the firm being offered to them.[58] The same is true, by extension, when they are offered "extra" votes in a firm beyond their share of cash flow rights. Finally, I assume that the greater uncertainty and risk surrounding the new manufacturing industries would push up hazard rates for these types of IPOs.

It is less clear what the prior should be on firms raising more new money as a proportion of IPO proceeds. Other things being equal, outside investors might be happier if managers were retaining their shares in the firm and only issuing new shares on behalf of the company. However, other things were not equal, and given the parlous state of interwar investor protection, it is not clear why investors would be any the wiser if managers diverted new money and extracted private benefits.

The hazard rates and their associated p-values from estimating the Cox proportional hazards model on the IPO sample between 1919 and 1929 are summarized in **Table 7**.[59] I employ four kinds of explanatory variable: firm risk measures; disclosure and certification variables; ownership and control variables; and industry dummy variables. Hazard rates of less than one indicate that the instantaneous rate of IPO failure varies inversely with the explanatory variable, and those above one a direct relationship. Beginning with firm risk (regression 1), the 0.943 hazard rate associated with firm size (MKTCAP) implies that an IPO with an additional £100,000 of capitalisation is 5.7% less likely to fail over a very short period of time.[60] Similarly, the hazard rate attaching to firm age (AGE) implies that a firm one year older is 2.8% less likely to fail.

[57] Shumway (2001) applied survival time analysis to the study of corporate bankruptcy. Closer to the theme of this paper.
[58] Leland and Pyle (1977).
[59] The IPOs from 1930 to 1939 showed too little variation in survival times to make estimation on this sample worthwhile.
[60] More formally, the ratio of the hazard rate of a firm with a capitalisation of £(X+100,000) is 5.7% less than the rate of a firm with a capitalisation of only £X.

Correspondingly, IPOs of firms which are £250,000 larger and 5 years older are approximately 13% less likely to fail.

The results regarding prospectus disclosure and the impact of underwriting are mixed (regression 2), and hint at their questionable worth to interwar investors. Recalling that the average number of years of past profits disclosed was less than three years, an extra year of profits reduced IPO failure by 23%. The inclusion of an audited net asset value or equivalent had an almost similar effect (19.4%), but the result lacked statistical significance. Contrary to expectations, disclosure of voting rights and having an IPO underwritten increased failure rates by 43% and 36% respectively.

Ownership and control variables had a significant influence on failure (regression 3). Consistent with the hypothesis that investors became more wary the greater the supposed riches they were offered, every additional one percent share of cash flow rights (PROPSOLD) sold to outside investors pushed failure rates up by 1.5%, and, every additional one percent of voting rights sold above the share of cash flow rights (EXTRA VOTES SOLD) raised failure rates an additional 2.3%. Furthermore, each additional one percent of proceeds raised as new money by the company increased the failure rate by 1.5%. This is evidence of the low quality of the some of the schemes launched on the market in the 1920s and management's ability to extract private benefits, as previously mentioned.

Finally, new manufacturing industrial firms even controlling for firm risk suffered 73% higher failure rates, whereas foreign firms were 35% less likely to fail than domestic firms (regression 4). Other industry classifications had no ability to explain IPO failure rates (results not reported). Inclusion of all the explanatory variables discussed above yielded similar results, with only a modest loss in statistical significance (regression 5).

The foregoing results suggest simple investment rules based only on a reading of the prospectus but, admittedly with the benefit of hindsight, that investors might have followed in 1928. Thus, for example, selecting only those IPOs with at least one year of past profits and not selling extra votes, would have left investors with one in ten of the 198 IPOs floated in that year. All twenty would have survived, including the five new manufacturing IPOs, Phospherine, Beechams Pills, Decca Gramophone, Falk Stadelmann and Ford Motor. These firms were 25 years old on average, and, more significantly, raised virtually no new money. This experience may have given rise to the distrust shown by investors in firms raising new money in the following decade when the market recovered. In the mid-1930s, new money raised by all firms and by new manufacturing firms fell to only a quarter and a fifth of IPO proceeds respectively, the lowest levels of the interwar period (**Table 5**).

Including dummy variables for those years with low survival rates, namely, 1919, 1920, 1927, 1928 and 1929 in the full hazards model (regression 6) indicates that 1920 and 1928, and, to a lesser degree, 1919 remain the worst cohorts even after controlling for the other influences on survival discussed above. I compare and contrast the influences on these two survival episodes from running the same Cox proportional hazards model on the 1919-20 and 1928 cohorts (regressions 7 and 8). Common influences lowering survival prospects were the lack of a profits record and membership of a new manufacturing industry. The main differences were the hugely adverse effect of having an IPO underwritten in 1928, and the much higher failure rates arising from selling a share of voting rights in excess of cash flow rights, as well as from raising new money in 1928. The ineffectiveness of underwriting is not a surprise given the relative absence of reputable banks and brokers discussed earlier. The greater risks of failure from selling more votes and raising more new money are again consistent with earlier findings.

What impact did the recessions of 1921 and 1930-33 have on survival rates? The 35% decline in *The Economist* Index of Business Activity between July 1920 and June 1921 was considerably more severe than the 18% decline between October 1929 and July 1932.[61] When variables measuring the changes in business activity over the first through the fifth year subsequent to each firm going public were included in the full regression models for the 1919-20 and the 1928 cohorts, they were not statistically significant in either case (results not reported).

FIRM SURVIVAL AFTER 1929

After the disasters of the late twenties, there was a dramatic improvement in firm survival when with IPO activity recovered in the mid-1930s (**Figure 2**). Virtually all firms survived.

This improvement was not attributable to firms becoming less risky. As we saw earlier, the average firm going public in 1934-38 was somewhat smaller, capitalized at £444,000 compared to the £516,000 in 1927-29, albeit somewhat older averaging almost 29 years as opposed to 22 years (**Table 3**). Additionally, almost the same number and proportion of firms in new manufacturing industries were floated in the two periods (**Table 4(i)**).

[61] GDP at constant prices declined only 5.8% between 1929 and 1931. This was far less than the 18.4% decline during the 1920-21 recession. Mitchell (1988), National Accounts Table 5A, p.836: Compromise Estimate of GDP at Factor Cost in constant price for the UK excluding Southern Ireland.

If firms were no riskier, they did at least improve the quantity of information disclosed after 1929. The average firm disclosed almost four years of past profits compared to only two years as a direct consequence of the 1929 Act,[62] and was more likely to include an audited net asset value in its prospectus. Yet, as was amply illustrated by the Royal Mail scandal, these improvements were of questionable value. There was a need to legislate over the content as well as the quantity of company financial information disclosed. This need was not addressed until the Companies Act of 1948.

Unfortunately, certification of issues by reputable underwriters did not improve greatly through the 1930s. Although the some unscrupulous company promoters were bankrupted in the late 1920s, and a few reputable issuing houses such as Cheviot Trust did subsequently emerge,[63] the reluctance of the prestigious merchant banks to underwrite industrial share still left investors vulnerable to the next IPO fad around the corner.

In contrast to the foregoing, the LSE exerted its influence on listing applications after 1929. Heeding the advice of the Macmillan Committee in 1931, "that you cannot prevent a fool from his folly is no reason why you cannot give a prudent man guidance"[64], the LSE began to vet new issue applications more carefully. In 1934, its *Rules* were amended to require the disclosure of the last balance sheet, the last profit and loss account and a working capital statement. It also chose to provide "guidance" on the wording of its Rules. The Committee announced that it would in future scrutinise applications more closely on a number of occasions in the early to mid-1930s.[65] An example of a firm falling foul of this tougher scrutiny was *Silver and Steelcrafts*. Its application for permission to deal in the preference and ordinary shares which had been offered to investors in November 1935 was rejected the following month. The Committee was dissatisfied with the content of the accountant's report included in the prospectus, and subsequently instigated and cooperated with an inquiry by the professional accountancy body, the ICAEW.[66] This was not an isolated instance. A substantially

[62] The Act required the auditors' report in a prospectus to detail the last 3 years profits of an issuing firm and of an acquisition where contemplated, the amount of issue proceeds the firm intended to raise, and their intended use (4th Schedule, Part II, para.1).
[63] Kinross (1982).
[64] Macmillan Report.
[65] In particular, applications from subsidiaries the parent of which had yet to publish a set of accounts, from companies whose IPO preliminary expenses constituted an unduly large proportion of its issued capital and from companies whose major asset was a patent. *The Economist*, 16 August 1930, p.323-4, "The Stock Exchange Committee and the Investor". See also Michie (1999), pp.266, footnotes 82 and 83.
[66] LSE, Minutes Committee for General Purposes, 6 January 1936 and 9 March 1936.

greater number of applications were rejected by the LSE in the 1930s than in the previous decade, as indicated by the minutes of the LSE Committee for General Purposes.

Here is evidence then of optimal self-regulation by the LSE, an attempt to exclude the worst instances of abuse in the listing process without regulating new listings out of virtual existence.

There were of course other developments in the 1930s compared to the previous decade which influenced the survival prospects of domestic firms, namely, the rise of tariff protection, collusion, and rearmament spending. The fact that there were only six failures among the 1930s domestic manufacturing IPOs prevents my quantifying the extent to which each of these factors contributed to firm survival. However, there is evidence to suggest that the impact of each of these exogenous factors was modest.

The decision by the British government to opt for tariff protection in 1932 led to *ad valorem* duties on most manufacturing imports ranging between 10% and 20%, although effective rates of protection were higher.[67] It is, though, far from clear that tariffs had any substantial impact on resource flows between industries, and therefore on firm survival. Although there was considerable variability in effective rates of tariff protection across industry, there is no evidence that this influenced industrial performance. For example, the two sectors which made the greatest contribution to the economic recovery of 1932-37, construction and iron and steel, suffered the lowest rates of protection.[68] Furthermore, the decline in imports in the newly protected industries was less than that in the imports of other industries.[69]

Whilst as much as 30% of the output of manufacturing industry was controlled by cartels in the 1930s,[70] we have no clear measure of the degree of the rise over the previous decade. At one extreme, cement manufacturing experienced unbridled competition in the twenties prior to entering into collusion in 1934; at the other, virtually the entire domestic electric lamp industry was controlled by a trade association across the entire interwar period.[71]

Increased government spending on rearmament benefited aircraft and automobile manufacturing. However, out of a total of 397 firms floated in the 1930s, only 24 and 9 firms respectively were engaged in these two industries. Rearmament would

[67] Capie (1978).
[68] Capie (1983), pp.140.
[69] Richardson (1967), pp.246.
[70] Mercer (1989), Table 4.
[71] Broadberry and Crafts (1992), “Case Studies”.

only have had a modest impact on the improvement in overall survival rates in the 1930s.

Finally, there was of course a strong recovery in British economic activity between 1932 and 1937, one of the strongest of the last century. This would have benefited any firm going public from 1927 onwards, not just those of the mid-1930s, and cannot therefore help us discriminate between IPO cohorts of the late 1920s and the mid-1930s.

The optimal self-regulatory framework of the 1930s subsequently gave way to a drastic tightening of listing rules after 1945. Henceforth, any firm seeking a listing had to have a minimum ten year profits record.[72] In 1956, the LSE provided guidance to the effect that applications from established firms would be preferred to those from start-up firms.[73] The consequences can be clearly seen (**Figure 3**). Firms going public were suddenly much more mature than those of the interwar years. Not surprisingly, this led to IPOs experiencing little or no risk of failure. Virtually all firms floated in the ten years after 1945 survived. However, this better survival record was bought at the cost of denying younger firms early access to the stock market. Whilst 131 newly-established start-up firms with no trading record went public in the interwar years, only one did so between 1945 and 1979. The LSE elected for financial stability over the provision of risk capital.

The IPO market was moribund by the mid to late 1970s, and was only rescued by the establishment of the USM in 1980, subsequently replaced by AIM in 1995. Both these innovations boosted the supply curve of equity funding provided by investors to IPOs on the LSE, similar to that in the US when NASDAQ started up in the early 1970s[74]. Simultaneously, there was a return to the LSE's "light touch" approach of the 1930s, A better balance had been restored between protecting investors and its own reputation and encouraging entrepreneurial activity.

CONCLUSION

IPO activity whilst volatile was substantial in the interwar years, and, in contrast to other major stock markets around the world, including the US, recovered strongly in the mid-1930s. The interwar years in Britain therefore afford us a unique opportunity to study how well one of the most developed stock markets in the world functioned in providing risk capital and screening the quality of firms seeking a listing. Relative to the

[72] Rule 159 App.34 Sch.II Pt.A.
[73] Michie (1999), pp.416.
[74] Fama and French (2004).

modern period, interwar firms financed a material portion of capital investment at IPO. However, new manufacturing industries were unable to finance proportionately more of their investments than the rest of manufacturing industry, evidence of the weak institutional environment at that time. It is possible therefore that these new manufacturing industries may have grown faster had they not been finance-constrained.

The poor survival experience of the 1919-20 and the 1928 IPO cohorts provides further proof of a weak institutional environment. IPO survival was much improved in the 1930s reflecting, among other things, the more careful scrutiny of listing applications by the LSE. Having achieved an optimal balance between its desire to grow by attracting new listings and its need to protect investors and its own reputation, LSE regulation subsequently became too heavy-handed to the detriment of young, entrepreneurial firms wishing to access the stock market. This position was not rectified until the 1980s.

Appendix 1: Variable definitions

CATEGORY	VARIABLE	DEFINITION
FIRM RISK	MKTCAP	total market capitalisation at offer price or par value in the case of non-listed securities
	FIRM AGE	no. of years since establishment of firm
DISCLOSURE	PROFITS RECORD	no. of years of past profits disclosed in prospectus
	AUDIT	audited net asset value or professional property valuation disclosed in prospectus
	VOTING RIGHTS	votes attaching to each security disclosed in prospectus
	UNDERWRITTEN	IPO underwritten by a third party
INDUSTRY (SIC 1948)	NEW MANUFACTURING	chemicals; electrical engineering, motors, aircraft; synthetic fibres; precision instr.; rubber
	TRADITIONAL MFG.	coal mining; shipbuilding; heavy engineering; textiles
	OTHER MANUFACTURING	other mining, metal manufacture; food drink & tobacco; clothing; paper & printing; leather
	FINANCE & PROPERTY	insurance, banking and finance (including property)
	RETAIL & DISTRIBUTION	distributive trades
	SERVICES	professional instruments; miscellaneous services
	OTHER	agriculture, forestry and fishing; transport and communication; gas electricity and water
	FOREIGN	locus of business outside Britain
OWNERSHIP & CONTROL	PROPSOLD	IPO proceeds as a %age of total market capitalisation
	VOTES SOLD	votes sold at IPO as a %age of total votes outstanding
	EXTRA VOTES SOLD	difference between PROPSOLD and VOTES SOLD
	NEW MONEY	new money raised as a %age of IPO proceeds
	ORD SHARES SOLD	IPO proceeds from sale of ordinary shares as a %age of total market capitalisation
	ORD SHARE MKTCAP	ordinary share capitalisation at offer price as a %age of total market capitalisation
SURVIVAL	SURVIVAL RATE	proportion of firms still listed on the LSE ten years after going public
	SURVIVAL TIME	number of months from IPO to delisting or being wound up (investors receive nothing)

Appendix 2: Comparison with Midland Bank Series

	THIS DATA SET			MIDLAND BANK SERIES			
	TOTAL PROCEEDS £M (A)	SHARES PROCEEDS%	DEBENTURES PROCEEDS%	TOTAL PROCEEDS £M(B)	SHARES PROCEEDS%	DEBENTURES PROCEEDS%	A/B
1919	28.1	92%	8%	220.0	90%	10%	13%
1920	63.5	80%	20%	307.7	85%	15%	21%
1921	6.2	59%	41%	90.1	53%	47%	7%
1922	21.1	43%	57%	98.6	51%	50%	21%
1923	25.0	30%	70%	90.5	51%	49%	28%
1924	24.8	57%	43%	100.0	62%	38%	25%
1925	42.3	46%	54%	132.3	66%	34%	32%
1926	37.9	61%	39%	140.8	65%	35%	27%
1927	47.8	69%	31%	178.9	72%	28%	27%
1928	66.3	77%	23%	251.5	74%	26%	26%
1929	29.4	77%	23%	198.6	78%	23%	15%
1930	64.9	1%	99%	77.9	56%	44%	83%
1931	19.0	7%	93%	41.3	44%	56%	46%
1932	2.2	88%	12%	38.8	56%	44%	6%
1933	60.7	16%	84%	61.7	50%	51%	98%
1934	38.3	46%	54%	100.6	65%	35%	38%
1935	45.6	41%	59%	116.1	65%	35%	39%
1936	52.1	62%	38%	128.8	70%	30%	40%
1937	43.3	56%	44%	111.5	70%	30%	39%
1938	5.7	50%	50%	74.4	55%	45%	8%
	724.1	51%	42%	2,560.1	64%	36%	28%

Appendix 3: Cox proportional hazards regressions.

The actual survival time of an IPO, *t*, is the realisation of a random variable, *T*, and is used to estimate the IPO hazard rate, *h(t)*, defined as:

$$h(t) = lim \frac{\Pr[t<T< t+\Delta t \,|T>t]}{\Delta t}$$

It is a rate and not a probability, and can vary between zero and infinity. A common model of hazard rates is the Cox (1972) proportional hazards model of the form:

$$h(t) = h_0(t)exp(\beta_1 x_1 + \beta_2 x_2 + ... + \beta_k x_k)$$

or, in natural logarithmic form,

$$\ln[h(t)] = \ln[h_0(t)] + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_k x_k$$

where X_i represents the explanatory variables, i=1,….,k, and $h_0(t)$ is the baseline hazard rate. Explanatory variables include firm size, firm age, and historic profits record as well as dummy variables for underwriting, audited accounts, and industry, all observed at t=0, the time of IPO. The Cox regression estimates the coefficients, β_i, by the maximum likelihood method. A critical assumption of this model is the proportionality of hazards for IPO sub-groups over time, or, in other words, that the effect of the explanatory variables on the hazard of IPO exit is the same across each sub-group at each time t. See Hamilton (2006), ch. 11, for a fuller discussion.

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Table1: Total IPO Volume and Gross Proceeds

	TOTAL No IPOs	EQUITY No IPOs	DEBENTURES No IPOs	TOTAL PROCEEDS £M	EQUITY PROCEEDS %	DEBENTURES PROCEEDS %	EQUITY MEAN PROCEEDS £000	DEBENTURES MEAN PROCEEDS £000
1919	89	81	8	28.1	92%	8%	320	273
1920	137	118	19	63.5	80%	20%	429	676
1921	20	10	10	6.2	59%	41%	363	256
1922	33	13	20	21.1	43%	57%	700	599
1923	51	27	24	25.0	30%	70%	281	728
1924	38	21	17	24.8	57%	43%	672	626
1925	84	67	17	42.3	46%	54%	293	1,331
1926	71	58	13	37.9	61%	39%	398	1,142
1927	114	97	17	47.8	69%	31%	342	860
1928	198	175	23	66.3	77%	23%	290	674
1929	89	76	13	29.4	77%	23%	299	517
1930	23	3	20	64.9	1%	99%	256	3,207
1931	14	5	9	19.0	7%	93%	270	1,964
1932	10	6	4	2.2	88%	12%	322	69
1933	38	25	13	60.7	16%	84%	384	3,929
1934	74	67	7	38.3	46%	54%	263	2,957
1935	102	92	10	45.6	41%	59%	201	2,703
1936	131	117	14	52.1	62%	38%	276	1,414
1937	72	66	6	43.3	56%	44%	365	3,206
1938	18	16	2	5.7	50%	50%	180	1,434
TOTAL	1,406	1,140	266	724.1	51%	49%	324	1,334

Table 2: Reasons for going public

	Unstated	New money	Merger	Vendor sale	Conversion	Other	Total
ALL IPOs	5%	49%	7%	11%	18%	10%	100%
NEW MFG	3%	66%	3%	27%	1%	0%	100%
OLD MFG	5%	42%	12%	20%	19%	3%	100%

Table 3: Equity IPO Characteristics 1919-38

Mean values equally weighted by number of equity IPOs in each period. See Appendix 1 for definitions.

	1919-20	1921-26	1927-29	1930-33	1934-38	1928
FIRM RISK:						
MKTCAP (£100,000)	720	814	516	136	444	465
AGE (YRS)	27.7	26.7	22.1	23.3	28.8	19.2
DISCLOSURE:						
PROFITS RECORD (YRS)	2.6	3.4	2.1	3.6	3.9	2.1
AUDIT (%IPOs)	62%	67%	64%	85%	85%	69%
VOTING RIGHTS (%IPOs)	46%	59%	69%	92%	94%	78%
UNDERWRITTEN (%IPOs)	68%	73%	84%	82%	92%	88%
OWNERSHIP&CONTROL						
PROPSOLD (%)	63%	61%	53%	57%	62%	69%
ORD SHARES SOLD (%TOTAL MKTCAP)	54%	14%	34%	26%	35%	28%
VOTES SOLD (%TOTAL VOTES)	62%	35%	49%	51%	48%	61%

Table 4: Equity IPO Volume by Sector

	TOTAL	FOREIGN	NEWMFG	TRADMFG	OTHERMFG	FIN&PROP	RETAIL&DISTN	SVCS	OTHER
No. IPOs									
1919-20	199	35	19	26	58	28	10	8	15
1921-26	196	76	25	23	44	3	16	4	5
1927-29	348	44	69	22	120	13	43	34	3
1930-33	39	4	5	4	15	4	6	0	1
1934-38	358	49	67	33	133	16	34	18	8
ALL	1140	208	185	108	370	64	109	64	32
%TOTAL									
1919-20	100%	18%	10%	13%	29%	14%	5%	4%	8%
1921-26	100%	39%	13%	12%	22%	2%	8%	2%	3%
1927-29	100%	13%	20%	6%	34%	4%	12%	10%	1%
1930-33	100%	10%	13%	10%	38%	10%	15%	0%	3%
1934-38	100%	14%	19%	9%	37%	4%	9%	5%	2%
ALL	100%	18%	16%	9%	32%	6%	10%	6%	3%

Table 5: Equity IPO Proceeds and New Money by Sector

(i) IPO gross proceeds (current prices, £M)

	TOTAL	FOREIGN	NEW MFG	TRAD MFG	OTHER MFG	FIN&PROP	RETAIL&DISTN	SVCS	OTHER
1919-20	76.1	8.4	6.1	17.7	22.9	10.9	2.6	2.9	4.5
1921-26	77.1	23.0	9.5	18.6	16.3	1.7	6.2	0.6	1.1
1927-29	106.6	17.1	21.5	7.8	29.4	4.5	15.7	7.9	2.7
1930-33	19.1	0.6	1.1	0.7	7.8	1.4	2.1	0.0	0.2
1934-38	88.8	15.1	15.8	10.6	38.6	3.1	6.3	5.2	2.4
ALL	367.8	64.2	54.2	55.4	115.1	21.6	32.9	16.6	10.9

(ii) New money raised (current prices, £M)

	TOTAL	FOREIGN	NEW MFG	TRAD MFG	OTHER MFG	FIN&PROP	RETAIL&DISTN	SVCS	OTHER
1919-20	47.4	5.9	4.3	6.5	14.7	10.0	1.5	1.7	2.8
1921-26	30.2	8.9	2.9	9.0	3.5	1.6	3.0	0.3	1.0
1927-29	49.9	10.6	11.6	3.8	12.6	2.7	4.8	3.7	0.1
1930-33	3.7	0.4	0.4	0.2	1.9	0.3	0.3	0.0	0.2
1934-38	24.1	7.6	3.7	1.9	6.3	1.1	2.0	0.9	0.5
ALL	155.3	33.5	22.9	21.4	38.9	15.7	11.7	6.6	4.5

(iii) New money raised (% gross proceeds)

	TOTAL	FOREIGN	NEW MFG	TRAD MFG	OTHER MFG	FIN&PROP	RETAIL&DISTN	SVCS	OTHER
1919-20	62%	70%	70%	37%	64%	92%	57%	59%	62%
1921-26	39%	39%	31%	48%	21%	95%	49%	46%	87%
1927-29	47%	62%	54%	49%	43%	60%	31%	46%	2%
1930-33	27%	71%	41%	29%	24%	23%	16%	-	100%
1934-38	25%	56%	21%	23%	16%	33%	32%	18%	21%
ALL	42%	53%	41%	40%	34%	73%	36%	40%	42%

Table 6: New Money Raised as % Gross Domestic Fixed Capital Formation

	FIXED ASSETS* (A)	GDFCF (B)	% (B/A)	NEW MONEY (C)	% (C/B)
NEW MANUFACTURING	357	327	91.6%	22.5	6.9%
CHEMICALS	227	138	60.8%	4.5	3.3%
ELECTRICAL ENGINEERING	74	67	90.5%	4.6	6.9%
MOTOR VEHICLES	33	73	221.2%	5.0	6.8%
SYNTHETIC FIBRES	23	49	213.0%	7.8	15.9%
TRADITIONAL MANUFACTURING	976	274	28.1%	18.6**	6.8%
SHIPBUILDING&ENGINEERING	311	143	46.0%	7.2	5.0%
TEXTILES	665	131	19.7%	11.5	8.7%
OTHER MANUFACTURING	1256	744	59.2%	38.9	5.2%
ALL MANUFACTURING	2618	1374	52.5%	83.2	6.1%

Source: Feinstein (1965), Ch.3, pp.45, Table 3.33

* Fixed Assets in 1920

** excludes coal mining for which Fixed Asset and GDFCF figures were not available.

Table 7: Hazard ratios of IPOs 1919-29

Hazard rates are estimated from a Cox Proportional Hazards Model. P-values are shown in brackets. See text.

Regression no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Period	**1919-29**	**1919-29**	**1919-29**	**1919-29**	**1919-29**	**1919-29**	**1919-20**	**1928**
MKTCAP (£100,000)	0.943	0.951	0.948	0.942	0.953	0.953	0.961	0.881
	(.001)	(.002)	(.002)	(.001)	(.007)	(.006)	(.162)	(.007)
AGE (YRS)	0.972	0.989	0.982	0.971	0.991	0.991	0.993	0.987
	(.000)	(.001)	(.000)	(.001)	(.027)	(.038)	(.178)	(.136)
PROFITS RECORD (YRS)		0.771			0.781	0.788	0.722	0.855
		(.000)			(.000)	(.000)	(.000)	(.068)
AUDIT DUMMY		0.806			0.988	0.89	0.941	1.121
		(.175)			(.943)	(.489)	(.868)	(.661)
VOTING DISCLOSURE DUMMY		1.433			1.314	1.236	1.219	1.215
		(.014)			(.085)	(.195)	(.486)	(.491)
UW DUMMY		1.360			1.273	1.218	0.786	2.437
		(.072)			(.169)	(.267)	(.401)	(.045)
PROPSOLD (%)			2.468		1.482	1.588	0.906	3.238
			(.005)		(.263)	(.209)	(.871)	(.138)
EXTRA VOTES SOLD (%)			3.295		3.814	3.474	2.616	16.628
			(.001)		(.002)	(.006)	(.229)	(.001)
NEW MONEY (%PROCEEDS)			2.469		1.692	1.695	0.562	2.543
			(.000)		(.031)	(.037)	(.224)	(.028)
NEW MFG DUMMY				1.726	1.771	1.688	3.123	1.598
				(.001)	(.001)	(.004)	(.025)	(.079)
FOREIGN DUMMY				0.652	0.600	0.688	0.339	2.212
				(.021)	(.005)	(.087)	(.009)	(.038)
1919 DUMMY						1.586		
						(.114)		
1920 DUMMY						2.188		
						(.003)		
1927 DUMMY						1.107		
						(.743)		
1928 DUMMY						2.424		
						(.000)		
1929 DUMMY						1.396		
						(.264)		
No IPOs	669	652	669	669	652	652	179	164
No failures	213	208	213	213	208	208	63	79
Log-likelihood	-1293.7	-1232.3	-1278.9	-1283.4	-1212.4	-1201.0	-274.5	-337.8

Figure 1: IPO Volume and Equity Prices on the LSE 1919-38

Business Activity is *The Economist* Index, Jan.1920-Dec.1938), Capie and Wood (1983). For Equity Index see text. 1919=100.

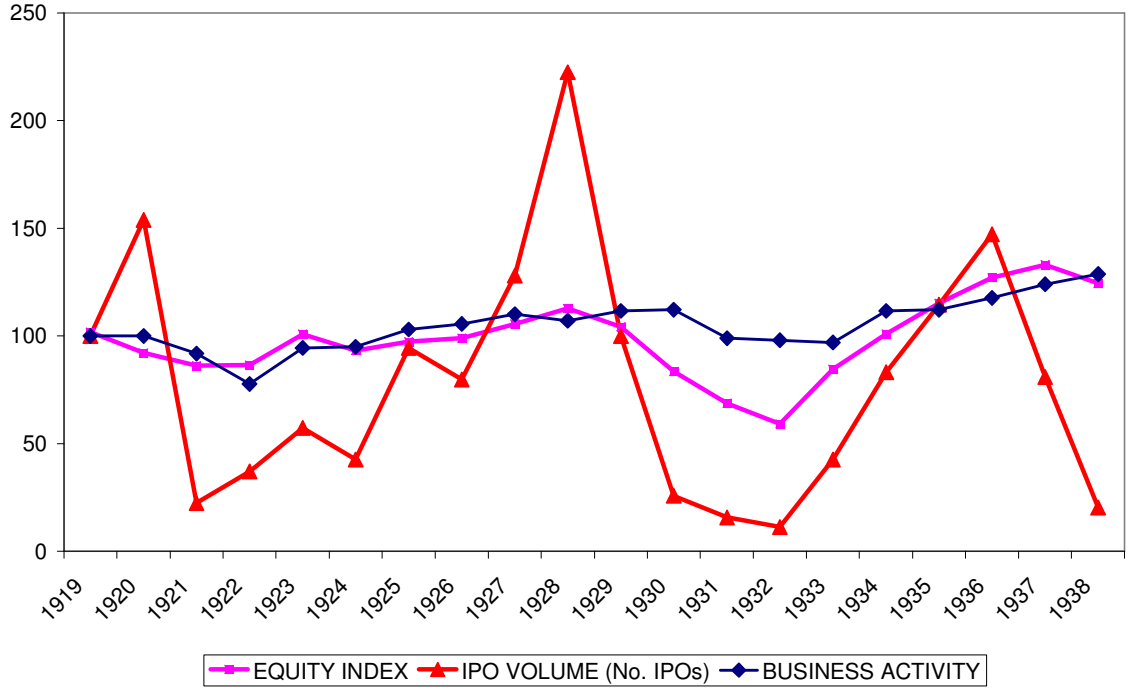

Figure 2: IPO Survival Rates

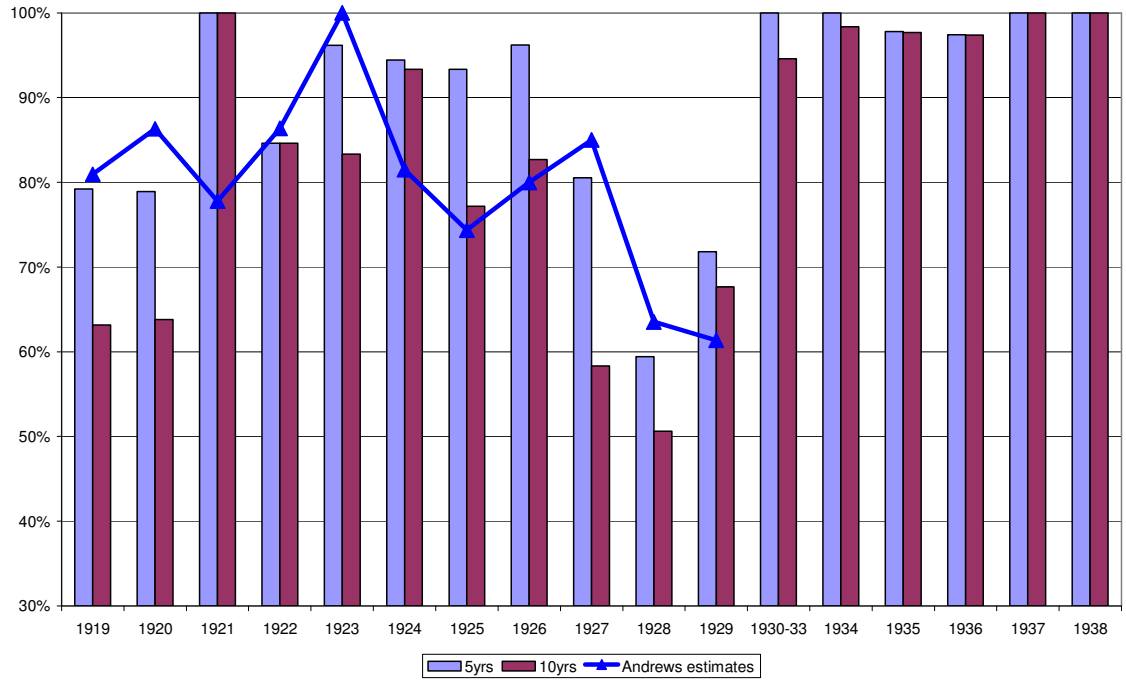

Figure 3: Firm Age and Profits Record of IPOs on LSE 1919-79

